Proceedings of the Seminar

The Institutionalization of Animal Welfare, a Requirement for its Regulatory, Scientific and Productive Development

11-12 November 2004, Santiago de Chile

UNIVERSIDAD DE TALCA

EUROPEAN COMMISSION

GOBIERNO DE CHILE
MINISTERIO DE AGRICULTURA
SAG

Animal Welfare

Seminar
2004

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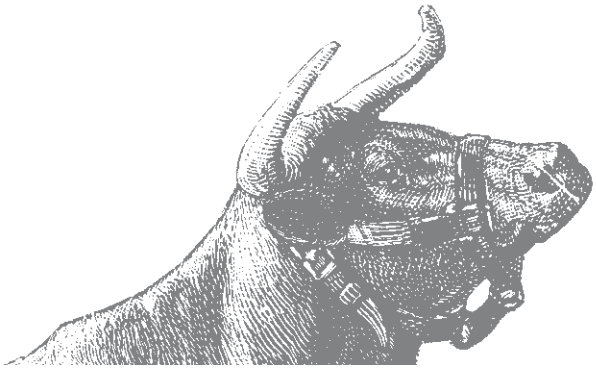

11 - 12 November 2004

Santiago, Chile

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Prologue

One of the activities carried out by the Chilean Agricultural and Livestock Service (SAG) corresponds to the control of Meat Law (Law Nº 19.162 of 1992); and this is the only legal body existing in the country where most of regulations on animal welfare are outlined, in particular with reference to animal transportation and humane slaughtering.

Since the signature of the Association Agreement between the European Community and the Republic of Chile, November 18, 2002, the issue of animal welfare forms part of the work Agenda, because it is a constituting part of Annex IV of the mentioned Agreement.

So, the organization of the Seminar "The Institutionalization of Animal Welfare, a Requirement for its Standard, Scientific and Productive Development" was the beginning of an ambitious work oriented to set the issue of animal welfare in both public and private scopes, with the intention to enrich the regulation frame currently existing, commitment assumed by Chile together with the European Union.

This bilingual document (english-spanish), gathers the presentations of this Seminar that was held on November 11 and 12, 2004 in Santiago, Chile.

The event was organized by the Agricultural and Livestock Service (SAG), the European Commission and the University of Talca, within the context of the Sanitary and Phytosanitary Agreement between the European Community and Chile.

The meeting was structured in three sections: a presentation of the subject from three complementary points of view, in charge of the Attaché General Director of the European Commission (General Direction of Sanity and Consumers' Protection), the National Director of SAG and the Rector of the University of Talca.

The second section consisted in eight conferences in charge of outstanding specialists, which were followed by three panels with the participation of nine specialists, whom exposed and discussed, together with the public, the thematic of animal welfare from three different and complementary perspectives.

Finally, the head of the SAG Livestock Protection Division, as a conclusion to these meetings, enounced the future lines of action in Chile with respect to animal welfare.

In each presentation authors and updated filiations are indicated during the meeting.

The Institutionalization of Animal Welfare, a Requirement for its Regulatory, Scientific and Productive Development

Seminar organized within the context of the Sanitary and Phytosanitary Agreement between the European Community and Chile

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Foreword

Animal Welfare within EU Legislation and Internationally

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Animal welfare policies in the European Union (EU) are today an issue of high public concern and political relevance. Today the farming of animals is no longer viewed by European consumers simply as a means of food production. Instead it is seen as fundamental to other key social goals such as food safety and quality, environmental protection, sustainability and ensuring that animals are properly treated. The critical link between animal welfare, animal health and food safety has been widely assessed. Important initiatives are also underway to build an international consensus on this issue. In particular I am delighted that in the context of the EC-Chile SPS (Sanitary and Phyto-Sanitary) Agreement it has been possible to cooperate together very fruitfully to organise this important animal welfare seminar.

Looking back the first Community legislation on animal welfare was adopted in 1974 and concerned the stunning of animals before slaughter.[1] This initiative indicated the importance that was already attached within the European Community to animal welfare and the prevention of unnecessary suffering. In particular the Directive states that:

> "**Whereas the Community should also take action to avoid in general all forms of cruelty to animals**; whereas it appears desirable, as a first step, that this action should consist in laying down conditions such as to **avoid all unnecessary suffering on the part of animals** when being slaughtered."

As concrete examples today in the EU calves older than 8 weeks have to be kept in groups and their tethering and muzzling is forbidden, pregnant sows can no longer be kept in individual crates and cages for laying hens without materials for enrichment will be phased out. Animals can be transported by road for a maximum of 8 hours, otherwise they have to travel in vehicles specially equipped for long distance journeys with water and food in sufficient quantity. Since 1993 in slaughterhouses specific welfare requirements are required for the animals' handling and management, stunning or killing.

[1] Council Directive 74/577/EEC.

Directive 98/58/EEC on the protection of animals kept for farming purposes underlines the principles forming the basis for EU animal welfare legislation and highlights the need to treat animals according to their physiological and ethological needs. Respecting the basic five freedoms[2] (freedom from discomfort, hunger and thirst, fear and distress, pain, injury and disease and freedom to express natural behaviour) is a fundamental principle and the EU has already taken various practical steps to secure real improvements in animal welfare.

EU animal welfare policy has also been underpinned by a specific "Protocol on the Protection and Welfare of Animals" introduced via the Treaty of Amsterdam in 1999. This recognises that animals are "sentient beings" and obliges the European Institutions and Member States **to pay full regard** to the welfare requirements of animals when formulating and implementing Community legislation in the fields of agriculture, transport, internal market and research. The new draft EU Constitution for Europe agreed in June 2004 reinforces this commitment to animal welfare and is an important landmark, in particular in view of a newly enlarged European Union consisting of 25 Member States.

Internationally there is a great challenge to balance competition, productiveness and animal welfare in the increasingly global trade in agricultural products. The limited international consensus on the role of animal welfare in international trade was highlighted by a report prepared by the European Commission in 2002 on animal welfare legislation on farmed animals in Third Countries and the implications for the EU.[3]

Given these facts the Commission has actively contributed to the development of animal welfare standards at the international level. In particular the 167 member countries of the World Organization for Animal Health (OIE)[4] have approved a specific OIE animal welfare mandate with the establishment of a permanent working group and various ad hoc groups. Important steps have been the organization in February 2004 of the first OIE Global Conference on Animal Welfare, and in May 2004 the adoption of guiding principles on animal welfare and the designation of an OIE Collaborating Centre on Animal Welfare. Specific OIE guidelines on land and sea transport, slaughter for human consumption and killing for disease control are foreseen to be adopted at the May 2005 OIE General Session. In Europe the Council of Europe has for many years been working on this issue, within the framework of various Conventions and Recommendations concerning the protection of animals.

Turning to the EC-Chile SPS Agreement, this includes a goal of reaching a common understanding on animal welfare standards, in particular on the stunning and slaughter of animals. This seminar provides an important opportunity to share information and expertise. The Agreement's Joint Management Committee has given a specific mandate to a working group on animal welfare and upcoming OIE guidelines will be used as the basis for mutually agreed animal welfare standards. In the future consideration will also be given to expanding the scope of the Agreement to include animal transport standards.

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[2] Defined in 1979 by the UK Agriculture Ministry's advisory body, the Farm Animal Welfare Council.

[3] http://europa.eu.int/comm/food/animal/welfare/references/2002_0626_en.pdf
http://europa.eu.int/comm/food/animal/welfare/references/2002_0626_es.pdf

[4] On the web: http://www.oie.int/eng/en_index.htm

In summary the European Commission strives to continue to update and innovate its animal welfare standards within the EU. Agreement on international animal welfare standards and guidelines will be vital and the OIE's activities are crucial in this respect. The EU believes that such standards should not be seen as trade barriers, but rather they represent opportunities for countries to access and compete in worldwide markets on a more level playing field. This can help to increase trade and prosperity while also giving due importance to animal welfare. The EU is fully committed to working with our trading partners such as Chile to promote animal welfare internationally and this seminar provides a shining example of what can be achieved in such a spirit of mutual assistance and understanding.

Institutionalization of Animal Welfare, a Requirement for its Standard, Scientific and Productive Development

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Confinement and treatment received by animals during production process is an issue that is being increasingly discussed with stronger force by people of developed countries. This is mainly due to the systematic criticism of environmentalists groups, which have remarkably influenced consumers' perception on this matter. Their ethical-environmental arguments have changed not only consumers feeding habits but also, in many cases, an increasing trend to get animal origin products which productive processes convene a high levels of respect and good treatment towards the animals.

Consumers' preferences for animal origin products with high welfare standards have obliged commercial agents of food and agriculture chain to satisfy said demand by incorporating production, commercial and market techniques, harmonious with these new trends.

The adoption of this concept by consumers let us have the certain knowledge that we are in the presence of a new value of attribute that affects with an enormous power their purchase decision.

Animal welfare is a public, complex and many-sided issue that includes important aspects of scientific, ethical, economic-commercial and politic nature. As this is an increasingly relevant matter for the society, practices associated to animal welfare must be sustained on objective scientific bases. This condition is basic, because it should not be subjectivized by considering only ethical-environmental or religious aspects, nor exclusively economic aspects. It will be essential to give, in the near future, a scientific focusing to animal welfare, particularly in livestock and fish-farming scope, in order to achieve credibility in the commercial area.

Chile cannot be unaware of this discussion; its incorporation as a commercial partner of the most important world markets represents new technical and commercial challenges. Its assimilation and incorporation to new quality standards for processes and products, as well as the demands of technical equivalence among the commercial partners imply technological changes and a wide and strong entrepreneur management. The introduction of animal welfare concept in particular within farming of animals, has arrived to stay to a point that it has turned out to be a technical barrier for the international commercialisation of meat products. This fact requires the adoption of new animal production methods as an answer to an increasing consolidation of a demand for differentiated products, in accordance with this type of attributes.

[1] National Director since August 1, 2005

In a vision of future sceneries, Chile together with the European Union are developing this issue in a pioneer manner, by incorporating it in its Association Agreement; this task has as objective the common understanding about general standards as well as specific ones, such as, for example, animal slaughtering and stunning systems.

Today, after the First World Conference on Animal Welfare, organised by the World Organization for Animal Health (OIE), held in the year 2004, in Paris, France, the importance of this matter is reinforced, emphasizing key aspects as terrestrial transportation, transportation by sea, humanitarian slaughtering and sanitary killing. Thus, the OIE, organization that currently has the authority to be the world referent for animal welfare issues, has developed guidelines, which, in the medium range, will be the technical requirements for the world livestock trade. In this discussion there participated not only the national technical instances, but also, universities, research centres and the civil and entrepreneurial society, among others.

In the Chilean case, the Agricultural and Livestock Service (SAG), is the State entity in charge of facing this challenge, due to its condition of supervising institution in those aspects related to animal welfare, as defined by Law Nº 19.162 (Meat Law) and by Law Project on Animal Protection, currently under discussion at the National Congress.

In this form the SAG, with the close cooperation of the European Commission, apart from that of the Universidad de Talca and the Associations of Veterinary Medicine Colleges of Chile (AFEVET) have join their efforts to organise this International Technical-Scientific Conference on Animal Welfare that opens the doors of discussion onr this issue at a national scope.

Challenges and Opportunities for the Academic World in the Context of Animal Welfare and the Commercial Globalization

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Animal welfare is a public, complex and many-sided issue that includes important aspects of a scientific, ethical, economic-commercial and political nature. Since this is an increasingly relevant matter for society, practices associated with animal welfare must be supported by an objective scientific basis, particularly as in the livestock and, in the near future, in the fish-farming areas it will be essential to achieve the credibility of participants in the commercial chain in the eyes of consumers.

Confinement and treatment received by farm animals during the breeding process is an issue that is being increasingly discussed with stronger force in developed countries. This is mainly due to the systematic criticism by environmentalist groups, which have remarkably influenced consumer perception in this matter. Their ethical-environmental arguments have changed not only consumer eating habits but also, in many cases, the tendency to obtain products of animal origin whose production processes encompass a high level of respect and good treatment towards the animals. The adoption of this concept by consumers ascertains that we are in the presence of a new value attribute that powerfully affects purchasing decisions.

Consumer preference for products of animal origin with high welfare standards have obliged commercial food agents and agriculture chains to satisfy that demand by incorporating production, commercial and market techniques harmonious with these new trends. Thus, lately we can observe the arising of alternative markets for livestock products that promote production with a high level of animal welfare. A clear indicator of this new trend is the increase in England and Denmark of extensive pork and bovine production where animals are no longer confined but bred in large spaces under environmental conditions similar to their natural conditions.

The First World Conference on Animal Welfare, organised in the year 2004 by the World Organization for Animal Health (OIE), in Paris, France with the participation of not only the national technical institutions, but also, universities, research centres and the public and business community, reinforced the importance of this matter, emphasizing highly relevant aspects such as terrestrial transportation, transportation by sea, and humanitarian and sanitary slaughtering. As a result of this event, the OIE, has developed guidelines which, in the medium range, could probably be the technical requirements for world livestock trade.

In this respect, a number of scientific studies show that the use of animal welfare protocols permit obtaining high quality meat products and achieving high levels of efficiency in the different stages of the commercialisation chain. If to this we add revenue improvements, as a result of increased product prices, we can conclude that the adoption of this new tendency in the livestock business is a favourable alternative for development.

On the other hand, the incorporation of Chile as a commercial partner in the most important world markets represents new technical and commercial challenges. Among other aspects, the application of new quality standards in the food and agriculture chains, as well as the demands of technical equivalence among the commercial partners bring significant technological and business management changes. In view of this logic, the introduction of animal welfare can be transformed into an opportunity for the development of exporting domestic meat products. This fact requires the adoption of new techniques of animal production handling in order to be able to respond to the increasing consolidation of the demand associated with this type of attribute.

From the point of view of veterinary and agricultural sciences the application of these guidelines in the field of animal welfare constitutes a technical and ethical challenge for higher education institutions in countries like Chile. The above would bring out important modifications in the curricular plan of studies for careers related to the agricultural and livestock areas, as well as in the advanced research of animal behaviour. Thus, it is important that Chilean universities offering these careers are able to meet these new challenges

In this regard, it is highly satisfying for the Universidad deTalca to be able to contribute to the knowledge and comprehension of the concept and the application of animal welfare in the Chilean society. We make a positive assessment of the fact of having taken part in this International Seminar that gave rise to this publication and, likewise, we are pleased to have worked hand in hand with the Agricultural and Livestock Service and the European Commission on this important event.

Conferences

Training in Animal Welfare

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1. Introduction

It is a great opportunity, for me and for the Institute that I represent, to participate in this seminar, because, as a collaborating centre of the Animal Health World Organization, OIE, we have quite a long experience in training for OIE member countries.

The Instituto Zooprofilattico is one of the ten laboratories in Italy which work to guarantee food safety and human health in the country, because we work from "farm to fork", as doctor Husu-Kallio said earlier, by controlling the quality of food for animals, of animal health as well as of food for human consumption. But what we do is not only to make laboratory analysis, but also to develop applied research, devoted to solve technical problems of our national and international community, and following the principle of our general director, that if you do something and you do not communicate that you have done it, it is nothing. Then, our main task is to export our expertise and to train up the people all over the world to use what we have developed at the first step in an experimental way and then in an applied way.

The Institute is located in Abruzzo, Molise Region in central Italy and our headquarters are located in Teramo. We are about 500 human resources, and most of us work in Teramo, where we have developed some kind of expertise in epidemiology, risk analysis, animal diseases, animals' identification and traceability and from few years in animal welfare.

As Dr. Husu-Kallio said this morning in his presentation, in 2003 we have formally realized our Animal Welfare Centre and in the following year the OIE, the World Organization for Animal has decided that we are trustable to collaborating at the Animal Centre on Animal Welfare, we were already collaborating in our centre for epidemiology, but now we have a collaborating centre for animal welfare, veterinary training, food safety and veterinary epidemiology.

Last summer, Dr. Husu-Kallio asked us to collaborate with the European Commission for this bilateral agreement with Chile to elaborate a common pilot project. As you can see the mandate of a collaborating centre is first of all to propose and develop procedures to facilitate the harmonization of international regulations, to provide scientific and technical training, and to coordinate scientific and technical studies. So we are particularly honoured to do this kind of job with Chile, respecting our mandate of collaborating centre of the OIE.

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In our experience, we have projects in East European countries, candidate countries, Mediterranean countries, and some consultancy experiences in Argentine and Brazil, so we are quite used to work in this, in developing projects. I have personally a good experience on bilateral agreement between Italy and United States, but it is on food safety.

We have to point out that the Institute has developed a knowledge management system which comes out from research, projects and from the network of collaborations we have all over the world. However, not only knowledge is product by our own, but we also have a collection of documentation of the existing procedures, that is to say, "we collect information from inside", from our information system and "from outside", as observer and collector of good practices.

The result of the implementation of this system, we have a wonderful library in our institute, which is really able to find everything, everywhere in the world. And so, in some way, we give back a feedback to the community from which we collect expertise through distributing and disseminating knowledge through ad hoc activity and training. Both of them can be developed in a traditional way, that is to say, face to face meetings, workshops, training courses, but in the last two or three years we are much more orientated to distanced activities through the web (internet). So our proposal for this work we are starting here in Chile will be most of all devoted to develop a web system, so we are thinking of e-learning courses, distance learning courses, and I will go more in depth on this project later on.

Our learning network is really spread out all over the world; here you can find some of our collaborators, people that we work together with. The California State University, Collins centres of epidemiology for animal health, on this support on institutes for Alles diseases research, and the universities of Georgia in the United States, and some other centres that are in Italy like Bologne and Teramo's University.

In particular on animal welfare, we have specific agreement of collaboration with another institute like our own which is in Sardinia region, but also with the University of Hannover in Germany, the

University of Cambridge (with professor Brumda), University of Vienna and we are also developing an agreement with La Universidad Católica del Salvador in Buenos Aires (with professor Stol).

2. The importance of the network

This network is fundamental for the Institute, because on animal welfare now, we need a high level of training. By the way, yesterday I had a very fruitful meeting at SAG, and the final agreement was that we do not have to work only on technical training, but also on management training. In this issue we have to join technical competence with management organization and leadership competences, because this is the only way to guarantee appropriate performances and behaviours. The cultural step we have to go pass through these two areas: management and technical training, and as you all know, there are no prospect for a profession that cannot adapt itself to a work which is changing so fast.

In the meeting yesterday I was impressed by the words of SAG director, when he said "animal welfare is by appearance a frivolous subject when a country has so many other problems to solve", and of course I agree in that, but my personal experience as a researcher says that if we start communicating animal welfare issues, if we start with children, if we start communicating animal welfare we will have in a near future a more respectful age, more respectful citizens, and if they are able, if they learn to respect animals, probably they will respect human beings much more and in my experience in health education programs for children we more often pass messages for population through children. You know food safety, and human animal relationship. All these themes carried out are delivered to public through children, and I think animal welfare in a country like this, is not frivolous if we can pass through the population and increase the awareness.

In our joint work with Chile, we will guarantee operative level in veterinary public health, but also in animal welfare, and we will help in harmonizing and in interpreting national norms. Harmonization is a problem whatever in the world, also within the European Community, where more often common legislation is transformed into national law, but quite often we have problems in interpreting the European methods, because even if we are a Union, a community, we are really lots of nations, but together with common purposes, but with different cultures, so, the harmonization is something which can be reached by creating communities of good practices, of people who work together, who compare their work and who decide jointly which might be the best way to reach a purpose.

Dr. Mohan Raj, participant in this seminar said in his conference on Animal Welfare in Paris in the year 2004, a very effective sentence that reads "Producers in countries wanting to export cannot afford to ignore the consumers concern in importing countries if they wish to sustain the economic prosperity and trade" So, it is clear, it is not a surprise that animal welfare passes through production.

Producers are the first ones who need to apply animal welfare standards, because they are perfectly aware that importing countries cannot be under evaluated. They know and they ask everywhere in the world to have the respect of animal welfare standards. But this is not enough, animal welfare should become a priority at national level, because it should become a cultural issue, and it happens, for instance in Europe, but also in the United States, for quality, for hazard, for all the other thing that require a growth, cultural growth in approach.

3. The importance of the OIE

The work of the OIE is very important because even if in Europe we have quite a good regulation, quite good norms on animal welfare, but for countries which do not have any of these, the OIE guidelines are the basic standards, and this is why European Commission said we will increase our mutual trust passing through the OIE guidelines.

The Strategic Plan 2001 to 2005, it was decided that animal welfare should have been considered as a priority, that is to say, that the member countries decided that the OIE should have had a specific mandate on animal welfare even if it was not foreseen by the World Trade Organization Agreement (WTO), and this is because when the WTO will decide to include animal welfare, the OIE will be ready to face the situation.

On the other hand, the OIE is supposed to assist mutual agreement, bilateral agreement, and so this is why the OIE has to provide a legislation that are the basis of regulations to improve this, so in 2002, as you know, the permanent working groups started working and the priorities were established to be at animals used in agriculture

The topics as Dr. Husu-Kallio said are transport, human slaughter, killing for disease control purposes, and housing and management will follow in the near future.

The OIE is also working in identifying research needs. You know, there is a very big production of research on animal welfare in many countries. I used to say that probably now, the most important parameters have scientifically demonstrated, so all we have to do is to implement, is to start from what research has demonstrated until today. So the OIE wants to define guidelines to orientate research in the future, and to enhance collaboration among research centres, and another task this organization has is to provided expertise on animal welfare issues to the OIE stakeholders group

4. Agreements of the First Global Conference on Animal Welfare

Last February 2004, Paris hosted the first Global Conference on Animal Welfare and it was an OIE initiative. For the first time researchers, experts, law experts, lawmakers, philosophers, public services, industries, associations for consumers' protection and for animal protection were sitting around the same table. The conference was very successful, mainly because for the first time all those people who normally are one against the other were together for developing a common project.

So the conference was successful, because the participation was very high, more than 300 participants, and was very qualified, both from the speakers point of view and from the participants themselves. The decision, the outcome of this conference is that future conferences should be organized at local level and most focused on specific subjects, and this because animal welfare is a worldwide subject, it is recognized, but it must be cut in someway on the specific needs of geographical areas. I think it's not a surprise if we say that standards and parameters of Europe are different from the standards we should look for in Africa, so of course it's a global issue, but we cannot avoid to consider, local, regional, situations.

So finally the OIE mandate was clarified to all the world and accepted by the stakeholders and the endorsement of the OIE's role as a leader for animal welfare has been finally accepted. Another outcome is very important outcome is the dialogue which started and the transparency that the

OIE has decided to give to each work on animal welfare, for instance, if you go to the OIE website (www.oie.int) you can look for all information you need and you can find all the reports of the working groups and of other groups' activities.

An now a few words on the specific, lets say themes that during the conference. I wish to start on animal welfare in the veterinary curriculum because this is my specific work. So the working group that during the conference works on veterinary curriculum has stated, and this recommendation has been collected by the community that undergraduate program and veterinary curricula must have animal welfare as a specific teaching issue. Some minutes ago the Dean of the Faculty of the Veterinary Medicine of the University of Chile said that animal welfare is something studied in many different areas. He said it is something which is not one task but it is transversal, and of course it is, but we have to insist, because animal welfare becomes a specific teaching issue in veterinary curriculum.

And it is not all, of course, because the community of workers is now out of the university, of course, so training on animal welfare should be promoted and we must activate an international network as to provide, both to people who want to learn and people who want to teach didactic material, documents and information.

The conference in Paris also established on research that the topics to be investigated should be identified, and funding organizations should be encouraged to finance projects on animal welfare.

With reference to trade both the OIE and the WHO should draft a comment document to clarify international issues in law and treated obligations.

The OIE has also referred to the issue of pets, so, at the first step, the mandate is to evaluate if standards development for production work can be applied to pets to and the second important thing is animal human as animal welfare must travel in the same way, they are very strictly connected.

Another important task is communication. There is a great work in Europe on communication on animal welfare. I think probably the United Kingdom is the place where this aspect is dealt with more professionality and with very high standards, but as I was telling you at the beginning of my presentation, communicate animal welfare issues means to increase the public awareness and can take, at a long distance strategy to a higher level of education from the side of people.

In short, animal welfare is included in the OIE, animal have codes for terrestrial animals, with some kind of guidelines. Their general principles apply to transport most of all, but within the next few years, it is expected to have a specific issue, on land and sea transport, slaughter for human consumption and killing for disease control purposes. To this respect, the working group on animal welfare will meet on December 2004 to review the final document, and it is hoped that by May 2005, this is voted and approved by the General OIE Assembly. This document dictates the general guidelines on these issues.

After this the document will be transmitted to the code commission which will review the document again, then it will be forwarded to the delegates of the Member countries, they will make comments and after that, they will be ready for the general assembly. So we hope, we strongly hope that by May 2005 we have four chapters approved. In content they are not far away by the European legislation, but as you we all know, they will be the basic legislation for countries which don't have any specific regulation on animal welfare.

5. The project

And now lets go on the project we want to develop in Chile, so as I told you, we have expertise on training and e-learning, we have quite a long tradition of collaboration with the OIE and we need to fulfil our mandate for the OIE.

We received the specific commitment by the European Commission. The European Commission asked us to make this common project and I want to show you, I want to be clear on this point, because it is important that you all know what the European Commission expects from this project: to increase mutual trust, they want us to work together to have a stronger trust to each other and they want us to work for the implementation of a training project able to increase the culture of animal welfare, the knowledge on the general principles, but most of all this project should enhance skills to manage monitors and verify the application on animal welfare. This is what European Commission asks, so this is for my work one part of the commitment.

The commitment of SAG, in my opinion was exactly the same, in the previous three days Paolo Dalla Villa, Head of Animal Welfare Unit of the IZS, and I have spent our time in working together and with a sub-direction and visiting farms and plants in Chile, this because we wanted to understand exactly which were the perceived learning needs and which were the unperceived learning needs. So watching, talking, reading documents, making meetings is the most common way we know to develop what we call "a learning need assessment". So we have now, elements for understanding what the European Commission wants, what the SAG wants.

We have heard and seen what the producers are looking for or what the plants are looking for and we have made what we called "direct observations" to understand what is also needed but not clearly stated. You know, it's not easy sometimes to express clearly what you need, but our expertising and our methodology is being applied now for this purpose, we would like to go on with our work meeting more closely people who work at regional and local level

Together with SAG we have established that our training should be addressed not only to veterinarians and technicians directly involved in applying, controlling, inspecting animal welfare standards, but also to people who are managing the services, the public services and the private plants and farms.

Finally, we looked for an activation of a network with the universities, because it is very important for us to know that this will not be a project coming from abroad. It must be important and clearly stated that this project is arising from here, and so it is fundamental the collaboration of said organizations. It is also required, apart from the collaboration of the OIE, the collaboration of the European Union, of our Institute, and also of the SAG and the Chilean Universities.

Since we are quite far away, what we will propose will be to work for increasing a community through the web, so we would like to develop a course instructed on e-learning, so this e-learning means that this people will have to start by their own, collaborative learning means that people will have to make practical exercises in connection with other people, and also we will use what it is called "visual class", these video-conferencing.

What we would like is to develop a project which will not finish when the course is finished, because we would like you to become a permanent network of good collaborative practices through the web but also through a common field of practice, and at the end we hope that what will remain is a permanent porto, a web porto for knowledge and skill dissemination.

The course will be targeted to veterinary officers, veterinary inspectors, accredited veterinarians at the first step, but the purpose is to extend some of it, apart from this learning process to managers.

The didactic materials will be prepared specifically for this purpose, they will be written down loadable tests, but also videos, images, checklists, and we hope we will be able to put on a virtual library able to support your study virtually. The evaluation system will be all over the course so we will design tests, quizzes, but not only because we will ask people to work on series by assays, by final and module assays, but also through practice. The course will be supported by tutors who will have the purpose to give the necessary support both in proceeding with the course from a technical point of view, but also from a content point of view. And, you know, it is not a very precise information now, because the project is still in development, but the subjects will be treated in modules; nevertheless the priorities we have identified are transport and slaughter, although we cannot avoid to give guidelines also on breeding and handling, and here you find swine, poultry, beef and dairy cattle, sheep and goats, according to the priority you have defined. What I've learnt is that swine and poultry are probably your main areas, because this is the most, I mean, the higher quantity of experts is concentrated on these two species, but we will give also guidelines on beef and dairy cattle and sheep and goat. Considering that not all the people attending the course, will have to work on the specific areas. If in a given region people deal only with bovines, for instance, they are not required to fulfil the other areas, because we cannot oblige people to make training on something they are not interested in.

So, the most important opportunity that this course will offer is that everybody will be able to choose what he wants to learn. So, introduction, history, principles, legislation, this is very important to give information on legislation and of course, we will start from what we have: European legislation, United States legislation, and OIE resolutions, regulations. Then the international awareness on animal welfare and where it is located, including concepts such as breeding and handling of poultry, pigs, beef and dairy cattle and sheep and goats, and we will go through behavioural characteristics, environmental requirements, housing, feeding, drinking, husbandry and management and monitoring systems. Transports will be cared through legislation, first, requirements and again, monitoring, inspections on how it is developed and the work of the people will be to understand and to try to solve situations and concrete problems. For slaughter, I suppose that we will have to go through the entire process, and the practical purpose will be to design checklists to facilitate the work of people who have to implement the standards and of people who have to verify that such standards are applied.

This system will permit to constitute a community of practices, a community of experts at national level and we will lead the portal with the opportunity to realize what we call e-port folio, which is an electronic way to present our own competences. So for every person who will participate in the project there will be a clear evidence of what here he has learnt and which are their own personal information, institutional information, project developed, and eventually publications, so that, all the world, but most of all, your country, can understand who is doing what and where.

So, finally let me conclude saying that this is not an easy challenge, this is not because there are lots of barriers which are technology, which are time and costs of training, and because somebody told me yesterday people work all the day, they don't have time, but we must be aware that training should become part of this job. If we learn something we are not working, we are investing on ourselves and for every project, for every purpose a community wants to reach. The most important thing is human resources. We can have wonderful slaughter houses, we can have wonderful plants, we can have wonderful farms, but if people do not know how to use what they have it will be a useless investment, so it must be important that the managers, both at private and public level understand that training is an investment on their future success.

Scientific Research Trends on Animal Welfare

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1. Introduction

Scientific research related to farm animal welfare has, among others, the following objectives:

- To develop strategies to improve animal welfare in livestock premises, as well as during their transportation and slaughtering.
- To develop methods to assess animal welfare in an objective form.
- To deepen cognitive and neurophysiologic mechanisms related to suffering, emotions and adaptation of animals.

It is important to keep in mind that these objectives belong to the scope of biological sciences; nevertheless, the welfare study also includes sociological and economic aspects. In fact, concern on animal welfare is a consequence of demands of consumers of some countries requiring that farming animals are bred, transported and slaughtered in a humanitarian way (Harper and Henson, 2000; 2001). To give an answer to these demands, it is necessary to know consumers' perception and farming of animals' aspects that are considered as unacceptable from animal welfare point of view.

Concern shown by consumers of some countries regarding farm animal welfare is not in harmony with the reduced segment of animal origin food market that shows high standards of welfare in their production processes. Probably, at least in part this might be due to the lack of transparency in process production and commercialization of animal origin food, thus resulting in a certain lack of confidence by consumers. Thus, it is necessary to study how consumers get to this information they demand related to food production system (Blokhuis *et al*., 2003).

Even though this is not always the main problematic, in many cases, improving farm animals welfare results in an increase of animal origin food costs (McGlone, 2001). For example, two of the possible strategies to improve welfare of chicken fattening are to reduce density of animals and to decrease growth rate; in this form they prolong fattening period and increment production expenses, and, as a consequence, on production system viability. (SCAHAW, 2000).

Considering that farm cattle is an economic activity, the research related to the strategies destined to improve farm animal welfare, should be accompanied by an economic study that permits the quantification of said strategies on production costs and, consequently, on the production system viability (McGlone, *op. cit*.).

Objectives mentioned in the three above paragraphs do not belong to the scope of veterinary or biological science in general, so they are not treated in this article. Nevertheless, without any doubt they are highly relevant if we intend to advance in the field of animal welfare.

In the year 2004, the European Union approved a research project on animal welfare entitled "Integration of animal welfare in the food quality chain: from public concern to improved welfare and transparent quality". This project has a budget of 17 million Euros and in it participate 39 institutes and universities of 13 countries. Among other objectives, the project pretends to develop practical strategies to improve farm animal welfare (specifically poultry, pigs and bovines) in stockbreeding premises, as well as to perfection a European assessment and certification system for animal welfare in the establishments (www.welfarequality.net).

Although currently this is not the only research project under way on animal welfare, it is undoubtedly one of the most ambitious one. Its objectives are one of the references used to select priority trends in animal research that are described in this article. Other sources of information especially useful for this purpose are the reports drawn up by the Scientific Committee on Health and Animal Welfare for the European Union, the Panel on Health and Animal Welfare of the Food Safety European Authority and the Farm Animal Welfare Council of the United Kingdom. Most of these reports indicate, not only which are the main welfare problems within different species and production systems, but also the priorities in the scientific research on animal welfare

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2. Development of strategies to improve welfare of farm animals

Following there is a description, in general terms, of some of the priorities or especially active scientific researches related to the strategies to improve farm animal welfare. Aspects related with animal welfare during slaughtering process are not included, because this issue will be treated in another presentation later on.

2.1 Neonatal mortality

Neonatal mortality is defined as death during the 3 to 7 days of life, although, in general, most of casualties are produced during the first 24 to 48 hours from birth (Mellor and Stafford, 2004).

Neonatal mortality is an important problem in a number of species of farm animals, not only from the economical point of view but also from animal welfare. Thus, for example, the report about the welfare of pigs in intensive conditions, drawn up by the Scientific Committee on Health and Animal Welfare of the European Union indicates that average neonatal mortality in pigs farms are unacceptably high and that necessary measures should be implemented to reduce it, without affecting negatively sows' welfare. (SCAHAW, 1997).

Neonatal mortality percentage varies according the specie, production and housing system, and to weather conditions. In ovine cattle the amounts frequently vary from 10 to 25%, even though, occasionally, it could reach 70%. In pigs, neonatal mortality usually ranges from 5 to 20% in establishments with lactation cages, while in premises without cages; it could reach 35% (Mellor and Stafford, *op. cit.*).

Hypothermic, sows malnutrition, lack of an adequate maternal behaviour, infections, injures suffered during delivery (labour) or immediately after birth or the action of predators, are the main causes of neonatal mortality (Mellor and Stafford, *op. cit.*).

Throughout the last 50 years a number of scientific works have been carried out in relation to the causes of neonatal mortality of farm animals, as well as regarding the most adequate strategies to reduce them (Mellor and Stafford, *op. cit.*). Nonetheless, there are still some aspects that need to be investigated, such as:

- **The effect of the sow characteristics and of the sow and piglets on neonatal mortality**: Although the effect of bedding system related to sow neonatal mortality has been widely studied (Verley, 1995), there is much less information about the importance of the characteristics of the piglet and of the sow. Notwithstanding the above, the evidences indicate that said characteristics have a critical effect on piglet survival (van Arendok *et al*., 1996; Tuchscherer *et al*., 2000). This aspect could be a crucial to develop, for example, a genetic selection program oriented to obtaining more adequate animals for each bedding system.

- **The development of intervention programs to reduce neonatal mortality**: Although there are many studies that indicate that piglets' survival depend on the interaction of different factors (Varley, *op. cit.*), this information is not yet available to be used in the elaboration of an effective intervention program in establishments.

- **Level of suffering associated to different causes of neonatal mortality**: in spite of the fact that of the numerous studies carried out in order to investigate the main reasons of neonatal

mortality in the different species of production animals, there are few researches in relation to the impact of these reasons on animal welfare. In fact, even though neonatal mortality also constitutes an economic problem, it is probable that the level of suffering experimented by these animals widely depend on the cause of their death. (Mellor and Stafford, 2004).

2.2 Lameness

Lameness is a very important animal welfare problem in many species, including broilers (SCAHAW, 2000) and milking cows (Webster, 1994); on these latter, there is an annual incidence estimation of lameness that reaches 25%.

Lameness causes pain, reduces useful life of cows and hampers the expression of normal behaviour of the animal (Whay *et al*., 1998). The combination of a high incidence and heavy effects on welfare, transforms lameness, according to some authors, into a main milking bovine welfare problem (Webster, *op. cit*.).

Lameness in milking cows obeys to the interaction of many factors, including, among others, the availability of space (Leonard *et al*., 1996), the type of soil (Leonard and O'Farrel, 1994), feeding (Kelly and Leaver, 1990) and the social behaviour of animals (Galindo *et al*., 2000). Nevertheless, the relative importance of each one of these factors or the way they interact among them is not known with accuracy. Both are important aspects to establish strategies that permit to reduce the incidence of lameness and thus, they are important issues of investigation.

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In broilers, lameness has a high prevalence and among 10 to 30% of animals might suffer painful lamenesses (SCAHAW, 2000). One of the main causes of this problem is the alterations of the normal development of the skeleton, caused by the fast growth rates of these types of chickens. (Kestin *et al*.,2001). This problem could be controlled by reducing the growth rates or by increasing the movement of animals. In relation to the latter possibility, some recent results suggest dietary changes and changes in the way food is provided, are aspects that might have a positive effect on chickens' welfare. The relation of diet, feeding manipulation and lameness incidence is thus, a very active research area.

2.3 Social stress

The stress caused by the aggressive interaction among animals and by the competence for resources such as food and space, might constitute an important welfare problem in many species. Apart from the effects directly derived from the answer to stress, aggressions can cause injures and even death (Edwards, 1998).They can also increase the incidence of some diseases as lameness in milking cows (Phillips, 2002).

On the other hand, the competence for food can interfere with the normal pattern of feeding, reducing consumption and increasing the risk of metabolic diseases such as ruminant acidosis. (Phillips and Rind, 2002).

In the member states of the European Union and in the particular case of pig breeding, problems derived from aggressions and competence among animals are more important due to the obligation to house in groups, pregnant sows.

Some of the research lines currently under way in the area of social stress and its consequence on farm animal welfare are the following ones:

- **Genetic selection and reduction of aggressiveness**: aggressiveness depends on environmental and genetic factors; evidence obtained in laboratory rates indicates that genetic selection can modify the tendency of animals to show an aggressive behaviour (Cairns *et al*., 1983). Some of the preliminary results also indicate that genetic selection could contribute to diminish aggressiveness in farm animals, and more concretely, in the pig.

- **Effect of diet on aggressive behaviour**: in pregnant sows bedded in groups, the increase of fibber in the diet seems to diminish the frequency of aggressive interactions (Roberts *et al*., 1993). Nonetheless, this effect seems to depend on the type of fibber they are provided, (Roberts *et al*., *op. cit*.) and there is also a possibility that some interactions are produced between diet and the feeding system being used.

- **Use of Pheromones to decrease aggressive behaviour**: Some studies indicate that there are some pheromones that could be used to reduce the aggressive behaviour in animals, without the inconveniences derived from medicine administration (Pageat and Teissier, 1998).

2.4 Tail-biting propensity in swine

The term tail-biting makes reference to a behaviour occasionally observed in pig specie that consists in biting the tail of one or many pigs of the pen. Some studies indicate a prevalence of between 1 to 10 %, although in some farms this can get to 20 to 60% (Bracke *et al*., 2004).

Tail-biting is a serious problem not only from the economical point of view, but also in reference to animal welfare. In fact, injures suffered by bitten animals provoke pain and they can be infected, causing, in extreme cases, the death of the animal (Huey, 1996). Besides, and as it will be discussed later on, the appearance of a tail-biting outburst indicates a handling problem.

Tail-biting is generally prevented by cutting the tail; nevertheless, said practice is a matter of discussion for many reasons. First, the appearance of neuromas after tail amputation that most probably, causes chronic pain in animals (Gross & Carr 1990; Simonsen *et al*., 1991). Second, some authors suggest that tail cutting is less effective than it is believed and that, in effect, it does not diminish the incidence of severe tail-biting. It can also occur that the amputation of the tail makes that animals with tail-biting tendency bite other parts of the body of their pen companions (Fraser & Broom 1990). Third, it is reasonable to think that the best method to prevent tail-biting should consist in the elimination of environmental factors that are responsible of their occurrence, more than to carry out a systematic surgical amputation. All these reasons explain the fact that European legislation on animal welfare prohibits systematic tail cutting and indicates that all other measurements should be taken to prevent tail-biting, keeping in mind environmental conditions and stockbreeding load.

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It seems that tail-biting is a redirected form of exploratory behaviour. In fact, under natural conditions, the pig dedicates a very high percentage of the time it is awaken (up to 80%), to carry out these type of behaviours that are mainly related to food searching. Said activity is performed by routing, by removing the earth with their snout. This behaviour seems to respond to a "behavioural necessity", that is, behaviour that the animal should obligatory performs, even if their feeding needs are already covered. Thus, in establishments with slatted floors, where the pig cannot direct towards a normal stimulation this routing behaviour, this is redirected towards alternative stimulations, such as the tail of other animals (Newberry & Wood-Gush, 1988).

On the other hand, the fact that this exploratory behaviour is transformed into a problem or not, depends on various factors mainly related with manipulation and animal feeding. Within the first ones, we can point out temperature, ventilation, animal density and the type of soil, among others (Haske-Cornelius *et al*.,1979; Moinard *et al*., 2003). As for the factors related with feeding, possibly, lack of nutritional components (salt and in special, essential amino acids) would increase the risk of tail-biting appearance (Fraser, 1987 a, b). Other studies suggest that dry feeding increase tail-biting risk, in comparison with moist or wet feeding. (van Putten, 1969).

Due to the multifactor character of tail-biting, one of the objectives of present scientific researches relative to this problem is the development of a system able to quantify tail-biting risk in a determined pig establishment. (Bracke *et al*., 2004).

Undoubtedly, one of the most important factors in the outbreak of tail-biting is the fact that in most of the establishments, pigs are not stimulated as where to direct their exploratory behaviour, specifically their routing conduct. In fact, practically all studies that have analysed the relation between tail-biting and the presence of materials that permit such behaviour, such as straw or shavings, have achieved similar results: provision of these materials reduce, to a great extend, the probability of tail-biting outbreak. On some occasions, also, tail-biting has been eliminated by offering animals a substratum for their exploratory behaviours. (Beattie *et al*., 1996).

Some recent works seem to indicate that the fact of providing a straw bed or similar in early stages of development could contribute to avoiding tail-biting at older ages (Day *et al*., 2002). Precisely, the effect of an early experience on later risk to develop tail-biting is another area of current researches related to this problem.

2.5 Feather pecking and cannibalism in hens

Feather pecking is a behaviour that can be seen in laying hens in any type of bedding, consisting in the habit of pecking of determined individuals and, on occasions, plucking out feathers of other hens. This action, not only causes pain, but also damages plumage of affected birds, compromising their thermal regulation capacity.

Cannibalism, on the other hand, can also be given in bedding system, it starts with feather pecking and turns to skin pecking and finally to more severe one that is subcutaneous skin pecking. In other cases, it consists in pecking the cloacae area. Both forms receive the name of cannibalism because they include blood ingestion and the ingestion of other tissues of affected birds, by the birds that attack them (SVC, 1996).

Apart from the negative consequences, feather pecking and cannibalism for affected birds; both behaviours tend to be prevented by partially amputating the peaks, which is a questionable practice, from animal welfare point of view (SVC, 1996).

Feather pecking could be an explorative redirected behaviour form (Blokhuis, 1989), although other authors have suggested alternative explanations (Vestergaard *et al*., 1993). Any way, this is a multifactorial problem, in which development takes part a number of factors as for example, the number of animals in each group, animals density, lightning, type of ground and feeding, among others. (Simonsen *et al*., 1980; Elson, 1990; SVC, *op. cit*.).

Similarly to tail biting in pigs, one of the objectives of current scientific research on feather pecking is the development of a system that permits quantification of the risk of appearance of this problem in a certain poultry farm. Another research line is the study of feather pecking genetic base and the possibility to reduce the incidence of the same through a genetic selection of animals (Kjaer, 1995).

2.6 Human-animal interaction

During the last two decades, a number of studies have been published, showing that the answer of animals' fear to persons has an important effect over welfare and productivity of farm animals. On the other hand, the intensity of this answer depends on the way persons responsible of animal care interact with them, which, at the same time is the consequence of training and attitude of such persons (Hemsworth and Coleman, 1998). Besides, a careful manipulation of animals can result in a customary process of the same under human presence, thus decreasing fear answer (Boivin *et al*.,1998). Research underway on this issue refers, among others to the following aspects:

Factors that modify manipulation efficiency to reduce subsequent answer to fear: Some researches indicate that the period or age when manipulation is carried over (Boivin *et al*., 1998; Uetake *et al*., 2002), as well as the presence of other animals while this is carried out. (Boivin *et al*., 1998) can modify their efficiency. Nevertheless, it is not known with certainty the magnitude of these effects nor the possible existence of other factors.

Development of formation training programs directed to improve knowledge and the attitude of personnel responsible of animals' care: It has been demonstrated that these programs can have a positive effect on animal welfare (Hemsworth and Coleman, 1998). Nevertheless, their content and form should be adapted to the features of each country and region, from the sociological point of view as well as from the livestock production structure.

2.7 Animal welfare in fish-farming

Most of scientific works on farm animal welfare make reference to mammals and birds. In some countries, nevertheless, fish-farming is one of the most important livestock activities, not only from the economical point of view, because of the number of animals.

In spite of the differences between fish nervous system and that of mammals and birds, there are anatomic, pharmacological and behavioural evidences indicating that fishes can experiment pain and other forms of sufferings (Chandroo *et al*., 2004).

Some of fish welfare problems are related to the density of animal's bedding, the possible competence for food and the problems resulting from handling, transport and slaughtering (Conte, 2004).

The report on fish welfare published by the Farm Animal Welfare Council, of the United Kingdom (FAWC, 1996), indicates some of the priorities research areas in this field.

2.8 Transportation

Animal transportation from farms to the slaughter house constitutes a critical phase in farming process, from the point of view of animal welfare. This is due to the fact that during transportation animals are exposed to a number of stressing factors in a relatively short space of time. These factors include, among others, the novelty, the mixture of unknown animals, the movement of the vehicle, lack of food and water, changes of temperature and relative humidity, and handling during loading and unloading.

On the other hand, the stress caused by transportation has important economical consequences, which can produce casualties and a decrease of carcass and meat quality (Broom, 2000; SCAHAW 2002).

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In spite of the numerous scientific works published on transport effects, there are some aspects that require a deeper research:

- **The effect of transportation time**: very long trips can, theoretically, compromise animal welfare (Knowles and Broom, 1990; Knoles, 1998; Saco *et al*., 2003). Nevertheless, from the scientific point of view, the main difficulty is to identify, with objective criteria, which are the maximum acceptable transportation times (Warriss, 2004), because it is not easy to discriminate which deviation, with respect to the media, of a physiological parameter or of behaviour is indicative of a severe welfare problem.

- **Conditions of temperature, humidity and ventilation in the vehicles**: the changes of temperature and relative humidity are some of the stressing factors that affect animals during transportation. Nevertheless, it is very difficult to establish the acceptable values of these, among other, because animals have different adaptation capacities to the environmental conditions in direct relation to their genotype and the place they have been bred. Further more, the effects of environmental conditions depend on other factors such as animal density in the vehicle and transportation time; these are factors that make it difficult to establish accurate recommendations for the different animal species. (SCAHAW, 1999).

2.9 Genetics and animal welfare

Genetic selection directed to production improvement has contributed to cause diverse problems to farm animal welfare. Thus, for example, the selection to improve broilers meat growth velocity has increased the incidence of lameness in these animals (FAWC, 1992; Kestin *et al*., 2001). In milking cows, the selection to increase production has conveyed a higher susceptibility of animals to suffer from lameness and mastitis (FAWC, 1997). Likewise, osteocondrosis, which is one of the main weaknesses of pigs' legs, is consequently, at least in part, the selection to improve the carcass quality.

One of the objectives of scientific researches in animal welfare is to eliminate or reduce the negative effects produced by selection to improve productivity over animal welfare (FAWC, 2004).

On the other hand, genetic selection can become an instrument to improve welfare, as it has been shown in this report, by describing various examples that illustrate this principle, including, in the case of pig, the selection of animals with a higher feasibility in the neonatal phase or in a slighter aggressiveness and, in the case of chicken, a smaller tendency to develop feather pecking. In a more general form, many aspects of animals temperament that have a clear influence on their adaptation capacity to the surrounding and, thus, over their welfare, have a genetic base and are susceptible to be modified through selection programs. These aspects include facing strategies, the tendency to show fear in front of new situations and of sociability (Eley and Plomin, 1997: Koolhaas *et al*., 2001).

End of the day, genetics offers tools potentially useful to improve farm animal welfare and this constitutes one of the most active research areas in animal welfare.

3. Development of methods to objectively assess farm animal welfare

As explained in the introduction of this article, the increasing interest for farm animal welfare is a consequence of consumers' demand that these are humanely bred, transported and slaughtered. In order to give an answer to this social demand and to ensure the transparency to production process of animal origin foods, it is require having a system availability to objectively value animal welfare and that this might eventually permit the development of a certification system.

Independent from the definition of welfare that is being used; its measurement should be based in the combination of various parameters of sanitary, physiological, behavioural and production nature (Gonyou, 1986; Broom, 1991). For having a system to permit animal welfare valuation in a livestock establishment, it is necessary to select the most useful parameters and decide the way in which these parameters should be weighted and combined among them. Even though some of these systems have already been developed (*e. g.* Bartussek, 2001), most of them are based on parameters coming not from animals, but from the environment in which they are inserted. This presents the inconvenience that the comparison among different production systems is difficult; besides, the real relation among such environmental and welfare parameters in animals are not always evident.

For this reason, one of the objectives of current research in animal welfare is to get ready a method based on measurements arising out of animals that permits a real and objective assessment of their welfare. This means, firstly, to study the validity of the different parameters (Engel *et al*., 2003) and, in the second place, to look for the most efficient way to weigh and combine them, so that the resulting method is at the same time valid and practical.

4. Comprehension of cognitive and neurophysiologic mechanisms related to suffering, emotions and to animals' adaptation

Suffering capacity of animals is an essential element in each discussion on animal welfare. In fact, if animals did not have the capacity to suffer, probably there would not be any ethical or moral reason to worry for their welfare. (Dawkins, 1980; Duncan and Petherick, 1991, Duncan, 1996).

The study of suffering capacity of animals is based on the anatomic, neurophysiologic, pharmacologic and behavioural evidences (Chandroo *et al*., 2004), and it is mainly related with the study of animals conscious and mental processes.

Even though, until a short time ago, many scientifics considered that issues related to animal mental processes were out of the reach of science – with the exception of some ethologists such as Griffin (1981) and Dawkins (1993), each time more researchers accept that said issues can be studied following the scientific method (Rushen, 2003). Consequently, the study of conscious and the mental processes in animals is one of the basic scientific disciplines, which advance is necessary for the progress of the research on animal welfare.

Another fundamental aspect, tightly related with the above, is referred to the meaning of the measurements used to assess welfare. In fact, if discussions on animal welfare depend on their capacity to experiment suffering, then the measurements taken to assess welfare should be related to the level of suffering of animals. Nevertheless, on many occasions this relation has not been established and it constitutes another area in which the progress of basic disciplines as neurophysiology and behavioural sciences is fundamental for the advance of knowledge on animal welfare (Rushen, 2003).

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Most of the researches carried out on animal welfare have made reference to the causes and manifestations of a reduced level of welfare. Instead, each time there are more specialists that insist on the need to study the positive parameters of welfare and the physiological mechanisms that control positive emotions such as pleasure. (Carter, 2001).

On the other hand, animal's adaptation mechanisms and the so called facing strategies – that are fundamental elements in the study of animal welfare – are subjected to a considerable variability among individuals. The comprehension of their cause is also within an important area of research. (Koolhaas *et al*., 2001).

5. Comments

The description of some tendencies in the research presented in this article does not pretend to be exhaustive. Nonetheless, we hope that it can be useful for the illustration of the multidisciplinary character of the research on animal welfare and the number of different aspects that require to be explored to improve farm animal welfare in an exacting and practical form, adapting the strategies to the characteristics of the different production systems and geographical areas.

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Fundaments of Animal Welfare Research

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1. Introduction

Why are we worried about animals? Do they have a sort of moral status? Very often we speak about the concern about animals from different points of view, and I think that one of them is the most important, ethical reasoning; nevertheless, we have to admit that we are here because this area is beginning to be developed in Chile as a consequence of certain requirements of international trade and commercial agreements subscribed by the country.

In origin countries, where such requirements have been demanded, these questions have risen because there is a public concern and also because many years ago consumers began to question the way we treat animals. That is the origin of this concern, and so, it had to be legislated on this issue; thus in Chile we should also start from that point: why are we worrying about animals?

Animal welfare and the research on this issue are intrinsically related to ethic. To this regard, there are various methods that are used to study animals, and, in the latest time, the target is to be able to understand their internal state of mind, as for example, how are they feeling or if they are in a state of aversion. Nevertheless, we can have the best methods to show that an animal is suffering, for example, but these methods will not help us if the persons in charge of the animals are not worried or of decision making with respect to the policies to be applied in animal farming. That is why there is such a close relation between animal welfare and ethic.

On the other hand, researches results inevitably have a subjective level of interpretation, because we cannot know with certainty what is really occurring with the animal, although the interpretations are based on parameters that indicate certain conditions such as stress or pain. A subjective criterion related to ethic is applied to the analysis of said parameters which constitute the basis to implement practices of different nature.

A document dated in the year 1789 has been considered the basis to write the history of animal welfare thought. This document was written by the English philosopher and economist Jermy Benham, who asked when people would start to worry about the treatment given to animals. He said that in that time, people was already realizing that black slaves could not be treated bad only because of their colour was different, and he asked himself when would people start worrying about treatment given to animals, that as they could not speak or show similar intelligence as human beings were indignantly treated.

Bentham said that the fundamental issue with respect to the animals was not to ask if they could be able to reason or not. In fact, in some cases, animals can show wider intellectual capacities than humans, for example, in case of mentally retarded children or persons in vegetative condition. Nevertheless, the important thing about this is to ask ourselves if animals, independent of their reasoning capacity or of any other capacity they might have, can feel pain. This is the important aspect we have to concentrate on.

With the current advance in knowledge, we know that animals have the capacity to suffer, so that is not a question anymore. Thus, an ethical concern rises on them, trying to give them the best possible life condition quality and to avoid unnecessary suffering.

This concern started in England a long time ago; the first animal protection acts are dated in the decade of 1870. Historically, the English society had showed a high concern for animal treatment; nevertheless, during the 60's, when intensive animal production was in vogue, Ruth Harrison wrote the book "Animal Machines", where she expressed her concern with respect to intensive animal confinement, which included the fact that they were considered as real production machines of something.

This denunciation caused a high public impact, to the point that a State Committee was created (Randall Committee), which mission was to study which were the main animal problems that concerned people, and according to this, to issue pertinent regulations. Thus, animal welfare concern entered to a state scale and in 1993, the Farm Animal Welfare Council (FAWC) perfected the outlines of the so called "five freedoms", that are the basic rights that animals should have when they are in production (right not to suffer hunger or thirst, right not to suffer discomfort; protection against pain, injuries or diseases; freedom to express normal behaviour; protection against fear and stress).

2. What is animal welfare?

In a very general way, we can say that animal welfare involves everything related to animal comfort that goes beyond lack of disease. Health is only part of animal welfare, but not a synonym; thus, the concept includes not only the physical condition of the animal, but also the psychological one. This last point is something that some veterinary doctors still have problems in understanding due to college education they received; nevertheless, a lot of scientific research has been carried out and, they show that animals do express their psychological experiences.

Within this context, FAWC modified the five freedoms above mentioned, incorporating the idea of watching over psychological welfare of animals, because they can also experiment fear, anxiety and other type of negative conditions.

It is also necessary to consider the animal physical and mental health, we have to make our best effort to have them in complete harmony with their environment and to be concerned about their adaptation to artificial environments, designed by men, in order to avoid suffering. We should not forget that animals that are currently under production were originally wild and quite adapted to their environment and, when they could not overcome a problem in their environment, the natural selection entered in operation, producing their death. Nonetheless, men submitted them to different type of confinement to which they were not naturally adapted for, so it's our duty to offer them good survival conditions.

Some definitions indicate that animal welfare is the absence of pain and suffering. Nevertheless, other say that it is not only the absence of negative experiences, but also animals should be provided with positive experiences, including aspects such as bedding (housing), responsible treatment of personnel towards animals, nutrition, sickness prevention, handling and humane killing.

3. What is suffering?

The dictionary says that it is an aversive stimulation, that is, a negative one, of the nervous central system that produces physiological and behavioural conflicts of the organism with the environment.

Animal suffering, specifically, has been defined as a subjective internal experience and a negative one of the individual that can be acute and prolonged in time, in which the animal cannot exert adaptive actions that it would normally use to face risk and to reduce it.

In nature, animals react against a number of stimuli such as, for example, a predator and hunger or to something so simple as heat. An animal that feels heat, moves to the shade, that is, it shows a behavioural reaction and compensates uneasiness and discomfort; an animal that is faced to a predator suffers a high stress and if he can, he runs away and saves itself, using all its natural mechanisms to overcome these risky situations. Nevertheless, if they are captured and kept within artificial systems, they are sometimes submitted to considerable stressing situations that unable them to exert their adaptive conditions; thus, this feeling overcomes their capacities, and they cannot deal with them, and this is when an animal suffering problem is presented.

One of the five freedoms above mentioned, refers to the fact that animals could be able to develop their normal and essential behaviour under any situation; for example, in the case of pigs, that can route, a behaviour that is impeded when they are confined in slatted floors, they do not have earth to dig, situation that can also generate stress and suffering.

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4. What does animal welfare study?

As a discipline, animal welfare studies animals in different conditions. For example, free range poultry production, compared to intensive production. The objective is to observe how animals respond to each environment in particular.

Stress is one of the main interests of animal welfare research, because it is a factor that acts in direct relation to the welfare condition of the individuals. It is worth while to point out the fact that stress and suffering are not synonyms, although currently we tend to speak of stress and automatically think that the animal is suffering; nevertheless, it is not like this.

Stress is the homeostatic state perturbation of the individual, due to natural or men induced events, and that can be detected in the animal through behavioural and physiological conditions, which can be registered and studied. As a biological process, stress tends to keep its energy by activating the physiological processes of the animal that has been faced to a challenge, to be used, to face and to survive to this situation.

Stress is a common phenomenon in nature and in productive systems; it should be a reason of concern only when it overpasses certain levels. The idea is not to avoid stress as a whole, but to understand that artificial breeding and confinement can alter animal's natural adaptation process. For example, external intervention made by man, can be directed to reproduction, in the sense of selecting which animals will be reproduced and which characters are to be transmitted and preserved in the population. Thus, together with selecting reproduction, many times original adaptation characteristics of animals will be eliminated.

Summarizing, actions like these make us responsible in front of animals, because we are restricting their natural capacities; we have an ethical responsibility towards them.

4.1 Reactions of the animal faced to an stressing stimuli

In the first place, there is recognition of the stimulation that could be a predator or, in a confinement system, cold, hunger or sliding floors. This stimulates the central nervous system, unchaining a set of behavioural, hormonal, immunological and nervous mechanisms, among others. This set of elements retro feed the animal's answer, which at the same time, preserve their systems to avoid stress. This is a normal auto regulated function.

Nevertheless, when the consequences to the stress answer are bigger than the stimulation and the animal cannot overcome them or when its adaptation capacities are restricted, an altered biological function is produced, that if sustained a certain period of time, can lead him to a pre-pathological state, and subsequently in declared pathologies.

It is very important to understand the recognition of stimulation; it refers to the perception by animals of stressing situations and not only to real elements such a predator is. The recognition of stimulation occurs in the scope of perception and, thus, it can produce fear or anxiety in the animal, without being a real challenge. For example, when animals have had a bad experience in production systems with persons that hit them, they can react to the simple fact of seeing that person or seeing another person with a similar clothing colour. Many pets react, for instance, to veterinary doctors dressed with white aprons, independent of the procedure, due to the relation they establish with past experiences, situation that triggers the answer to stress.

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In production systems, many times animals are exposed to stimulations not perceived by men, but that for them are very strong, presenting a stressing answer, which sometimes can be transformed into a chronic stress.

4.2 Impact levels of the different actions faced by animals

For example, if stress is reduced, action that is produced under normal natural conditions, the animal is capable of maintaining its normal homeostasis, but if stress is reduced and induced by humans, which is the most common situation, physiological and behavioural responses are produced.

If stress is permanent, for example in confinement systems where animals are with chronic stress, welfare problems begin to be presented; there could be a higher level of action if limitation to animals is constant and, under this situation they could reach a pre-pathological state and reproductive problems.

Finally, other critical situations are frank cruelty with animals, reaching pathological conditions, including population problems, when referring, for example, to animals with conservation problems.

4.3 Main components of stress response

There is a normal response, through energy mobilisation to face a challenge, together with the increase of cardiac and breathing rhythm and the decrease of digestive function to redirect resources for stress response. If stress is longer or stronger, this could also produce stop of growth, reproduction and of the immune and inflammatory response.

Stress can produce analgesia, which is the adaptation of animals faced, for instance, to the attack of a predator to be able to continue running away. Some neurological effects can produce cognitive and sensorial alterations; for example, stress causes learning difficulties.

Product of a prolonged stress or a very acute one, pathological consequences can be presented as fatigue, miopathies, hypertension, ulcers, psychogenic dwarfism or bony (osseous) decalcification (also observed in humans); and the suppression of reproduction that can reach to anovulation, impotence or low libido; if the alteration of immune system is too big, there could be a low resistance to diseases, and when the neurological effects are too prolonged, an accelerated neurological degeneration can be produced during ageing. All these are stress consequences that range from slight to strong ones.

4.4 How can they be assessed?

Animal responses are studied through physiological and behavioural observation. Different methods have been developed to study behaviour ecology and animal social organization; alteration and physiological damage can be measured by analogy through the physiological measuring presented in humans, for example, that are depressed or anxious. These psychological alterations and others, have a set of symptoms, already described inhere, and, if there are similar alterations in animals, analogy arguments can be used and we can say that it is probable that these animals are presenting a similar process to that of the humans.

Another method used in the study of animal welfare and that is very useful in farm animals, is the measuring of preference and motivation. This is what we call "to ask the animal", where this shows what is more important for him in the environment and enables us to provide it to him

4.5 Indicators used in the study of animal welfare

Behavioural: habitual behaviours are studied in confined animals and they are compared to their behaviours while living in wild life. This does not mean that an animal is suffering if while in confinement it has the same behaviour that while in wild life. These, together with other parameters, can help to get to the so called "general picture".

We can also observe abnormal behaviours that, many times, are consequences of welfare problems; for example, of prolonged stress or breeding. There are some animals that, at the moment of observation, may not be subject of stress, but as they were bred in an unnatural way, for example, without their mothers, this has generated abnormal behaviours to them, as stereotypes, which are repetitive movements, interpreted as behavioural scars of an artificial breeding.

Other elements of interest are the behavioural responses to new situations, such as facing animals to new stimuli (incentives) and to observe if they have an exaggerated reaction, a normal one or if they simply have no reaction at all; this last could be a sign of major depression. There are a number of tests that are used for this purpose, for example, in a research with bovine cattle, which results indicate, which is the answer capacity of animals faced to new objects or situations.

Behavioural responses of animal to pain, after having been subjected to castration, tail cutting or to other processes that are generally painful. This study permits to determine pain healing forms; if the animal has an intense response and with many signs of stress to a procedure carried out without analgesics, we could think that, if an analgesic is applied and a parallel study is performed

resulting in a smaller increase of cardiac frequency and that it does not present postural problems showing that he is not suffering too much pain, we might think in implementing the use of analgesics, in order to improve animal welfare as system and economic limitations permit it.

Physiological: the most obvious is death rate. If in a production system many animals are dying, it is evident that something wrong is happening. Some physiological signs that might have a faster change in front of stress are changes in cardiac and breathing frequency and in temperature. Nevertheless, we have to consider the context in which these changes occur; because not always the raise of these parameters indicate the presence of stress; there are other types of stress in which animals react in the opposite way.

Thus, it is important to know what these indicators are, but when we are investigating we also have to determine in which context they occur, the psychological condition of the animal, its past experience as well as its age and sex.

Reproductive: if animals are not reproducing in a normal way, there could be a problem of animal welfare. Reproduction is affected when stress reaches important levels.

Enzymatic: Enzymes can indicate, for example, muscle damage after transportation. One of the most studied hormones is cortisol, that is, its changes in front of determined stressing processes.

Immune and biochemical blood response: these factors change in stressed animals; for example, glucose level, even though we have to consider that other factors such as exercise can also be the reason for these changes. In general, they are indicators that are used in combination with other indicators.

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4.6 Indicator to measure animal welfare

Behavioural: it is very useful to study the budget in animals of different farming systems or in nature versus confinement; behavioural differences are observed as well as maternal-infantile contact or the time invested in the search of food in nature versus confinement feeding.

Comparisons do not necessarily show big differences, nor do they determine that there is suffering per se, although they are good indicators that help to complete the joint vision with respect to the animal condition. These observations has helped to understand, for example, why it is very important in chickens the so called "sand bath" and that when they are kept in cages they cannot do it causing animal welfare problems.

Other behavioural studies with wild animals such as guanacos have been oriented to know their characteristics in order to implement production systems. For example, the study of their social organization has been a very valuable knowledge due to the short time of confinement of this specie (2 to 3 generations). Within this context, guanacos cannot be treated as other ungulate species, such as cows, putting all males on one side, and females on the other; in the guanacos the family organization is very important and, if it is not respected they could suffer depression problems.

Other studies on radio telemetry have been carried out, studies that are very useful in wild animals, even though they can also been used in farm animals kept in extensive systems or, inclusive, to measure their cardiac frequency and to observe their answer to some processes.

Results analysis can measure incidence or prevalence of abnormal behaviours and to determine their relation with different systems or if there are modifications when animals are changed from production system; it should always be considered which the modification behind any abnormal behaviour is. The disappearance of behaviour does not have a significant importance in animal welfare if we do not know the process behind it, that is, why the animal already did that.

It is the classic case of the horses that bite the mangers. In other times veterinarians were taught to use surgical or mechanical solutions to eliminate this behaviour. At present, and especially in other countries, these methods are not used anymore, because it is understood that the animal has an internal motive to show said behaviour. Then, the first thing to do is to find out which is the reason of this behaviour, thus, different options should be experimented and after finding out its cause, the abnormal behaviour can be solution. This is one of the forms to "heal" these abnormal behaviours when they are not permanently established, as well as the behavioural scars that remain when breeding has been abnormal.

Other studies that are used at "open field", such as observations of how the animal reacts when facing new situations; for example, how do they react when they are submitted to different breeding systems or at different weaning ages. This is very used in bovines or other types of ungulates.

Study on preferences, consumption and demand have a very interesting focusing, where economic techniques are used to ask the animals. Tests areas are defined in which, for example, a mink lives in a compartment that has another eight with different things: a tunnel, a bathing tub to swim, contact with novel objects and others. The animal is maintained living in this close

economy system and it does not have access to other resources. Starting from this situation we can find out which resource is the most important for the animal, which resource he visits the most. When this is determined, they put weigh to the access doors to the different compartments, that is, the animal should pay a price to accede to wanted resource. Then, the animal will stop entering to the compartment with resources he is not very much interested; on the contrary, highly interesting resources, such as food, will make the animal to move a strong weigh in order to reach it. Comparatively, we can determine the interest gradient.

With this information, demand elasticity curves can be built and thus determine which resources are left aside. In these assays occur the same that in assays carried out with humans: when food prices go up, people stop buying some products, starting by choosing cheaper things, and other things, considered as luxurious, are not bought any more; nevertheless, there are other things that people continue buying, such as bread, even though prices continue rising. This is a non elastic product.

Likewise, we can ask animals which are their behavioural priorities. In the case of minks (the research lasted many years), it showed that animals were willing to pay for swimming, almost as much as for food. Social contact was the other important factor for them; contact with objects or with other novel things were not so important, and then followed the interest for the tunnel or for toys; these last ones were abandoned as soon as the weight increased.

Physiological: Measure and telemetry are used in these researches to study cardiac frequency, for example. Guanacos have been used to face castration without analgesics, to determine the change in their cardiac frequency.

At present, a back bag is being proved in the laboratory with a remote blood tester, which is left on the animal's back. This is a solution to the problem presented each time a person got near the animal to collect blood samples, because this action changed the levels of samples that needed to be measured, for example, stress response hormones. The animals were accustomed to walk with the back bag, and then they were sampled each three hours and thus obtain basal indexes for the different parameters.

Other methodologies have been developed to avoid stress in animals for the simple fact of carrying out a research and in order to obtain real results for animal welfare studies. For example, samples used are collected in a non stressing way, as the measuring of hormones that indicate the response to stress through saliva, which is much easier and avoids the need to take a blood sample. This is used in pigs, that when they are in their pens, samples are collected with a giant swab, which is then centrifuged, thus determining the amount of cortisol contained in the sample. The results are compared among different systems and animal's reactions are interpreted for different handling processes, for example.

Another way to study hormones is to start from faeces. Some studies carried out in rhesus monkeys show that, when they are submitted to a stressing process, as the annual health checking, a significant response was seen in their faeces one day after this checking. This system permits, in a non invasive form, to study their reaction in front of different handling or production systems.

5. Comments

We have seen different indicators that can be used, even though none of them are the "panacea". Cortisol, for example, is the preferred one for veterinary doctors that like hard data and who prefer them instead of behavioural studies that give less information. But, as indicated, the cardiac frequency per se or the increase of only cortisol, do not give much light regarding animal welfare.

As researches are trying to find out which is the internal condition of the animal, to know if they are suffering an anxiety reaction, a depression or fear, and we cannot exactly know what is in their minds, then we can use triangulation among three parameters to get near to reality. Thus, animal welfare studies use, for example, a behavioural, a physiological and a reproductive indicator. The combination of these three parameters permit to get near to what the animal is really experimenting.

I would like to finish my presentation with a little reflexion related to what animal welfare is in production levels. Many studies can be carried out and, finally, when we know the animal condition, we can or cannot apply the results in the production systems, due to different causes. When we are going to take a decision, there are, of course, economical limitations; then the combination between animal welfare and economical limitations lead us to different points, making us to take the adequate decision. The animals, when living in their natural environment, do not have the maximum welfare; there are situations in nature, processes and phenomena in which the animal can suffer hunger or they are chased by their predators, making their welfare acceptable, but not optimum. Thus, in production environment, they will not probably reach the optimum state either. The idea is to respect their dignity and their life, in such a way that they do not live with unnecessary suffering.

The decision is to know what the right point to maintain them is; if they are derived to very high production levels, it is highly probable that their welfare is altered, and nevertheless, there are acceptable animal welfare standards with reasonable economical profits.

The Welfare Implications of Animal Breeding and Breeding Technologies in Commercial Agriculture

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Summary

The aim of this paper is to consider the potential welfare problems associated with new developments in animal breeding and breeding technologies, and to provide advice on an appropriate framework within which such developments may be monitored and, where necessary, regulated.

There can be no doubt that the commercial applications of new breeding technologies, as well as conventional breeding strategies, have the potential to influence animal welfare in a positive way. For example, in FAWC's Report on the Welfare of Dairy Cattle (FAWC, 1997) we recommended that, when commercially available, the sexing of sperm should be used to reduce the number of unwanted male dairy calves, provided that the technique had not been shown to produce adverse effects. Other potential 'positive' applications include breeding for longevity in dairy cows, improved neonatal survival in pigs and breeding for anatomical characteristics to reduce the risk of fly strike in sheep. Breeding for disease resistance in a range of species is also attracting increasing research interest.

On the other hand, inappropriate use of breeding technologies may create new problems, or exacerbate welfare problems that have arisen within conventional livestock breeding. Some of the most serious welfare problems in commercial agriculture are the outcome of a lack of balance in genetic selection in conventional livestock breeding programmes.

It is the impact of any breeding technology or strategy that is important to welfare, whether it is the quality of life of the offspring that is compromised, or whether it is the application of the technology itself that affects welfare. Furthermore, where genotype-associated welfare problems are recognised, we believe there is no reason to separate commercial applications of new breeding technologies from conventional livestock breeding. Indeed, the boundaries between conventional breeding and biotechnology have become increasingly blurred, particularly as a result of developments such as "marker assisted selection" which allow faster genetic change in target traits compared with conventional livestock breeding methods. Such developments should not necessarily be viewed as a threat to animal welfare. If they are applied to animal breeding in a responsible way, they have the potential to improve welfare.

[1] Speaker.

Nevertheless, we believe that safeguards are required with regard to the suitability for introduction of breeding technologies into commercial agriculture. Additional safeguards are also required for the importation of new breeding technologies developed outside the protection or the European Union, and for the importation of certain breeds of livestock, whether they are the product of new breeding technologies or the result of conventional breeding. We are also of the opinion that there should be a proper assessment of welfare, not only for novel or existing technologies but also for conventional breeding programmes. It is clear that, in welfare terms, it is in conventional breeding that many serious and extensive farm animal welfare problems are currently found in commercial agriculture.

We therefore recommend that Member States, either separately or together, should consider the establishment of a Standing Committee for the evaluation of welfare problems associated with new and existing breeding technologies. Such Standing Committees would provide advice to their Governments, and to the EC, on the effectiveness of existing legislation and practices relating to farm animal breeding procedures in order to assure animal welfare. They would also give consideration to ethical questions associated with animal breeding even where measurable detrimental effects on animal welfare may not be immediately evident. Any breeding technology, whether developed within the EU or overseas, should be thoroughly evaluated prior to, and during, its incorporation into commercial agricultural practice.

We are also concerned that targeted surveillance should occur on farms where new breed types or new breeding technologies are first introduced into commercial practice, and that the welfare impact of all such developments should be reviewed throughout a period of normally not less than 5 years after introduction into commercial agriculture. Furthermore, in order to determine the consequences of current breeding strategies or any new breeding technology and to provide essential feedback on welfare performance, we believe that a robust welfare surveillance system should be established. This should accurately monitor the incidence of specified on-farm welfare problems and be capable of providing information on welfare problems associated with breeding strategies or technologies and to determine the respective genetic and environmental contributions. This surveillance system should include the extensive data currently collected by breed societies and breed companies as well as by government departments.

Finally, we recommend that industry, possibly with EC support, should sponsor research and training programmes for the development of husbandry systems to support the demands of new genotypes in relation to their production system. We believe that the European Association for Animal Production (EAAP) could play a pivotal role is achieving these objectives for the benefit of animal welfare throughout Europe.

1. FAWC'S philosophy and methods

The Farm Animal Welfare Council (FAWC) was established in 1979. Its terms of reference are to keep under review the welfare of farm animals on agricultural land, at market, in transit and at the place of slaughter; and to advise Great Britain's Rural Affairs Ministers of any legislative or other changes that may be necessary. The Council has the freedom to consider any topic falling within this remit.

Animals are kept for various purposes and in return their needs should be provided for. They are recognised as sentient beings in the Treaty of Amsterdam, thus FAWC considers that we have a moral obligation to each individual animal that we use. This obligation includes never causing certain serious harm to animals and, when deciding on our actions, endeavouring to balance any other harms against benefits to humans and/or other animals.

The achievement of high standards of animal welfare requires awareness of animal needs and both caring and careful efforts on the part of all that are involved in the supervision of farmed animals. General guidelines as to what those who use animals should provide in order to avoid suffering and other harms, are contained in the five freedoms:

- Freedom from hunger and thirst, by ready access to fresh water and a diet to maintain full health and vigour.
- Freedom from discomfort, by providing an appropriate environment including shelter and a comfortable resting area.
- Freedom from pain, injury and disease, by prevention or rapid diagnosis and treatment.
- Freedom to express normal behaviour, by providing sufficient space, proper facilities and company of the animal's own kind.
- Freedom from fear and distress, by ensuring conditions and treatment which avoid mental suffering.

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2. EU legislation on farm animal breeding procedures

Specific legislation on farm animal breeding procedures is now in force as a result of European Directive 98/58/EC concerning the protection of animals for farming purposes. This is implemented in The Welfare of Farmed Animals (England) Regulations 2000, and the equivalent Regulations for the devolved administrations, which state that: "natural or artificial breeding procedures which cause, or are likely to cause, suffering or injury to any of the animals concerned shall not be practised", and that: "no animal shall be kept for farming purposes unless it can reasonably be expected, on the basis of their genotype or phenotype, that they can be kept without detrimental effect on their health and welfare."

3. Other welfare initiatives relevant to animal breeding

Within the UK there are examples of initiatives by animal breeders as well as veterinary bodies to address welfare concerns associated with breeding and breeding technologies. For example, the dairy industry has developed a nationally available selection index (£Production Lifespan Index (£PLI)) that incorporates longevity, as an inclusive measure of cow health, in addition to production traits. Plans are in place to expand the £PLI to include additional health traits, for example, lameness, that will increase opportunities for dairy farmers to select bulls for both health and production.

The Royal College of Veterinary Surgeons (RCVS) advises on artificial breeding techniques, including embryo collection and transfer, in its Guide to Professional Conduct (RCVS, 1996). The advice is based upon the Bovine Embryo (Collection, Production and Transfer) Regulations 1995, but through its professional guidance, the RCVS extends the principles to other species and techniques used in advanced breeding technology. It is stressed that, at all stages in such procedures, the welfare of animals should be paramount. Nevertheless, the RCVS has no mechanism to routinely monitor compliance with this advice. Furthermore, this advice is only applicable in techniques where veterinarians are directly involved or are responsible for supervision.

In the EU, in response to growing public concern about farm animal breeding and reproduction, the Sustainable European Farm Animal Breeding And Reproduction (SEFABAR) project was initiated in 2000 by the Farm Animal Industrial Platform (FAIP). It was an EU funded Thematic Network of representatives from all sectors of the livestock industry, plus breeding scientists and economists, brought together in a series of workshops over a three year period. During this time, the remit of SEFABAR was to discuss the future sustainability of livestock breeding within Europe, including a consideration of future European and world markets. Animal health, human health and environmental considerations also formed important parts of the discussions.

One of the outcomes of the workshops is the agreement by breeding organizations represented within SEFABAR to develop Codes of Practice for farm animal breeding. These codes are now being developed under an 18-month FAIP co-ordinated project, Code of Good Practice for European Farm Animal Breeding and Reproduction (CODE-EFABAR).

If welfare is given a high priority within these proposed Codes, and European breeding organizations agree to operate within them, they have the potential to raise the prominence of animal welfare as a key issue in changing breeding strategies. However, it must be recognised that many breed organizations operate within world markets and this may constrain the degree to which such

Codes may address welfare concerns, particularly those which, in order to enhance welfare, might constrain the ability to achieve the gains that commercial sustainability usually requires.

This is a view supported by The Federation of Veterinarians of Europe (FVE) who in 1999 adopted a resolution urging, "member countries and the European Commission to consider the introduction of measures designed to safeguard the welfare of animals with respect to the risks inherent in selective breeding programmes, while preserving the unique characteristics and genetic advantages of European breeds" (FVE, 1999).

4. Gaps in current regulations

We recognise the value of the EU legislative requirement specific to animal breeding but we are concerned about how effectively it is enforced. For example, we are not aware of any cases where it has been used successfully to restrict any breeding procedure. Examples of genotype associated welfare problems in commercial agriculture, such as those documented in the modern dairy cow or broiler chicken, demonstrate the obvious difficulties in defining what is unacceptable in terms of animal welfare. It is also clear that, when problems are recognised in species in widespread commercial use, there may often be no easy solution to rectify them, particularly when they have arisen as a result of past breeding strategies or changes in husbandry and management. Effective advice, and possibly legislative control, is needed to define acceptable and realistic breeding goals if such welfare problems are to be addressed.

We have also sought to determine how those sections of European Directive 98/58/EC concerning animal breeding are interpreted and implemented in other parts of Europe. However, we have found no detailed regulatory framework in any Member State which addresses fully the particular problems associated with the breeding of farm livestock for commercial purposes. Member States such as Italy have taken a similar approach to the UK in that the wording of the European Directive has been incorporated into national legislation. Denmark and Sweden have introduced legislation which allows the possibility of future controls. For example, the Danish Act on the Protection of Animals 1991 states that the Minister of Justice may lay down rules prohibiting the release of bred animals which have difficulties living in nature. A further provision gives the Minister of Justice the power to lay down more detailed rules on biotechnology, including a prohibition on the use of such methods on animals kept for farming purposes.

German animal welfare law attempts to define more precisely the nature of problems associated with breeding which are considered unacceptable. It is prohibited to breed vertebrates or to change them through biotechnology or genetic engineering if it is expected that the offspring are lacking parts of the body or organs for species specific use or they are unfit or deformed, thereby causing pain, suffering or harm. The German legislation specifically mentions behavioural and other welfare problems and prohibits the production of vertebrates where it is expected that behavioural abnormalities will occur resulting in suffering or increased aggressiveness. The law also prohibits breeding vertebrates if their keeping is only possible under conditions causing them pain, avoidable suffering or harm.

We have concluded that the lack of an adequate framework for the detailed consideration of how European Directive 98/58/EC may be interpreted and enforced is a significant gap in current welfare controls in most Member States.

There is a further potential gap in the existing welfare legislation in relation to "the generation of what might be judged intrinsically objectionable changes to animals" even in the absence of clear animal welfare, animal health or human health, or environmental concerns, as applicable to both GM and conventional farm animals. This may include insentient animals or animals with their physical characteristics, or normal patterns of behaviour, radically and unacceptably altered.

A problem in the case of novel technologies is that many are developed from commercial sources, often overseas, and are therefore not initially covered by EU regulations for research animals. Technologies can be introduced into the EU by veterinary surgeons as part of "recognised veterinary practice". These could become established within livestock farming before there had been any proper evaluation of welfare implications. This potential problem is well illustrated by "juvenile *in vitro* embryo transfer" (JIVET), a technique currently used commercially in Australia. JIVET is the mechanism through which follicle growth in juvenile animals (calves of 8-10 weeks old and sheep and goats of 6-8 weeks old) can be stimulated, offering the potential to substantially reduce generation intervals and produce multiple progeny. Practically, the technique requires hormone treatment of prepubertal animals, followed by oocyte recovery under general anaesthesia and via laparoscopy. Although this procedure, which presents clear ethical questions and may carry potential welfare problems, is not currently used in EU commercial agriculture, the possibility that this may become the case, as in Australia, is real.

Methods of detecting such imports, perhaps through liaison with veterinary practices and organizations, breeding and agricultural representative organizations, and Government departments will be important. In addition, the continued monitoring of imported techniques for an extended period following their introduction is important to ensure that welfare problems which may exist, but which may not be immediately obvious at the time of import, are detected further down the line.

Even for technologies developed within the EU, once they are outside the protection of research animal legislation, any animal that is subjected to or is the product of new technology is protected only under the general welfare legislation. For example, concern has been expressed about initiatives to promote the incidence of twin calves in the beef industry through the implantation of multiple embryos. Whilst the technology required to achieve this may not be, in itself, a welfare concern, we are aware that problems, such as poor calf survival and disease have arisen in some commercial agricultural systems. Additional welfare problems may be associated with the implementation of breeding technologies already in existence. For example, there are no rules to govern the number of embryos which may be implanted into sheep or cattle, or the number of times such a procedure may be performed.

It is essential that targeted surveillance is made of farms where new technologies, developed under laboratory conditions but recently released into commercial practice, have been implemented. There is a strong argument for a period of commercial trials before novel techniques may be available for general use. This would provide a bridge between the controlled conditions of the laboratory and general farm use.

5. Welfare consequences of animal breeding

Since 1992, all FAWC reports on the welfare of different species of livestock have highlighted welfare concerns associated directly with animal breeding strategies. However, compared to many other issues we have addressed, it has been far from straightforward to offer useful advice or to make recommendations as to how such problems may be resolved.

The example of lameness and mastitis in the modern dairy cow demonstrates the need for a broad strategic approach to addressing welfare problems associated with genotype. Such an approach must, of necessity, involve the co-operation of breed companies, farmers, geneticists, veterinary and other advisory organizations. There is an argument that if real welfare improvements are to be made, there is a need for some level of independent advice about, and possibly regulation of, the genotypes that are being promoted within commercial agriculture.

Welfare problems associated with conventional breeding methods are also demonstrated in the modern broiler chicken where there is evidence to link past selection for fast growth with associated leg and cardio-pulmonary problems. The FAWC Report on the Welfare of Broiler Chickens (FAWC, 1992) raised particular concerns about the level of leg problems and proposed four principle methods of reducing the incidence, including the increased selection of breeding stock for strong and well-formed legs. Recognition of such problems has encouraged broiler breeding companies to modify selection programmes. However, there is a need for assurance that these changes have had positive effects on animal welfare.

We also commented on the selection of broiler breeding stock in the FAWC Report on the Welfare of Broiler Breeders (FAWC, 1998). We emphasised the importance of ensuring that factors such as cardio-vascular health, foot and leg health, social behaviour and resistance to disease were given high priority in selection procedures. We also expressed concern at the problem of hunger in broiler breeders and recognised that it was likely to get worse if selection for fast growth continued. We made the specific recommendation that the objectives of the breeding companies in the future development of strains of broilers should include welfare improvement, in particular the avoidance of problems of prolonged hunger in broiler breeders.

The resolution adopted in 1999 by the FVE summarised their concerns associated with animal breeding. They stated that "Selective breeding programmes may cause animal welfare problems. It may become difficult or impossible for natural copulation or parturition to occur; offspring produced by selective breeding for certain specific characteristics may be unable to express their natural behaviour; or they may be predisposed to hereditary, congenital, metabolic or infectious disease, disability or early death. The introduction of such selective breeding programmes may make it impossible for the breed to be maintained by natural means".

On the subject of breeding technologies, the FVE stated that, "the use of new and emerging technologies in artificial breeding, such as ovum and embryo transplantation and genetic manipulation, may also be a source of concern, and it is likely that some future advances in science will also have animal welfare implications. The technique used may carry inherent welfare risks for the animal (*e. g.* the particular method by which semen or ova are obtained); the intended outcome of the procedure may be intrinsically objectionable (*e. g.* the development of animals with unnatural physical or behavioural characteristics); and offspring may be produced with welfare disadvantages such as those mentioned above".

A recent report published by the UK Department of Trade and Industry, 'Genetics and Genomics of Sheep and Cattle in Australia and New Zealand' effectively highlights the "technological crossroads" that animal breeding has reached (DTI, 2002). The report emphasises that, "new opportunities are opening up that are likely to transform the way breeders improve their stock", for example, growing commercial interest in the potential of marker assisted selection looks set to accelerate the rate of genetic change to livestock by conventional selection methods. We recognise that the application of gene-mapping to selective breeding programmes may be used to rectify welfare problems, for example by selecting for specific health traits such as improved leg health in broilers. We are concerned, however, that with considerable commercial competition between breed companies, the primary focus of attention will be for production-related traits. In the case of the dairy cow this might be for higher milk volume and changes in constituents, and for the broiler chicken, faster growth rate, improved feed conversion ratio, or greater breast muscle mass.

We are aware of research groups using marker-assisted selection for animals with greater levels of disease resistance, for example, salmonella resistance in poultry and parasite resistance in sheep. The DTI report also states that in Australia and New Zealand, "there [is] considerable interest from a number of groups to identify and exploit genetic variation among livestock for disease resistance" (DTI, 2002). Whilst this will have obvious welfare benefits, it is important that the development of such strains is not used to disguise welfare threatening conditions which would otherwise produce disease and does not discourage the development of higher standards of stockmanship and provision of a good quality environment.

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6. Genotype and environment interactions

The selected examples of welfare problems described in the previous section are those where narrow breeding objectives, or novel breeding technologies have had adverse consequences for animal health and welfare. However, breeding related welfare problems cannot be viewed in isolation since most are inextricably linked with the environment in which animals are kept. Of fundamental importance is the quality of management of any animal throughout its life, but there are many other aspects of the environment which, if inappropriate for a particular genotype, may have consequences for welfare which are just as serious as poor management. For example, welfare problems may also arise where a particular breed of animal is poorly suited to the environment in which it is reared.

In our FAWC Report on the Welfare of Sheep (FAWC, 1994) we expressed our concern about the potential problems associated with changes in breed structure in response to the commercial demand for different carcase and conformation characteristics. We recommended that if any change in breed or breed type is contemplated in challenging extensive conditions, replacement must only be with one that is sufficiently well adapted to the environment. We also recommended that within breed selection programmes, monitoring is carried out for problems associated with selection for greater muscularity.

We made a similar recommendation in our FAWC Report on the Welfare of Pigs Kept Outdoors (FAWC, 1996) where we stated that, breeding companies, and those responsible for the selection of breeding stock to be kept in outdoor enterprises, should ensure that only those strains of pig with the genetic potential to thrive in the conditions are used. In the report the importance of temperament was also raised and we recommended that when selecting pigs, attention should be paid to the need for good temperament and mothering ability.

We hold the general view that the welfare of some breeds of high performance potential may be adversely affected when kept in more extensive or organic environments. The increasing demand for organically produced food has encouraged greater interest in this aspect of animal welfare with some research directed towards the suitability of breed types for organic systems. For example, a recent study has examined the suitability of two commercial broiler strains, one fast- and one slow-growing, in a free range system. Both strains became very heavy at the minimum age of slaughter specified by organic requirements with the fast-growing strain having the poorest feed conversion ratio. This, in addition to poor mobility, as reflected in low usage of the outdoor area, and the presence of deep pectoral myopathies led the authors to suggest that the fast-growing strain was particularly unsuitable for free range production. Given that organic standards require chickens to be slaughtered at a greater age than is now the normal age for standard broiler production, it is likely that exposing certain commercial broiler strains to such systems would be a welfare concern.

The standard of management is an aspect of the environment in which an animal is kept and we recognise that, with high levels of management, many of the genotypes of higher production potential can often be reared without major welfare concerns. However, we are concerned over the importance of high levels of skill required by those persons responsible for some genotypes given the known variation in standards of management across farms. We recognise and welcome the attempts made by many sectors of the livestock industry to improve the management provided to emerging genotypes, and encourage the maintenance of research and training programmes for the development of these.

7. Welfare surveillance

Since breeding strategies, either by conventional breeding or using novel technologies can have such major influences on animal health and welfare, it is essential to have accurate information on the extent to which any trait which influences welfare is improving or getting worse, in addition to the respective impacts of genetic and environmental factors. Breeding companies test the performance of new genetic strains under highly controlled conditions with very high standards of management. It is on release to the commercial sector, when breed company management guidelines are sometimes ignored, standards of husbandry might be lower, or livestock are reared in less than optimal environments, that welfare problems often become apparent.

The importance of welfare surveillance to animal breeding strategies has been demonstrated in Scandinavia where, for the last 20 years, integrated databases and comprehensive recording schemes have been developed for both cattle and pig breeding. In the 1970's Scandinavia developed a philosophy that breeding objectives should include health and production traits rather than just production goals. It was recognised that an essential prerequisite for the efficient operation of such breeding objectives was the accurate recording of health, reproduction and production traits. Integrated databases, initially between the milk-recording scheme and the artificial insemination (AI) service, were developed and subsequently expanded to include health traits. For example, in all Scandinavian countries, veterinary reports on clinical treatments are now incorporated into the databases. The result is that Scandinavian countries have adopted Total Merit Indices (TMI) in selection programmes. Not only has such an approach improved animal health, as demonstrated for example, by a steady decline in mastitis levels in dairy cattle, but the total economic gain from selection for a TMI in dairy cattle has been shown to be 10-25% superior to single trait selection, despite a reduced gain in milk production levels.

The Scandinavian model has shown the importance of integrated databases and comprehensive recording schemes. The information obtained has provided effective management tools at farm level with economic benefits; it has produced valuable information for research and development at a national level; and it has provided a vehicle for the application of research findings into commercial practice.

In some livestock sectors, much of the desired information is already being gathered by, for example, breeding companies. This should be utilised and supported by additional monitoring and surveillance where necessary. However, it is essential that although data may be obtained from a range of sources, their analysis must be carried out by a body which is considered by all to be independent. In addition, where data is not of a confidential nature this should be made available for further analysis by interested parties.

We believe there is an urgent need to develop on-farm welfare surveillance systems capable of providing reliable, robust information on the prevalence of a range of health and welfare traits for different species of livestock. The information obtained from such surveillance systems would be of value to, and must be available to, farmers, breed companies, veterinarians and researchers.

8. Genetic modification

The term 'GM animal' refers to animals modified either via transgenesis (when individual genes from the same or a different species are inserted into another individual) or by the targeting of specific changes in individual genes or chromosomes within a single species. There is a range of technical barriers that have to be overcome before the production of GM livestock for food production would be viable, notwithstanding its acceptability to the public. These include; the low efficiency of genetic modification of the genome for pigs, sheep and cattle; the high levels of embryonic loss; the incomplete knowledge of the genome for most of the major farmed species; and the fact that potentially desirable traits such as disease resistance and improved production are polygenic and require the alteration and co-ordinated expression of several genes. Funding agencies are not currently supporting GM livestock projects to a high level since investment returns are considered to be low. It is considered that the commercial development of GM animals as a source of food is unlikely to be progressed unless the regulatory, ethical, economic and environmental issues, as well as public concern can be addressed. The extent to which GM will become incorporated into future livestock breeding strategies may well be determined, not by scientific developments, but by public acceptability of the technology. Opposition to GM crops by consumers, retailers and environmentalists continues to influence the commercial application of GM technology in the plant sector, and there is no reason to believe that a similar level of opposition would not develop if the technology became incorporated into livestock breeding.

9. Cloning for commercial purposes

Although cloning may be used in conjunction with genetic modification technology, it is fundamentally different in that a clone is an organism or cell derived from a single ancestor by asexual means. It was the production in 1997 of a cloned sheep (Dolly) from an adult cell that resulted in considerable public debate on the implications of cloning, particularly the wider ethical issues. In 1998 we produced a FAWC Report on the Implications of Cloning for the Welfare of Farmed Livestock (FAWC, 1998), which considered the welfare implications of the techniques involved and the regulatory controls which might be necessary. We considered both the ethical and welfare issues associated with cloning and made a number of important recommendations. One overriding recommendation was that, until the problems of oversized offspring, embryonic and foetal losses and birth abnormalities, and the possibility of problems associated with aged DNA, have been satisfactorily resolved, there should be a moratorium on the use of cloning by nuclear transfer in commercial agricultural practice.

We also recommended that a Standing Committee should be established to oversee the developments of cloning technology. We stated that the Committee should review outputs of research aimed at tackling the welfare problems identified in our Cloning Report (and any other problems which may emerge); it should determine the time when it may be appropriate to introduce cloning into commercial agricultural practice; and it should ensure that the controls put in place at that time are both adequate and effectively implemented. The report also recommended that the Standing Committee should play a role in both promoting public awareness of the facts and issues concerning cloning and related technologies, and conveying public concerns to Government and Scientists.

The problems associated with cloning identified in our 1998 report still remain. In all species the efficiency of the technology is still very low: for example in cattle, which is the most studied species, on average only 3% of the transferred cloned embryos develop into viable calves. There are a number of welfare problems associated with nuclear cloning. For example, clones tend to have higher birth weights and may have a greater propensity in later life for respiratory problems and immune system deficiencies compared with normal animals. In addition, placental and foetal abnormalities that can lead to death of the clone at various stages of development are common.

It is difficult to predict the extent to which cloning will become incorporated into food animal production in the future. Research has suggested that because of the current technical and welfare problems, there will be few practical applications of cloning in commercial agriculture in the foreseeable future. However, representatives of commercial breeding companies developing cloning for commercial applications see many potential benefits and have predicted that cloning will become a routine part of livestock breeding within 20 years. They suggest that cloning will serve a number of purposes such as the commercial development of disease resistant animals, improved feed conversion, greater muscle mass, and the production of meat of more consistent quality. Breed companies also see an application of cloning to evaluate the performance of animals of the same genetic make-up under different management systems and also in preserving the genome of both premium and rare breeds of animals.

10. Ethical considerations

We addressed the subject of ethical aspects of biotechnology in our Cloning Report (FAWC, 1998) and adopted an ethical framework in that a procedure may be considered intrinsically objectionable for any one of the following reasons:

a) it results in very severe or lasting pain on the animals concerned;

b) it involves an unacceptable violation of the integrity of an animal;

c) it is associated with the mixing of kinds of animals to an extent which is unacceptable;

d) it generates living beings whose sentience has been reduced to an excessive extent

Whilst points a) and c) in the above should be adequately catered for under current welfare regulations, decisions about unacceptable violation of integrity or reduction in sentience are not. Our Cloning Report commented on potential problems concerning violation of integrity or unnaturalness which, in the absence of suitable controls, might well result in a significant insult to the animals involved. We stated that we shared concerns that "an attitude may be developing which condones the moulding of animals to humankind's uses, irrespective of their own nature and welfare". In the case of cloning, this was a perception of a cloned animal as a manufactured being, which to some in society is offensive. We also stated that, "it is not clear that a radical distinction between human and non-human is now defensible, either biologically or ethically, nor that any such disjunction is sufficient to warrant the treatment of other living creatures merely as means. We owe respect to other animals, and especially to those which we choose to domesticate."

Both conventional and novel breeding techniques have the capacity to produce animals whose integrity has been altered to an unacceptable degree. An example of a possible candidate for such ethical consideration is the featherless broiler chicken, produced in Israel by conventional breeding methods. Such an animal might not be excluded from commercial production on welfare criteria since it is feasible that the environment for which it was selected may actually favour baldness. However, it might be argued that such a significant change to genotype or phenotype should be prohibited from entering commercial production on the grounds that it constitutes an intrinsically objectionable change to the nature or 'integrity' of the animal.

Another example where a broader set of ethical considerations, rather than a purely welfare based approach, might be required is for the commercial acceptability of a strain of laying hens that are "genetically blind". Researchers in Canada concluded that when compared with sighted hens, the blind birds laid more eggs, consumed less food, were less affected by flock size and stocking density, and had better feather cover. The researchers suggested that on the basis of their evaluation of welfare, the blind birds may have reduced stress levels and that it was worthwhile to explore further the potential of this mutation in egg-laying strains kept in cage systems.

A final issue is that of selecting animals for behavioural traits. A reduction in sensitivity to the environment is a general effect of domestication in many species, but we are aware that selection for temperament is becoming increasingly important in breeding programmes. This is particularly the case for species such as pigs and laying hens, where a move away from close confinement systems, driven by either legislation or market forces, has revealed the importance of behavioural traits such as reduced levels of aggression. Whilst breeding for temperament has been carried out for hundreds of years, the protection of behavioural flexibility and sentience in animal breeding is becoming an issue where regulation may be necessary.

The above examples demonstrate the wide range of issues that demand proper ethical evaluation on the basis that they constitute major changes to the integrity or sentience of animals. For simplicity, we have chosen not to address the possibility that these examples pose a more obvious risk to welfare, for example, that 'blind' chickens are more efficient because they are less active.

11. Concluding remarks

We have considered carefully the options available for addressing the broad range of ethical and welfare issues that relate to breeding and the application of breeding technologies in farm animals, as raised in this report. We believe that any failure to address the issues highlighted presents a significant risk to Governments, to the livestock industry and, most importantly, to animal welfare. For example, there is considerable public disquiet about genetic modification, cloning and some novel breeding technologies. At the present time it is difficult to predict the extent to which developments in these fields will become incorporated into livestock breeding programmes. However, it seems reasonable to assume that public opinion will be an important factor influencing developments in these areas. A crucial role of our proposed Standing Committee would be to be seen by the public as a trusted and reliable body to provide balanced advice to Government and at the same time to listen to public concerns about such matters.

In addition to helping avert potential risks, the proposed model for a Standing Committee would provide a number of other benefits. For example, analysis of data from an effective welfare surveillance system would provide information on both genetic and environmental influences on

health and welfare, thus allowing both aspects to be addressed in a coherent way. Such a welfare surveillance system would also allow welfare problems to be addressed when they first become apparent and not, as is often the case, many years after they develop.

In the same way, research effort in many areas of farm animal welfare could be much more effectively and carefully targeted if accurate data on the prevalence of welfare problems were available. The proposed welfare surveillance system would, in itself, be a resource of enormous value in that it would allow trends in a wide range of welfare problems to be monitored, thereby assisting Government and other interested parties (*e. g.* research groups) to focus attention on the most pressing problems. At the same time it would allow industry to demonstrate where recognised welfare problems were being addressed, both through selective breeding as well as through management.

Animal breeding and the use of breeding technologies is a dynamic and growing field that has the potential to influence animal welfare in a positive, as well as negative, way. The proactive approach we recommend to address the issues raised in this paper would ensure that neither progress nor welfare are compromised.

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Housing of Productive Species: an Overview to the Intensive Confined System and its Relation with Pigs Welfare

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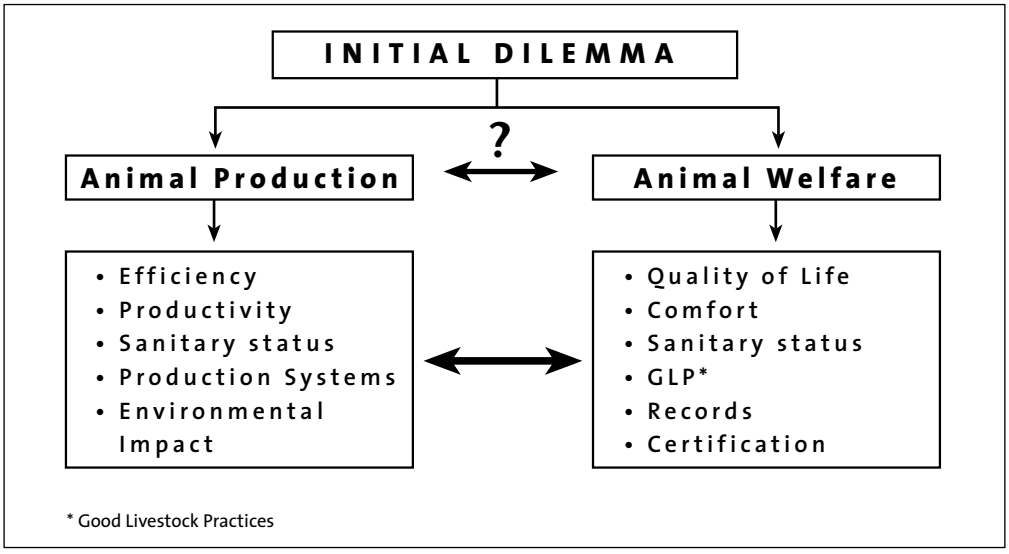
1. Introduction

To different extent, it is established or set – and today with certain insistence – the apparent dilemma that has risen between the intensive confinement livestock systems and animal welfare, in other words, both situations are presented as contrasting and, consequently, with the obligation to choose one of them. Whilst, on one hand, man establishes codes, standards and procedures to achieve high levels of productivity and efficiency in obtaining high quality livestock products for their use and consumption, on the other hand, there appear voices that prioritize life quality of animals over scientific, productive and social considerations.

The central issue is, then to try to clarify this eventual dilemma or disagreement between both situations, without getting into radical position such as "productive-economist" or "integrationist-welfare".

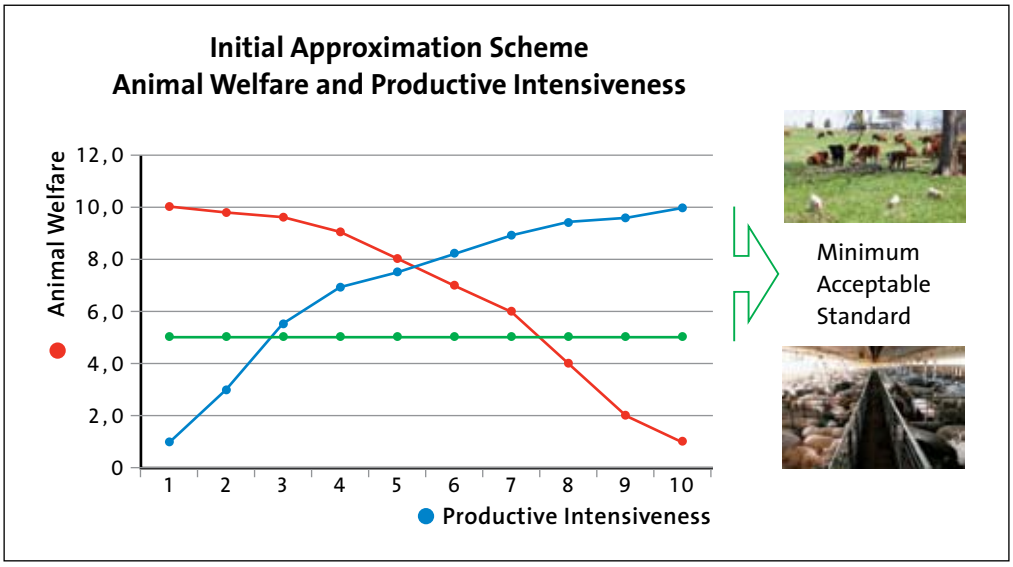


In other words, according to supply ethical demand for human population, could animal products of first generation be generated in a humane equilibrium environment that permit to combine productive interests with due respect to freedoms or with minimum animal welfare conditions?

If the dilemma persists, it will be the obligation of the different scope of decisions – politics, regulative, entrepreneurial, professional and scientific, to establish equitable production systems and, of course, to correct as soon as possible situations that outrage humanitarian procedures in animal production.

The above can be even more urgent in those intensive animal production systems, in which, for different reasons, they tend to confine animal mass. The situation of the intensive confined livestock establishments, with sophisticated models of construction and infrastructure for animals housing generate, indeed, an environment of artificiality for the animal, which could be defined as an state of "productive disclimax" , tending to maximize the genetic potential and, consequently, to optimize the productive answer and the company's profitability.

Undoubtedly, these intensive livestock models are the models with higher risks in cases of animal welfare danger. Nevertheless, "more natural" experiences of animal production (open range systems), the well known "outdoor systems", can lack serious restriction for animal welfare.



Then, animal welfare issue is not related only to production systems (intensive and extensive). Far from the varied factors that influence animals' life quality, the best strategy to establish adequate levels of animal welfare is to do things well in livestock area. To achieve this, it is necessary to combine, for example, the demands for productive efficiency with good management practices; to keep animal productivity levels and economic profit using protection strategies and promotion of animal sanitary status; the obligations in front of quality and safeness for the final product by using correctly the biological materials (substances); and, finally by implementing, adequate management of transportation and animal slaughtering.

As in other human activities, the efforts to achieve high animal welfare standards will always be necessary, but not enough.

2. General considerations on animal welfare

The first consideration, - over which, apparently, there is complete agreement – is that animal welfare is not a scientific concept. Its conceptualization derives from the ethical interest of the society concern for the ways animals are treated. Thus, animal welfare refers to their quality of life under natural or artificial conditions. It is specifically based on this approximation that appears the scientific efforts for monitoring, measuring and explaining the levels of animal's quality of life.

From the above, we can deduce that it is a highly subjective concept, depending on the level of importance assigned by the person or society related with animals. Thus, the concept of animal welfare incorporates elements such as health condition, happiness, ageing and feelings of pain, sadness and, also, pleasure or comfort. Some authors consider that animals or at least "higher animals", would experiment states of affectiveness or negative or positive experiences and, consequently, would present suffering when life conditions are not good enough.

From this point of view, it would seem natural to consider these conditions of suffering or happiness (inherent to the human being), as criteria to assess animal treatment. Some authors state that "neither the loss of health conditions nor the level of stress or even their behaviour would be the best indicators to assess animal welfare, because this depends only on the animal feelings". (Duncan 1993). Other experts indicate the concept of animal welfare also incorporates issues related to the biological performance and the animal behaviour (Tannenbau, 1991; Fraser, 1995; Duncan, 1997)

A more biological approximation indicates that animal welfare would be reduced to the absence of diseases, injures, damages and malnutrition, translated into high rates of growth and breeding, normal behaviours and in an adequate physiological homeostasis. Animal can face a group of difficulties throughout their life and use physiological and behavioural mechanisms to overcome them. If one of these mechanisms fails, ability and capacity to grow and reproduce would be reduced. Thus, we could understand that welfare in an individual animal would be its condition to adapt itself to the environment, (Broom, 1986). From this conception we can quantify, in a more precise form, welfare levels that might be experimenting.

3. Animal welfare and farmed animals

Farmed animals under intensive confinement systems should be understood as the combination, or set of, at least three components: *man*, *animal population* and *physical environment*. The presence of man designing and organising said livestock systems, to benefit humanity, makes us think that he will be responsible not only for production (to achieve adequate levels of response), economy (to obtain corresponding profits), but also for the animals and the environment, assuring optimum levels of animal welfare or protection or environmental protection.

This anthropocentric approach is based on the fact that human being is involved in these undertakings, using his reflexive and analytical capacity, his level of intelligence, his cosmic vision and the necessary ethical gradients that permit him to establish codes and agreements.

Based on this perspective, in the year 1965, the Brambell Committee decided to review the conditions of animal welfare under intensive production systems and proposed that they could

at least have "the liberty to stand up, to lay down, to clean themselves and to stretch and move themselves". These minimum standards constituted the based of the well known "Five Freedoms" systematised by the Committee of Welfare of Farm Animals in Great Britain (FAWC, 1993).

These freedoms are directly associated to the confinement conditions of breeding animals and, consequently, with the physical environment where they are kept and developed:

- **From thirst, hungry and malnutrition**: through the access to fresh water and diets to assure a total health condition and strong animals.
- **From discomfort**: by providing an adequate environment, including housing and shelter areas.
- **From pain, injuries, traumatism and diseases**: through the prevention or early diagnostic and treatment.
- **To show their normal behaviour**: by providing them necessary space, adequate infrastructure and facilities and the company of other animals of their own specie.
- **From fear and stress**: by assuring corresponding conditions to avoid mental suffering.

In this productive relation a variety of situations or human performances can be present and lower the animal welfare levels. Among these we can point out the following; (Jensen *et al*., 1997):

- Direct damages to the animals, including ill-treatment or hitting, producing fear or carrying out inappropriate surgical procedures.
- Voluntary or involuntary neglect, including deficient food management, bad hygienic handling, and wrong treatment in front of pathological signs, bad injure treatment, inadequate procedures in situations of risk or shock.
- Lack of prevision in cases of emergencies such as fires (prevention procedures are required to fight fire and a fast evacuation of the animals); interruption in power supply (alternative for power supply should be considered), or in extreme climatic conditions, in which case there should be contingency plans to face eventual drinking water freezing, including fan systems or temperature dissipation, among others.
- Inadequate housing conditions, transport and animal slaughtering.
- Diseases, which is a high relevant factor in the decrease of animal welfare, so it is of paramount importance to have available corresponding bio-safety procedures and vaccinations plans, to make a precautious diagnosis and to establish specific treatment protocols to avoid pathogens resistance.

Thus, in intensive confinement animal breeding systems, the levels of animal welfare will depend on the responsibility and interrelated action of, at least, three groups of persons:

- producers (entrepreneurs or owners), and professionals in charge of design and management of the infrastructure;
- personnel in charge of daily handling of animals, who are responsible of monitoring them, feeding them, to carry out necessary treatments, to transport them from one place to another or to load them into vehicles.
- The technical veterinarian personnel, drivers of transport vehicles and operators of the slaughtering plants.

None of these three groups of persons responsible for animal's management can assure by themselves, the adequate levels of animal welfare.

4. Chilean legislation on animal welfare

In Chile, there are almost no legislation to regulate the relation man-animal and we can only find some isolated rules related to animal's ill-treatment and other aspects relative to the protection and management of breeding animals.

The first effort of a legal disposition was the intend of the Parliament Representative Mr. Jorge I. Hübner and others, in a bill, presented on April 25, 1962 to the Low Chamber, which, to the date of its dissolution as a result of the Coup d'état on September 1973, was in its legislative stage and apparently not considered important by the government of that time.

The second effort was the Draft bill originated by the Advisory Department of the Ministry of Justice, dated on September 22, 1977, which was approved by the military government of the time; nevertheless, it was never sent to the General Comptroller Department to be enacted, and thus, it never had the status of a Law of the Republic.

The first legal in force disposition appears with Law Nº 18.859, published in the Official Newspaper on November 29, 1989, incorporating Article 291 bis of the Penal Code that establishes "the person that commits ill-treatment or cruelty against animals will be punished with a penalty of minor presidium in its lowest grade, and a fine of 1 to 10 monthly minimum income or only the last one".

Law Nº 19.162 "Obligatory System for Cattle Classification, Typifying and Nomenclature of their Meats", published in the Official Newspaper of September 7, 1992, regulates the operation of slaughter houses, cold-storage plants and establishments of meat industries, in which we can see some norms related to animal welfare aspects.

On the other hand, the Official Letter Nº 474 of the Ministry of the Interior (October 5, 1992), is directed to the Majors and Governors and they are instructed to watch and prevent actions that imply ill treatment of animals within their corresponding jurisdictional territories.

The bill presented by the Honourable Deputy Mr. Exequiel Silva and others, together with the Veterinarian Doctors Institute of Chile, dated November 24, 1995, is up to date, still in its legislative procedure. This project establishes rules related to animals ill treatment and protection, and it could be considered as the first integral initiative regarding to man-animal relationship.

Finally, we should mention the technical efforts made by the Government and by breeding organizations through pertinent organisms, in order to define certain specific techniques related to Best Practices in Animal Handling, which specifically indicates rules on animal welfare and the constructions and facilities for animal breeding.

5. Intensive confinement and pigs welfare

5.1 General aspects

Approach to the issue of animal welfare and to the intensive breeding confinement systems, has their origin in an agreement on some general aspects: the physical environment in which animals live is a critical point for their welfare; the different systems of animal production and housing have a sensible influence in the animal welfare condition; this has strongly been influenced by man also; at present no animal specie would exist living in their natural environment.

The initial reactions on the issue of intensive animal production and animal welfare were of restrictive type, abolitionists and, consequently, integrationists.

Some opinions rose, for example, supporting abolition of breeding laying hens in cages; the elimination of artificial systems of calves breeding; the prohibition of farm animals being tied up; the prohibition of using slippery floors, or the prohibition to keep farm animals in dark environments (Harrison, 1964).

5.2 Specific aspects of handling and pigs' welfare

Following we will approach some aspects of the physical environment that have a level of influence in pigs maintained under intensive confinement production system.

One of the most prevalent factors on animal welfare in a construction destined to farmed pigs is the type of floor or ground. In general, pigs are bred in slatted floors, semi-slatted floors made of different materials (concrete, metal or expanded plastic), or in solid surfaces or floors without absorbing material (cereal straws, sawdust and shaving among others).

In general, pigs need a high proportion of solid floor for their comfort and when the floor is slatted or grated, these should comply with certain specifications regarding the separations or openings, to allow flowing of faeces and, on the other hand, to avoid traumatic injures. Piglets or unweaned piglets (offspring) are kept in plastic slatted or wire grated floors coated with plastics, generating a certain grade of discomfort due to the poor isolation of this type of floors as a product of its high conductivity. Thus, young piglets require a solid surface and a temperate area for bedding areas. At the same time, breeding and fattening pigs (over 30 kg of weight) and gestational sows are to be kept in slatted floors, while slatted floors of delivery crates (lactating sows) should be made of metal to diminish an eventual heat stress.

On the other hand, abrasive conditions of the floor are more critical as pig's weight increases, thus sensibly affecting the animal welfare.

Pigs tend to separate the activity areas from defecation zones (dirty zones) from the area of resting (bedding areas), thus, from the point of view of animal welfare, it is convenient to mix solid surface with slatted ones. An inadequate design of the pens, for example, the wrong separation among them and over density factors, would provoke undue behaviour of these animals decreasing their comfort.

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The type of floor in special for young animals provokes damage by fraying the hoofs (Furniss *et al*., 1986). It has been shown that the use of slatted floors or grated ones in piglets crates is traduced in a higher amount of traumatic injures than using cement floors (Algers, 1984).

Thus, it is fundamental to determine the dimensions and the design of bars and separations of slatted floor, as well as the surface of concrete floor and the type of absorbing material used in it. A floor that is too flat or soft, as well as the use of absorbing beds, tends to produce an excessive hoof growth which produces postural abnormalities and problems in animal transportation, together with lameness, that is the highest cause of elimination of adult animals and female reproducers. (Barnett *et al*., 1984.)

Table 1, indicates the dimensions of the concrete bars and the separations of slatted floors for housing different types of animals.

Table 1
Recommendations for concrete slatted floor, according to type of animal

Characteristic	Type of animal		
	Piglets	Breeding	Fattening/Female
Bar width (mm)	50 - 120	75 - 150	80 - 200
Separation width (mm)	9,5 - 22	12,5 - 25	17 - 30

Source: Jensen, P. *et al*. (1997).

Housing places (pens and cages) should have a system to eliminate faecal and urine wastes, in order to have clean resting and bedding areas. This is achieved through the use of slatted floors or by using absorbing materials, which should be withdrawn every day in order to maintain hygienic conditions and comfort together with reducing harmful gas concentration for the pig.

In general, animals are exposed to these gases as result of the accumulation of faeces and urine in the pits of slatted floors; of the moist absorbing material or due to the deficient ventilation of the infrastructure. High concentrations of these gases in the constructions (NH_4, CO_2, CO, H_2S, methane) tend to provoke respiratory symtomatology in animals, as well as to present altered behaviours in them (tail biting or cannibalism) and ocular and nasal irritation.

The respiratory symptoms are increased by the presence of dust coming from the absorbing material and from food, all of which are inhaled together with micro organisms present in the environment. The recommendations related to suspension particles indicate that these cannot be higher than 2,4 mg/m^3, as a maximum level of visible dust. (AWSC, 2004).

The recommendations of the Veterinary Scientific Committee for Animal Welfare in the European Union indicate that the maximum levels of toxic gases are:

- NH_4: 10 ppm
- CO_2: 3.000 ppm
- CO: 10 ppm
- H_2S: 0,5 ppm (Jensen *et al*., 1997)

On the other hand, the use of absorbing material (mainly cereal straw), produces in pigs an increment of their exploratory behaviour, which diminishes the aggression levels towards other animals, such as destructive behaviours (tail biting), the stereotyped activities (biting of bars or pens) and it improves noticeably animal's life and housing conditions.

The effects of the use of these materials on pigs' welfare can be divided in three categories (Jensen *et al*., 1997).

- Comfort effects, due to the texture of material, the thermal isolation and to their absorbing proprieties.
- Recreational effects, that permit chewing behaviour, routing habit and others.
- Dietary effects, due to the intake of an amount of absorbing material which could compensate the low levels of fibber diet portions.

Another aspect that should be considered in relation to intensive confinement breeding and animal welfare is the social structure of domestic pig. This characteristic is maintained as a social inheritance of its ancestors which used to be organised in small groups (the female and her offspring and, eventually, young females) that are kept together until the following breeding season or until the following estral period, when males joined the group. This social structure could be maintained in intensive systems until weaning moment, where groups of higher density are artificially established, formed by animals of different groups. This fact should be considered in relation to the social domain in the group which is established at early ages (social nursing ranking); although social dominance in adult animals is another phenomenon, established since delivery date, this could be the base to understand subsequent social structures.

So, when pigs gather with many flocks at weaning time, during the first 24 hours they fight until establishing the new social order within the group. In general, the mixture of pigs of different origin (flocks or pens) is a negative fact for animal welfare, fact that is strongly felt in older or adult animals. It is convenient to mix animals of similar weigh, and to use procedures to minimize

subsequent aggressions produced after mixture or to design constructions to permit escaping and the possibility to get protected.

On the other hand, there is a relation between the group size and the group density and their agonistic behaviour and, thus, in the group welfare. Apparently, animal welfare levels would tend to diminish in groups of more than 15 to 25 pigs; another inconvenient is that, in numerous groups, the inspection and revision of animals is more difficult to be carried out.

Based on the above, we have to consider that pigs are social animals, except for adult males and females about to give birth. This is highly relevant in the design of the facilities and in the comfort they should achieve in their housing.

Other two important aspects for design and operation of constructions to house animals are those related to space availability per animal and environmental temperature.

Intensive confinement systems for pigs have been developed to achieve an efficient use of available space, generally associated to reduction of the individual space per animal, so that in these systems a minimum area for animal necessity has been determined for the comfort of each pig.

The above mentioned have two types of consequences:

- The effects of animal density or of the reduction of available spaces for a normal behaviour and the organic answer of the pig.

- The effects of reduction of available or minimum spaces over the agonistic attitude of the animal.

The assigned space should permit the pig to carry out exploratory actions, normal activities in relation with food and water consumption, social interactions, visual contact with other groups and to establish necessary spaces to have a discontinuous contact with other individuals, that is, to have a minimum empty area around his body, which is also called individual distance or individual space.

Some of the advantages of establishing or maintaining this individual distance or spaces are: the minor corporal damages produced by physical contact; decrease of competence for food consumption, and the reduction of disease transmission.

The space assigned refers to the available surface per each pig (m^2/animal) and animal density term refers to the number of pigs in a determined area (N° of animals/ m^2/. Both concepts are mathematically equivalent, but they are not necessarily from the point of view of behaviour and animal welfare.

On the other hand, corporal size dimensions are the initial determinants to establish the space requirements of the animal. From welfare point of view, it is obligatory to comply with this minimum space necessities, because, on the contrary there appear abnormal behaviours, physiological changes and, finally, reduction to the productive responses.

We know that corporal shape of the pig is the same, with minor changes, during all growth period. Live weight can be expressed in function to the corporal dimensions, and vice versa, through the classical equations:

$$(1)\ LW = k \cdot CD^3 \qquad ó \qquad (2)\ CD = k \cdot LW^{1/3}$$

where, LW: live weight
CD: corporal dimension
k : numeric constant

According to equation (1), it is possible to obtain the animal's weight through a corporal measuring. Thus, the area or surface occupied could be derived from these equations and be expressed in the following equation:

$$A = k \cdot LW^{2/3}$$

where, A: occupied area or surface, which will vary according to the position of the animal (for example, prone lateral position or sterna position).

Proposed surfaces vary from a minimum area of 0.019 x $PV^{0.67}$ (sterna position) to an area of 0.047 x $PV^{0.67}$ (lateral prone position) (Petherick & Baxter, 1981), with an average of 0.030 x $PV^{0.67}$ in slatted floors (Edwards *et al*., 1988; Spoolder *et al*.,1997).

Other recommendations (Jensen *et al*., 1997) indicate that the surface should be adjusted to higher values (0.047 x $PV^{0.07}$) to ensure lateral prone position in all animals, even though occupied areas are of only 0.03 x $PV^{0.67}$ the animal response would not be affected by it. It has also been suggested that the available space for different categories of pigs should ensure that all and each one of them can lay down simultaneously, also considering other factors that might affect the behaviour and welfare, such as environmental temperature, group size and type of construction.

For the case of other constructions to house breeders, the recommendations are the following (AWSC, 2004):

- Cages for pregnant females: 0.6 m width x 2.0 m length. Without including feeding and drinking troughs
- Cages for females that had recently given birth (birth cages): 0.5 m width x 2.0 m length.
- Pens for females that had recently given birth: 3.2 m^2 per female and her offspring.
- Individual pens for males (male hog pens): 5.6 m^2 per male.
- Group pens for dry females (weaned): 1.4 m^2/female.

Among the different environmental factors that affect pigs welfare in the intensive confinement systems, environmental temperature is, without any doubt the most important one. Differently from other species, the domestic pig has a scarce hairy layer that provide him with small thermal protection; a higher level of corporal isolation is reached through its greasy layer.

The thermal ranges in which pigs are bred are very wide, meaning that they should be adjusted with a certain grade of precision of environmental temperatures, according to the type of animal. Thus, different thermo neutral zones should be established for each group of animals; this has been defined as the limited range of environmental temperature in which physiological functions are maintained with a minimum metabolic rate and, consequently, with a minimum

energetic consumption. Based on the above, minimum and maximum critical temperatures can be established (TCMi and TCMa) and they permit the animal to live in environments with optimum levels of comfort and welfare.

According to different authors, environmental temperatures (or thermo-neutral zones) decrease in direct relation with live weight of animals and these are shown in table 2.

Table 2
Environmental Temperatures according to type of animal

Type of animal	Temperature (°C)
Neonatal	34
Nursing piglet (4 - 6 kg)	25 - 30
Weaned piglet (up to 14 weeks)	22 - 25
Breeding (30 - 50 kg)	18 - 20
Fattening (50 - 100 kg)	15 - 18
Breeding females	14 - 18

Other aspects related with the physical environment of intensive confinement systems that prevail over behaviour and animal welfare are relative moisture, lighting and noise level.

With regard to environmental humidity, it has been determined that pigs adapt better in conditions of higher humidity that in dry atmosphere. Low environmental levels of humidity tend to present cutaneous irritation and problems with animal thermoregulation. In spite of not existing experimental evidence, it is recommended to maintain relative humidity between 50 to 80% (Bogner, 1982), which would diminish the incidence of respiratory problems, evaporation would increase and cutaneous temperature would decrease, improving animals behaviour.

On the other hand, it has been observed that pigs present day or evening patterns of activity. Thus, fattening pigs that are maintained in pens show higher levels of activity during the day, with a bimodal distribution in morning hours and by the end of the day (Simonsen, 1990).

It has not been quite determined the effect of light intensity on animal welfare. In general, it is though that, in certain breeding situations (animal coupling), it would be convenient to maintain pigs in semi-dark environments thus diminishing aggressive behaviour and tail biting. Nevertheless, pigs cannot be constantly kept in dark environments and it is reasonable to give them periods of light for about 8 hours or more a day, for their adequate behaviour. On the other hand, light levels should be between 40 to 80 lux.

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Cattle Transportation: National Situation and International Recommendations

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1. Introduction

Handling previous to slaughtering received by cattle destined to meat production, in special, transportation, is one of the most stressing in their lives and it can provoke a serious deterioration to product quality (Warriss, 1990; 1992). This handling is important from four basic points of view:

- **Ethical aspects**: human beings and, specially, stock breeding professionals, should try to avoid unnecessary suffering to animals destined to produce meat for human feeding.

- **Amount of produced meat**: inadequate transportation, the long time the animal has been deprived from food and ill-treatments during handling before slaughtering, provoke a loss of carcass weight, apart from hematomas (contusions, injures), and this implies cuttings of carcass and the subsequent loss of weight.

- **Amount of produced meat**: the inadequate handling previous to slaughtering provokes animal stress, changes in the metabolism, hormones and muscles of the live animal and all this is traduced in changes in colour, pH and water retention capacity in the post mortem muscle. As a consequence of this, the characteristics of meat changes, being less acceptable for the consumer and shortening product useful life.

- Regulations requirements: in the last years, an increasing concern has been expressed by consumers in the sense that animals should be bred under acceptable welfare standards and humanly handled during slaughtering. These aspects should be registered in a traceability system of the product, to ensure wholesomeness, safety and to be able to differentiate them. This has concluded in an increase of legal and regulatory requirements on animal welfare.

In Chile we can observe that there is a high risk of presenting animal welfare problems and also in the quality of meat during said stages, based on aspects such as commercialization schemes used in general and in particular for bovine cattle; the characteristics of production and operation of slaughtering plants, as well as handling conditions before slaughtering.

A variety of studies permit to conclude that:

- a high amount of bovines are moved on foot, through long distances, from the breeding centres to consumption centres (Matic, 1997);
- in general, fasting rest times used in slaughtering plants overpass 12 hours (Gallo *et al*., 1995);
- there is an increasing detection of meats affected by animal's stress, such as the "dark cutting";
- almost no attention is paid to unnecessary suffering occasioned to animals during cattle droving and insensitiveness (Gallo, 1994; 1996; 1997; Gallo and Cartes 2000; Gallo *et al*., 2000 a).

As a result, during the last 10 years various research projects have been carried out on this issue, initially financed by the Research Direction of the Universidad Austral de Chile 8DID S-90-39 and S-95-17) and then by CONICYT (Projects FONDECYT Nº 198062, 1010201, 7010201 AND 1050492). These researches are the back up of this report.

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2. National situation

Bovines breeding zones in Chile are located in the south of the country (IX, X and XI regions); as to slaughtering, this is mainly performed in zones with higher population and, then, of higher consumption levels, basically in the Metropolitan Region.

Table 1, shows the distribution of paths (km) crossed by bovines that are transported from production zones of the main slaughtering plant in Santiago, observing that practically a 50% of the bovines travel for more than 600 km on trucks, which means over 12 hours journey (Gallo *et al*., 1995).

Table 1
Number and percentage of bovines slaughtered in main slaughtering plant of Santiago, related to distance and origin place (Matic, 1997)

Kilometers travelled	Slaughtered bovines	
	N°	%
000-149	4,067	25.5
150-299	2,207	13.8
300-449	805	5.1
450-599	663	4.1
600-749	4,375	27.5
750-899	712	4.5
900-1.049	3,096	19.4
> 1.050	10	0.1

On the contrary, in the case of equines (Gallo *et al*., 2004), travelling distances to the slaughtering centres are relatively short. 57% of truck with equines that get to the main slaughtering plants of the Metropolitan Region come from nearby places (< 100 km); 33% from a distance between 100 to 300 km, and only a 10% come from a distance farther than 300 km.

In the case of ovine, most of them are slaughtered in places located near breeding establishments, that is, in the XI and XII regions. There, due to the exporting experience, adequate vehicles are used, and it is clear the interest and improvement in animal handling and of the slaughtering houses to train and make campaigns related to best practices of handling, transportation and meat quality. Nevertheless, there is also a considerable number of sheep that are moved out of said regions towards north of the country, by travelling during more than 24 hours including river crossed on ferries. Studies will be carried out in the year 2005 related to ovine transportation, especially to long distance transportations. The aim of these studies is to determine the effects suffered by animals from behaviour viewpoint and of some blood variables, as well as the amount and quality of produced meat.

Pigs and poultry are mainly slaughtered in places near breeding premises, and only a small amount of them are transported through longer distances; the reason is that these species do not bear prolonged travels and they are very sensible to the stress.

3. Animal welfare and stress

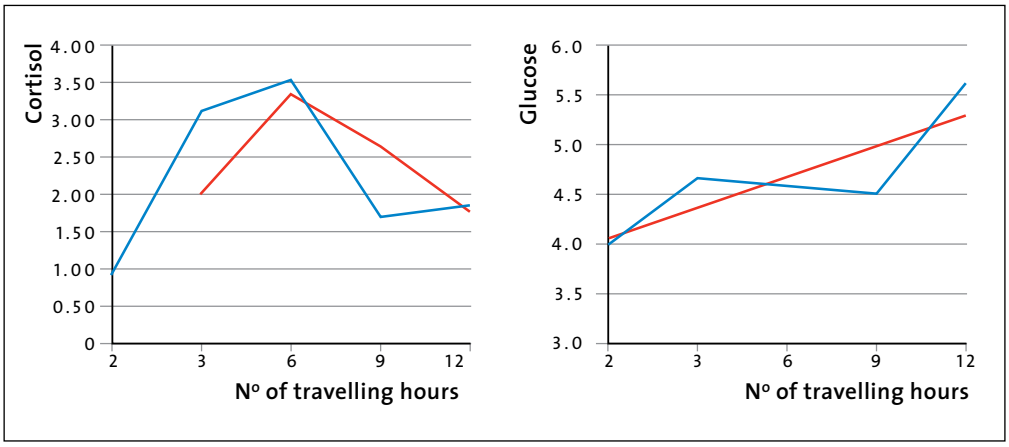
Stress was defined by Selye (1954) as the action of nervous stimuli and emotionally provoked by the environment that surrounds the animal, on nervous, endocrine, circulatory, respiratory and digestive systems that produce measurable changes in functional levels of these systems.

Recent observations indicate that stress should be considered as the biological and functional response of environmental demands.

To this respect, transportation is a strange situation for animals which consequence is stress, that can be studied in many ways, as, for example, by registering the *behavioural change of animals* during travels (if they fall, they lay down, the positions they adopt, the attitudes, teeth grating, salivation, shaking, defecation and others); the *changes in their physiological variables* (increase of cardiac and breathing frequency; raise of corporal temperature, others); as well as, *the changes in their blood variables* (cortisol, glucose, leukocyte counting, accumulated globular volume, concentration of creatine phosphokinase and others) (Shaw and Tume, 1992).

Transportation effect on some blood variables in calves was studied by Oyarce *et al*., (2002), by inserting in their jugular vein a permanent cannula, in order to avoid the stressing effect of blood collection. Figure 1 shows the changes produced in cortisol and glucose concentrations as transportation time increases. A fast raise is observed in cortisol and a slower one in glucose.

FIGURE 1
Evolution of average concentration of cortisol and glucose in calves transported in trucks (Oyarce *et al*. 2002)

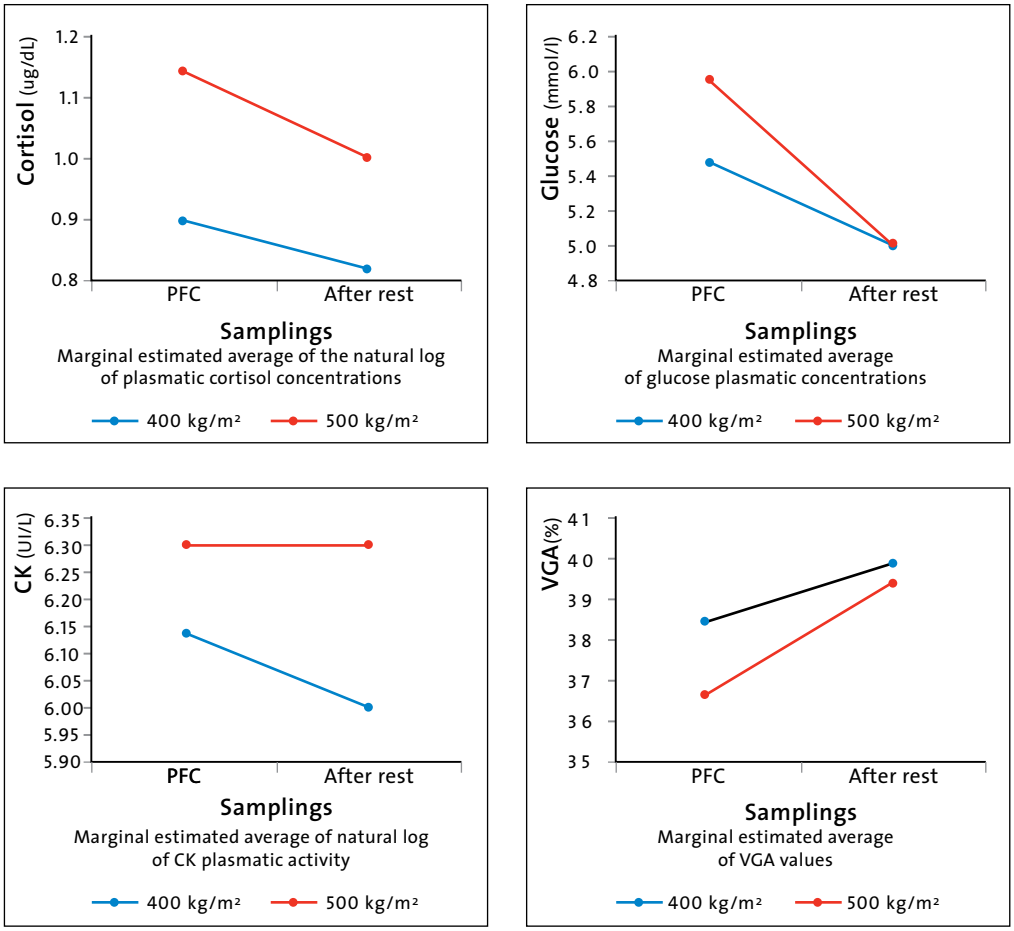


During transportation, travelling time not only affects animal welfare but also, the characteristics of the vehicle, the driver and the way they drive; climate and highways (curves, steep roads, road stones and others); environmental temperature (heat, cold, rain and snow among others); load density; as well as the characteristics of the animals that are being transported (age, sex, presence or lack of horns, nutritional condition and sanity) among others.

Based on the above, figure 2 shows that a load density of 500 kg/m^2 during transportation produced higher concentrations of cortisol (P = 0.0021), glucose (P= 0.039) and CK (P= 0.024), than a load of 400 kg/m^2 , which were measured at the arrival to the slaughtering house, PFC. In the case of agglomerated globular volume, VGA, density of 400 kg/m^2, showed the highest values. These results agree with Knowles (1999) whom indicated that apart from travelling time, at equal same travelling time some blood variables are affected by load density.

FIGURE 2

Effect of two densities of load used in calves' transportation destined to the slaughter house, over the blood concentration of cortisol, glucose, creatinephosphokinase (CK) and agglomerated globular volume (VGA) when arriving to the slaughter house and after 12 hours of rest (Tadich *et al*., 2003)



The relation of load density, the maximum permitted value by the bovine cattle transportation regulation is 500 kg/m^2 (Chile, 1993; 1997). In a recent study, Gallo *et al*., (2003 c), determined that average load density, commercially used, and determined after arrival to the slaughter house, is 490 kg/m^2 at regional level (including, preferably, transportations of less than 300 km) and of 450 kg/m^2 in the Metropolitan Region (that includes transportation of up to 900 km). Nevertheless, it was also shown that used load densities range is very wide (288 to 632 kg/m^2) and that the maximum permitted density, 500 kg/m^2 is frequently over passed. This occurs mainly in truck with trailer that are the most commonly used ones, and especially for calves transportation, that are the animals with the highest commercial value. To this respect, various authors recommend, as maximum, densities of 360 kg/m^2 for adult cattle; values over 400 kg/m^2 are considered too high and with a major risk of cattle to fall down (Tarrant *et al*., 1988; 1992; Tarrant y Grandin, 1993; Knowles, 1999).

The same trucks used for bovine cattle transportation are used for equines transportation. Gallo *et al*., (2004), observed that simple trucks (45% of trucks) and those with trailers (43%) were the most frequently used; small trucks registered only 12% of movements.

This study also determined that load average density was 247 kg/m^2 (corresponding to a space availability of 3,76 m^2/animal), according to slaughtering plant records and of 355 kg/m^2 (1,61 m^2/animal), as directly observed. This discordance of average sub estimation would be due to two reasons: occasionally, not all equines that came on a truck were unloaded in the same plant, so some of them stayed on the truck to continue to another plant (that is, there were more equines than the ones registered and weighed); the other reason is that, in many cases, a truck transported, apart from equines, other animal species (bovines, ovine and/or caprine), that were not considered in the equine reception registration).

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Even though in Chile there are no specific regulations related to space availability, except for bovines, studies carried out in other countries indicate as appropriate a density of 1.14 and 2.23 m^2/equine, (Stull, 2003). Thus, registered load densities are within the acceptable margins, even though sometimes it was observed that the vehicles used for these transportations were not the adequate ones as well as unloading methods used, especially for hurt or prone positioned animals. In fact, in the direct inspection of 400 equines at the arrival to the plant, following percent values were found: 0.25 dead; 1.5 downers; 1 with lameness; 0.5 fractured and 0.25 injured. This situation goes definitively against animal welfare.

Apart from the effect over some of stress indicators blood variables, the transportation of animals provokes changes in the behaviour of animals. Thus, for instance, during transportation, bovines tend to keep standing while the truck is in movement and they use, preferably, parallel or perpendicular orientations to the truck main axis to improve balance safety; nonetheless, after travelling for 12 hours, the animals fall or lay down due to tiredness produced by trying to keep the equilibrium. These behaviours predispose animals to suffer from trampling and bruise (Gallo *et al*., 2000). On the contrary, pigs prefer to travel lying down and ovine lay down after 4 to 6 hours of travelling.

Other behavioural characteristics that can be observed during transportation and that are related to stress are: puffing and blowing, mating, fights, biting and kicking (in equines) and others.

In extreme cases, transportation can produce animal's death. Mortality is higher in pigs (0.1 – 1%) and poultry (0.2 – 0.6%) whilst ruminants are more resistant. The causes of mortality are basically: overloading; trampling caused by falls; asphyxia caused by deficient ventilation; suffocation caused by heat (pigs and poultry); shipment fever; mixture of animals of different sizes; characteristics of incompatibility among animals (weight, fattening condition, sex, age); dehydrated by lack of water; and very stressing genotypes (pigs). It is worth while remembering that, stressing situations, especially if they are very prolonged; produce a lowering of defences in the organism, also predisposing the animal to diseases.

On the other hand, transportation produces loss of live weight, which components are, mainly, urine and faeces. Nevertheless, carcasses can also loose weight together with other organs due to dehydration (as a result of evaporation, perspiration and thermo regulators such as puffing and blowing), or lose of fat and proteins, which are moved to produce the energy used to maintain the equilibrium during travel.

Loss of live weight in animals is ever increasing during transportation; although its relation is not lineal and main loses occur during the first 24 hours fast (Bass and Duganzich, 1980). Apart from time passed since the last food intake, the fast loss of weight has to do with factors such as type of food consumed, weather conditions, exercise and stress to which animals are submitted during loading, transportation and unloading.

Weight losses are more important during spring-summer seasons than in autumn, probably due to a higher heat dehydrating.

Table 2 quantifies the above mentioned issue.

Table 2

Weight loss in calves subjected to different times of transportation previous to slaughtering, in different seasons of the year (Gallo *et al*., 2000)

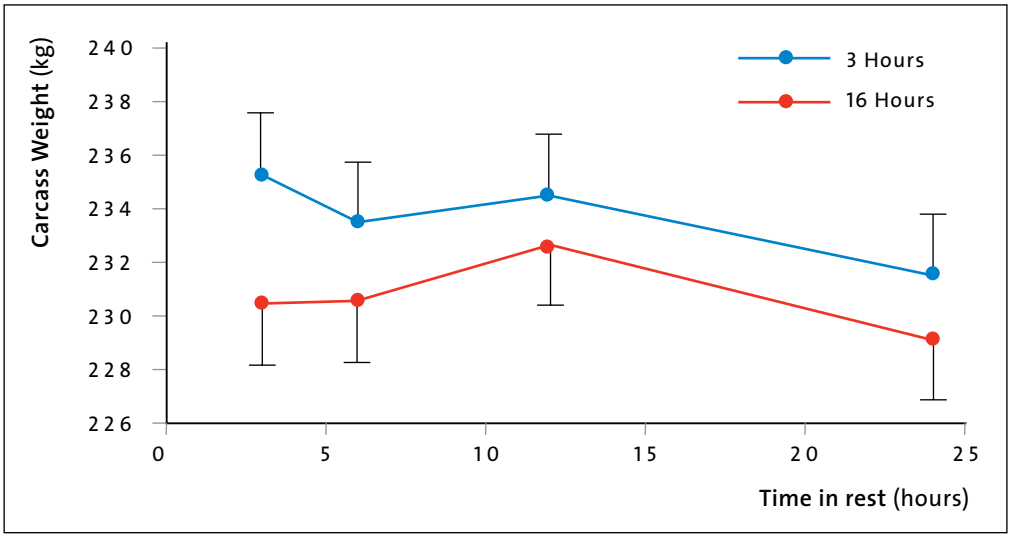
Season of the year	Conditions	Number of hours of transportation			
		03	06	12	24
		Average Weight Loss (%)			
Autumn/Winter	Transportation	6.5[a]	5.0[b]	6.0[a]	10.5[c]
	S.D. (+/-)	1.1	1.4	1.1	1.1
	Slaughter Rest (12 h)	0.8[a]	1.2[a]	-0.3[b]	-0.6[b]
	S.D. (+/-)	1.6	1.4	1.1	0.9
	Total	7.3[a]	6.2[b]	5.7[b]	9.9[c]
	S.D. (+/-)	1.5	1.4	1.6	1.0
Spring/Summer	Transportation	4.6[a]	7.3[b]	8.9[c]	11.9[d]
	S.D. (+/-)	1.1	1.2	1.3	1.3
	Slaughter Rest (12 h)	2.4[a]	0.8[b]	0.03[b]	-2.6[c]
	S.D. (+/-)	1.2	1.0	1.3	0.8
	Total	7.0[a]	8.1[b]	8.9[bc]	9.3[c]
	S.D. (+/-)	1.4	1.1	1.5	1.3

S.D: Standard Deviation; different letters in a line indicate statistically significant differences among treatments (P<0.05).

Transportation inevitably includes food deprivation, so, apart from affecting stress blood indicators, it can provoke weight loss that compromise carcass (Gallo y Gatica, 1995; Gallo *et al*., 2003 b). Figure 3 shows these weight changes in bovines faced to longer fast time at slaughter house, after a short transportation (3 h), and a long one (16 h); the tendency we can observe is to lose carcass weight the longer waiting time is, especially after a long transportation. This is an important aspect for meat producers to keep in mind.

Figure 3

Changes in carcass weight in calves kept in rest and fast during 3, 6,12 or 24 hours, after a transportation of 3 to 16 hours (Gallo *et al*., 2003 b)

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During animals' transportation, apart from weight loss, frequent traumatisms, contusions or physical damages are produced. According to Chilean Standard Nº 1,306 (INN, 2002), contusions are defined by levels according their deepness:

- level 1: affect only subcutaneous tissue;
- level 2: also affects muscle tissue;
- level 3: affect subcutaneous, muscle and bone tissues.

Economic losses are considerable due to the limited destination that traumatic carcasses could have, due to cuttings and to the meat quality. (Godoy *et al*., 1986). Table 3 shows that, the longer transportation time is, especially 24 hours, the amount of contusions increase more, as well as their deepness (level 2).

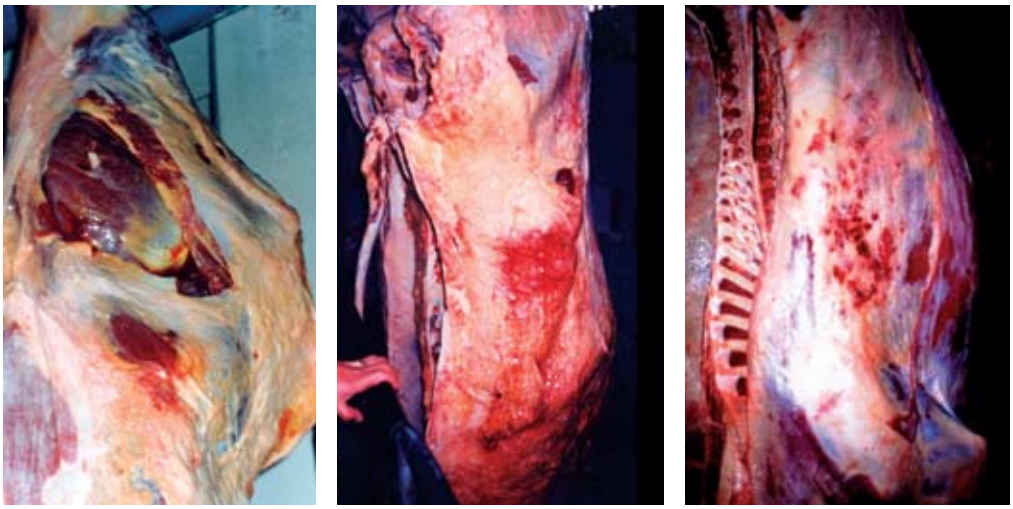
Table 3
Contusions observed in calves' carcasses subjected to different transportation times previous to slaughtering, in different seasons of the year (Gallo *et al*., 2000)

Season of the year	Level and number of contusions	Transportation hours			
		03	06	12	24
Autumn/winter	1	17	11	12	25
	2	-	-	2	3
	Total	**17**	**11**	**17**	**28**
Spring/Summer	1	7	1	8	12
	2	2	-	-	-
	Total	**9**	**1**	**8**	**12**

Carcasses can also show marks of sharp elements used during cattle droving for loading and unloading, which are presented as petechial haemorrhages (figure 4C). To this respect, Chilean regulation (Chile, 1993; 1994) prescribed use of sharp sticks, although it permits the use of sticks and electric shock. Nevertheless, the wrong use of the latter can also produce bruises (marks) in the carcasses. The same occurs with the use of hitting with sticks, animals falls while crossing

the sleeves, scales, trucks and in the stunning box, when floors are slippery and due to careless handling. During transportation, hits are in general, stronger and they provoke deeper injures, as shown in figure 4 (A and B)

Figure 4
Bovine carcasses with contusions level 1 and 2 due to hitting (A and B, respectively) and due to the use of sharp sticks (C)



A B C

On the other hand, table 4 shows that, when comparing the incidence of contusions in calves transported in densities of 500 and 400 kg/m^2, during 3 to 16 hours, more contusions are presented as higher densities and transportation hours are involucrated (Valdés, 2002). Other studies indicate that, from the point of view of stress, load densities of 500 kg/m^2 were the most stressing ones (Tadich *et al*., 2003) and, in spite that no effect was found in these densities on carcasses quality (regarding to pH and to dark cuts; Mencarini, 2002), it seems advisable that it is necessary to diminish densities of transported calved in long journeys, in order to reduce contusions and to improve their welfare.

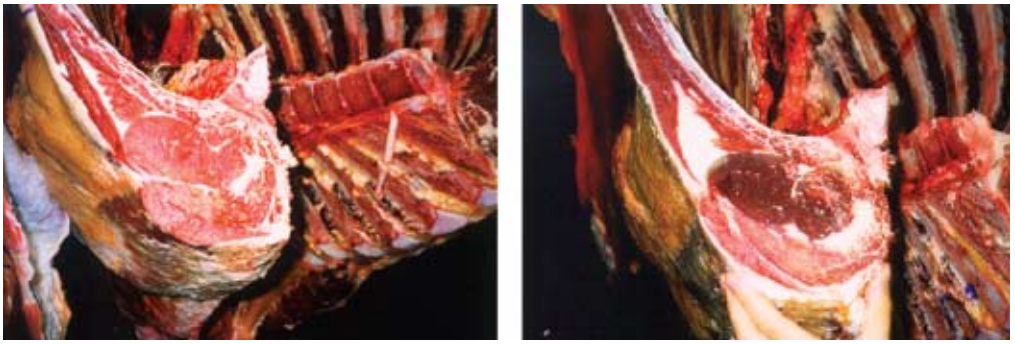
Table 4
Effect of transportation time and load density in the presence of contusions in calves (Valdés, 2002)

Presence of contusions	Transportation hours							
	0 3				16			
	Load Density (kg/m^2)							
	400		500		400		500	
	Nº	%	Nº	%	Nº	%	Nº	%
Level 1	8	28.5	10	31.3	11	39.2	14	43.8
Level 2	2	7.1	1	3.1	1	3.5	4	12.5
Carcasses with contusion	10	35.7	11	34.3	12	42.8	18	56.2
Total of carcasses	**28**	**100**	**32**	**100**	**28**	**100**	**32**	**100**

As to meat quality, this can be affected due to the stress provoked in animals to be exposed to a variety of adverse conditions at the same time, such as lack of food and water, hunger, danger, mixture of animals of difference precedence, bothering environment, fatigue, heat, cold, light and space restrictions, among others (Forrest *et al*., 1979.

Chronic stress, previous to slaughtering, provokes excessive consumption of muscle glycogen thus minimizing formation of lactic acid in the post mortem muscle and hinders the natural diminishing of pH that would occur in that period, which, instead of reaching values of 5.4 and 5.7 overpasses the 5.8, thus producing anomalies known as "dark cutting beef; figure 5), because the meat presents a darker colouration, apart from a high pH (Hood and Tarrant, 1980).

Figure 5
Transversal cutting at 9th rib height; a normal loin can be observed and another one with a dark cutting (A and B, respectively)

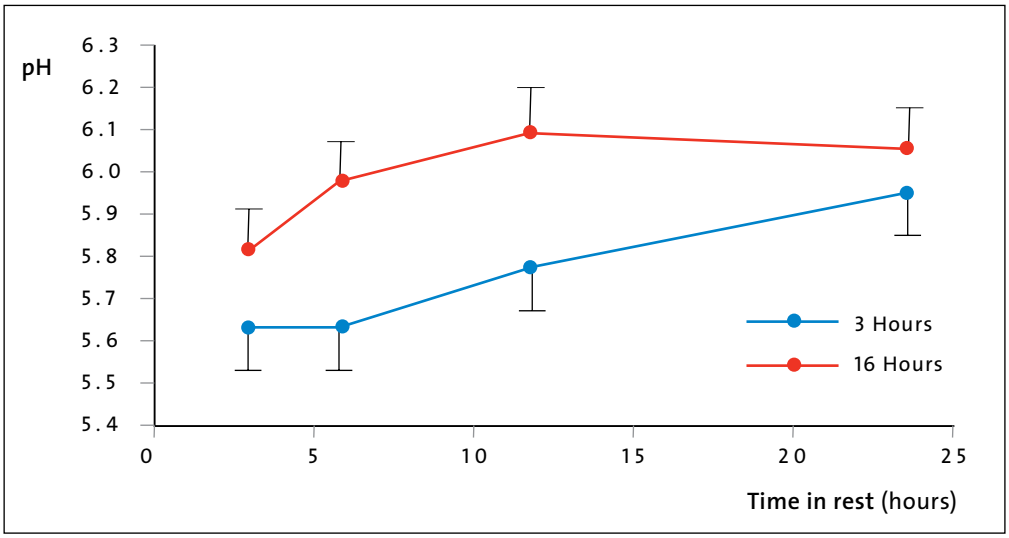


A B

Some studies show that in Chile, in general, 10% of cuttings are dark cuttings, although there are seasons and fields where this condition overpasses the 30%. Currently, they represent a serious problem for the industry, and specially, a limiting for exportation, because meats with high pH are inadequate for vacuum packaging, due to its fast deterioration. On the other hand, carcasses prices are lowered, even when only some muscles (cuttings) are affected (Almonacid, 2003).

As shown in figure 6, and in table 5, the prolonged transportation also affects pH and the occurrence of dark beef cuttings.

Figure 6
pH changes in carcass of calves maintained in rest and fast during 3, 6, 12 or 24 hours, after a transportation of 3 to 6 hours (Gallo *et al.*, 2003 b)



As indicated, the dark beef cutting is directly related to a decrease of muscle and hepatic levels of glycogen (Gallo and Lizondo, 2000, table 5); apart from the fact that the risk from quality problems increases if the animals are deprived from food during a long time, and, also in strange environments. A higher risk is also presented in animals with a low reserve of glycogen from the fields (Mc Veigh and Tarrant, 1982).

Table 5
Behaviour of different variables in calves submitted to different times of rest after a short transportation (3 hours) and a long one (16 hours) (Gallo and Lizondo, 2000)

Duration of transportation	Variables	Rest hours 3	6	12	24	Total
Short (3 h)	Average pH	5.63	5.63	5.77	5.95	5.75
	S.D. (+/-)	0.11	0.18	0.43	0.41	0.30
	Carcasses with pH > 5.8 (%)	10	10	20	50	23
	Dark beef cutting, at sight (%)	0	10	30	40	20
	Muscle glycogen (micromoles/gram)	38.0	45.1	23.6	14.1	-
Long (16 h)	Average pH	5.81	5.97	6.09	6.05	5.98
	S.D. (+/-)	0.31	0.40	0.32	0.29	0.30
	Carcasses with pH > 5.8 (%)	30	50	90	80	63
	Dark beef cutting, at sight (%)	10	30	40	40	30
	Muscle glycogen (micromoles/gram)	23.7	16.4	17.0	14.1	-

In short, among the relevant factors for the occurrence of dark beef cuttings, there outstands a positive relation with fasting time and it is more evident if previous transportation was also long (Gallo *et al*., 2003 b).

Amtmann *et al*., (2004), observed that in transportation of 16 and 24 hours, the probability of presenting carcasses with dark cuttings increase in 3.4 and 5.5 times respectively compared with 3 hours travels. On the other hand, independent from the time of transportation, fasting of 24 hours increases in 9.4 times said probability, compared with 3 hours fasting. Consequently, prolonged waits of breeding and exhibits show animals should be avoided, as well as in slaughtering houses, and particularly in those with prolonged transportation (before and after slaughtering), and it should also be provided that rest hours are really a relax and not an additional stress. Undoubtedly, the longer waiting times are, more adverse events could be presented during these periods.

According to Tadich *et al*., (2001), bovines journeys, with or without rest, longer than 24 hours should be avoided due to tiredness and stress that they produce in animals and the negative effect on the amount and quality of meat.

4. International recommendations

The World Organization for Animal Health (OIE; www.oie.int) has received the complete power of the 166 member countries to be the world leader organization in the issue of animal welfare. This organization was chosen because its standards are exclusively based on science; an example of this is the standards and recommendations issued in the diseases and zoonotic fields.

The purpose of the OIE in this new field it has been empowered with, is to prepare the bases of an international good behaviour guideline in favour of the animals, that can be adopted by all member countries when animals or animals' by-products are bilaterally commercialised (OIE, 2004).

The guidelines that have been drawn up by a group of experts of the OIE, are general, and they try not to indicate figures of maximum or minimum transportation times, load densities and others, due to the different conditions among the different countries. These guidelines are characteristic because they include, apart from the journey time itself, all previous auxiliary handlings, that is, all handlings during pre-transportation period (cattle droving, loading, preparation of animals), as the subsequent or post transportation handling (unloading, subsequent rest, conditions at their arrival and others).

Another interesting aspect is that these guidelines include the requirements for training and competence of personnel in charge of animals handling during loading, transportation and unloading.

Summarizing, the guidelines on animals' terrestrial transportation include the following aspects:

1. Specific responsibilities for each link of the commercialisation chain: this refers, for example, the adequate infrastructure of the establishment in order to be provided with pens, sleeves, loading areas and others.

2. Personnel training and competence during animal gathering, cattle droving, loading, transportation and unloading: this refers to the fact that there should be "personnel in charge of

the animals", in each link of the commercialisation chain, and they should be able to show that they have been trained by well known entities.

3. Trip Planning: it emphasises the importance that the trip should be duly planned and organised in due time, instead of accepting the conditions presented according to circumstances. It considers the type of vehicle to be used, the driver, the duration of the journey, required documentation, highways and roads condition, preferred routes, space availability for animals, definition of feeding conditions (to feed them or just give them water), etc.

4. Period previous to the trip: it includes from the moment animals are gathered to be loaded. In this period, the animals and the truck should be examined to know their condition. Compatible groups should be selected, and pens should have corresponding protection to adverse environments, it is also worth while considering previous experience of the animals (contact with men, condition them), as well as other specific aspects of the species such as sensibility, stress or aggressiveness.

5. Animal's loading: this subject defines the adequate structures to load and unload animals, that is, height-steepness, supervision by trained personnel, permitted and prohibited droving elements and others.

6. The trip or day's journey: this has to do with the adequate driving, to animal's contention methods, the characteristics that the vehicle should have (non-slipping floor, ventilation system, among others), the periods of rest for the animals and the inspection of the same. It also includes indications for emergency situations, as in case of presence of diseases or if euthanasia has to be performed.

7. Unloading and post unloading rest: unloading considers, basically, the same aspects considered for loading activity, although other aspects are added such as: recovery of stress after transportation; supervision of animals and conditions of pens or destination fields; checking of sick animals; food requirements, water and infrastructure; risk of disease transmission, and also corresponding indications about cleaning of the vehicle.

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5. Comments

Transportation is an unavoidable stressing event for animals; nevertheless, there are many reasons to improve and maintain it, so animal can suffer the least possible stress.

In this scope, even though there are some ethic and animal welfare aspects playing a role in it, there are also different types of economical (amount and quality of produced meat) and regulatory aspects to be considered (domestic and international requirements).

Among the most important aspects related to the improvement of animal's transportation, outstand the design and construction of adequate structures (vehicles, droving elements, sleeves, loading ramps and others), the preparation of animals (appropriate genetics, adequate previous contact with man and the structures), as well as training of personnel that handle them. Based on the experience of the author of this article, this last aspect is the most urgent to achieve advances in a rapid, wide and less expensive way; this should be carried out in all aspects of the meat chain, not only in the personnel that directly handle the animals (farm, exhibits, transportation, slaughtering plants), as well as stockbreeders, transporters, exhibits and slaughtering personnel.

Likewise, it is important to incorporate animal welfare as an obligatory subject in the study networks of professionals of the agricultural area, especially in the veterinary medicine schools.

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Humane Slaughter or Killing of Farm Animals

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1. Introduction

Animal Welfare is not a term invented by scientists. Rather it arose in society to express ethical concerns regarding the treatment of animals (Duncan and Frazer, 1997). The success of RSPCA (Royal Society for the Prevention of Cruelty to Animals) sponsored Freedom Food scheme in the United Kingdom (www.rspca.org.uk) and the number of other animal welfare-based quality assurance schemes operating around the world (for example, www.certifiedhumane.com, in the USA) would support this view.

The European Union Treaty of Amsterdam explicitly acknowledges that animals are sentient beings, rather than agricultural products or commodities, and is an example of response to the society's concern for animal welfare (www.eurogroupanimalwelfare.org; www.europa.eu.int). Similarly, the World Organization for Animal Health (www.oie.int) has established a Working Group on Animal Welfare through the Resolution No. XIV and drafted standards for animal transport and slaughter for human consumption or killing for disease control purposes.

The Food and Agriculture Organization (www.fao.org) have taken initiatives to providing humane slaughter guidelines and the World Trade Organization (www.wto.org) has considered animal welfare in the context of compensating farmers for the additional costs when they are required to meet higher standards of animal welfare.

Education played a very important role in this chain of events. Although the existence of prevention of animal cruelty laws in some countries shows that animal welfare is not necessarily a concern of the affluent society, it is rather a universal realisation, proactive measures are still needed.

It is a statutory requirement in many countries that animals including poultry slaughtered for human consumption are rendered immediately unconscious prior to slaughter. Animals should also be killed humanely during the out breaks of diseases. The European Food Safety Authority (EFSA) has recently published a detailed scientific report on these topics (see: www.efsa.eu.int/science/ahaw/ahaw_opinions). Therefore, the scope of this article is limited to presenting an overview of the established or known stunning and killing methods.

2. Stunning methods

It is mandatory, in Europe, that stunning methods should induce immediate loss of consciousness and sensibility (EC, 1993). It is generally agreed that, if the onset of unconsciousness is not immediate, the induction of unconsciousness with a stunning method should not cause anxiety, fear, distress, pain or suffering. Nevertheless, the duration of unconsciousness induced by a stunning procedure must be longer than the sum of time that lapses between the end of stun and the time to onset of death. Since the effect of a stunning method is momentary, the onus of preventing resumption of consciousness thereafter relies on the efficiency of slaughter procedure (bleeding out); i.e. the prompt and accurate severance of blood vessels supplying oxygenated blood to the brain. Severing two common carotid arteries and two external jugular veins in the neck would achieve this in most of the farm animal species, except cattle (see: www.efsa.eu.int/science/ahaw/ahaw_opinions). The supply of oxygenated blood to the brain via vertebral arteries in cattle warrants chest sticking, rather than neck cutting, i.e. cutting brachiocephalic trunk or artery. Chest sticking is also commonly used in pigs for practical reasons.

Established and most commonly used stunning methods are:

- mechanical - penetrating and non-penetrating captive bolts;
- electrical – head-only or head-to-body;
- gas mixtures – carbon dioxide, inert gases or mixtures.

Penetrating and non-penetrating captive bolts induce brain concussion leading to loss of consciousness and sensibility. However, inadequate stunning and/or recovery of consciousness are frequently reported, especially in bulls, which appear to be due to the poor maintenance of guns and cartridges and inappropriate shooting position.

Traditionally, inserting a rod via the bolt wound and destroying parts of brain and spinal cord 'pithed' cattle that were stunned with penetrating captive bolts. This practice helped to improve operators' safety and prevent return of consciousness and sensibility in animals. Since pithing is attributed to brain particles entering blood, it has been banned to improve consumers' confidence and safety in some regions where transmissible spongiform encephalopathy (TSE) is suspected or known to occur (see: www.europa.eu.int for detailed report). A potential alternative to pithing is warranted.

Electrical stunning is commonly used to render many species of animals unconscious and insensible prior to slaughter. Electrical stunning is considered to be humane based on the scientific principle that stimulation of brain with an electric current of sufficient magnitude induces generalised epilepsy (indicative of pathological state of neurones determined by assessing the degree of synchronisation of neuronal activity) accompanied by unconsciousness and insensibility.

It is known that spreading depression (SD) also occurs as a pathophysiological consequence of generalised epilepsy and can be recognised from the occurrence of a quiescent electro-encephalogram (EEG).

Literature suggests that neuronal excitability could be typically described in terms of a stimulus threshold (the stimulus amplitude required to elicit a depolarisation at least 50% of the time with long duration pulse width) and of chronaxie (the stimulus duration at which the threshold is twice the minimum). Numeric indices of neuronal excitability is typically calculated on the basis of rheobase, which is defined as the minimal current strength below which responses

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cannot occur even if the current continues, and the chronaxie, which is defined as the minimal duration of a current required to evoke the potential at twice the rheobase strength (see Mu *et al*., 2004). It is also worth noting that the chronaxie, determined using implanted metal electrodes, of myelinated neurones are significantly lower than that of unmyelinated neurones (0.6 and 4 milliseconds, respectively; see, Tehovnik, 1996). Evidently, both the chronaxie and rheobase must be above certain threshold levels to induce neuronal excitation.

In vitro studies have revealed that pulse width of an electric current is an important factor in determining whether a neurone depolarises or not. Pulse width of short duration are insufficient to cause depolarisation, whereas, longer pulse width beyond a certain threshold have very little additive effect, i.e. produce no greater depolarisation (Tehovnik, *op. cit*.).

This relationship between pulse width and neuronal response is widely exploited in human medicine in which induction of unconsciousness is undesirable and the electrical stimulation treatment should not inflict permanent neuronal damage, for example, thalamic stimulation in patients with essential tremor (Parkinson's), and vagus nerve stimulation in patients with partial epilepsy (Woods *et al*., 2003; Mu *et al*., 2004). Further scientific literature concerning direct brain stimulation can also be accessed at http://www.wireheading.com/index.html.

Based on our existing knowledge, it is suggested that the effectiveness of stunning would be determined by the waveform (*e. g*. sine wave alternating current or pulsed direct current, frequency (Hz) and amount of current (Amp) used. The physics of electricity can be learned at http://www.allaboutcircuits.com.

From humane stunning and slaughter of animals points of view, it has been known that, in contrast with direct currents (DC), alternating currents (AC) affect neuronal components that are parallel or perpendicular to the electrical fields, and therefore, AC is more effective than pulsed DC. Within

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waveforms of currents, stunning animals with low frequencies (up to 200Hz) appears to be more effective than higher frequencies.

In this regard, the amount of current necessary to achieve effective stunning increases when the frequency is increased. Within a waveform and frequency of stunning current, a minimum amount of current is necessary to induce generalised epilepsy in animals. We need to establish minimum currents appropriate to electrical waveform and frequency of current for each species of animals slaughtered for human consumption. When these have been established, we need to implement constant current, rather than constant voltage, stunning to ensure humane slaughter. Nevertheless, electrical stun/killing appears to be better than stunning because it eliminates the chances of recovery during bleeding in animals.

Gas mixtures are mainly used for stunning or stun/killing pigs and poultry. A potential animal welfare benefit of using gas mixtures is that they could be administered to small groups of animals contained in cages or crates without the need for restraint. Under this situation, killing with gas mixtures is better than stunning because the interval between the end of exposure to gas mixture and bleeding would be considerably long for the last animal in a group to be shackled, hoisted and sever blood vessels in the neck or chest. Carbon dioxide in air, carbon dioxide plus oxygen, anoxia induced with argon and / or nitrogen and mixtures of carbon dioxide and argon or nitrogen are being used. However, since exposure to gas mixtures do not lead to immediate loss of consciousness and sensibility, it is thought that the induction of unconsciousness with gas mixtures should not be distressing to animals.

Research evidence suggests that pigs and poultry, given a free choice, avoid an atmosphere containing high concentrations of carbon dioxide in air (*e. g.* 40% or more) that would be required for stunning. In addition, exposure of pigs and poultry to a high concentration of carbon dioxide induces gasping (oral breathing) and head shaking, and some pigs show escape attempts to avoid inhaling this gas. By contrast, pigs and poultry do not avoid an anoxic atmosphere (2% or less oxygen) created using inert gases (argon).

Scientific evidence reveals that, unlike mammals, birds have intrapulmonary chemoreceptors (IPCs) that are acutely sensitive to carbon dioxide but insensitive to hypoxia / anoxia. It is also known that stimulation of IPC depresses respiration, i.e. induces apnoea, and the rate and extent are dependent on the inhaled concentration of carbon dioxide. In addition, inhalation of carbon dioxide leads to stimulation of central (brain) and arterial chemorceptors in all animals, including poultry.

Humans also experience a sense of breathlessness (dyspnoea) due to inhalation of carbon dioxide or accumulation of this gas in their blood (visit: http://www.hsph.harvard.edu/physiology/dyspnealab/dyspnea_banzettpubs.html for long list of downloadable scientific papers on dyspnoea).

An interesting observation is that, in humans, breathlessness activates brain pathways associated with the perception of pain (visit: http://www.ampainsoc.org/pub/bulletin/mar01/upda1.html). Therefore, animal welfarists argue that stunning of animals with hypoxia / anoxia is far more humane than carbon dioxide stunning. If exposure of animals to carbon dioxide is to be continued as a stunning or killing method, we need sound scientific evidence to indicate that it does not cause pain and suffering prior to loss of consciousness.

Traditionally, we solely relied on a single stunning method or procedure to me*et al*l our requirements, for example, ensuring animal welfare, commercial feasibility, and economic viability. All the available methods have advantages and disadvantages. We need to develop novel methods of stunning / killing animals to meet high standards of animal welfare and optimise other factors.

Commitment to improving animal welfare is a 'journey' rather than a 'destination' and we need concerted action plans to sustain productivity and growth.

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Killing for Diseases Control Purposes

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One of the differences between killing for human consumption and killing for diseases control are that animals that we kill for human consumption have an economical value, whereas the animals we kill for disease control purposes become an economic burden to the farmers and to the state. Farmers will have to be paid a compensation for killing their animals for the eradication of a disease, but we also have to dispose a potentially infected material, so that the set of rules that apply is slightly different from those that we use in evaluating human consumption matters. The basic criterion for determining animal welfare remains the same.

Within the mechanical methods used to eliminate animals in order to control diseases are the free bullets that are ideally suited for killing animals that cannot be restrained into crates or cradles to apply captive ball which is followed by "pithing" or any other mechanical methods. Free bullets are also suited for fractured animals and it is also a very humane method.

Now, the free bullets are not military ammunitions. These free bullets, are, specially made with plastic sleeves instead of metal sleeves. The metal sleeves bullets, used in the military encounter is designed to injure opponents and incapacitate them. And if we fire a metal bullet through the head, the metal bullet come in both from one way and come out through the other way; it increases the risk of not achieving humane killing of the animal and it also increases the chances of killing someone else that is in the nearby, so these plastic sleeves bullets actually crumbles and becomes sort of a stopper as the bullet penetrates into the skull, and it achieves its maximum impact by introducing it in the medium depth.

Other alternatives are the use of captive balls followed by "pithing" and bleeding, that are commonly used in large animals, and as mentioned in the latter conference, if the application of all the set of things already talked about in the humane stunning situation, also apply here, so the captive balls guns have to be maintained, the cartridges will have to be stored properly and the animals should be shot in the appropriate position, because a captive ball stunning does not guarantee death in all the animals. After the shot follows "pithing" to destroy the brain or bleeding so the animals do not regain the consciousness. Nevertheless, there is cause for improving on this one, because if we design or encourage manufacturers to build guns that are more powerful, deliver adequate impact on the skull and destroy more brain, at least the deeper part of the brain that controls respiration and cardio functions, death may be achieved in all animals without regaining consciousness. For example, with the commercially available captive ball guns, if you shoot a deer it drops dead, they are extremely susceptible to captive ball stunning and they die and you should go and see that they are really dead, but in ruminant, for example in hunting salvage pigs we need some kind of assurance to make sure that the animal is dead before they are slaughtered.

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Another method is percussive blow to the head followed by bleeding, this percussive method is commonly used to dispose of young animals, unwanted lambs or calves, and it needs a very skilled person to perform it and a lot of care and attention to do that. It may not be an ideal method if it is needed to kill a large number of animals, because human fatigue might be provoked and induce misadventures.

Other two methods are cervical dislocation and decapitation, physical methods for poultries species. This should be performed properly to induce immediate loss of consciousness.

There are mechanical devices, like a penetrating captive ball that could be used on poultry species on the farm, they are operated using compressed cylinders or cartridges although the manufacturers are now considering spring loaders captive balls, which is called humane poultry's killer. Further information on this can be found in the Humane Slaughter Association website.

With regard to maceration of unconscious birds, because it has been observed that in adult chickens, if they are conscious, they fly out of the macerators and part of their bodies are caught in the macerators blades and death is not immediate. So we probably need a procedure to render the birds unconscious before macerating them on the farm.

Now, all these methods, because they involve spillage of biological material which could potentially be infected, reduce the senses of maintaining biosecurity.

The electrical stun-killing method can also be used, as mentioned before, if it is intended to kill animals by stopping their hearts or induce cardiac ventricular fibrillation. The most effective electric wave form and frequency to achieve that is a sine wave AC, 50 Hz, and the voltage to be applied to achieve that, may differ according to the species of animals and the type of electrode that is used.

This method can be applied either using the two cycle methods, that is by applying it to the head only first, then applying across the chest which would involve some form of restrain. This method is non invasive, and it improves the biosecurity that could be maintained in the farm.

As indicated in the latter conference gas mixtures can be used to eliminate animals, like carbon dioxide, inert gases or the mixtures of the two, and there can also be other options of using carbon monoxide and hydrogen cyanide.

There are logistical problems, for example, if we want to apply gas mixture that is denser than air, like carbon dioxide, we will start to fill the chest from the ground up, because heavier gases rise from floor to the ceiling and to make sure that the carbon dioxide concentration reach a level above the head of the animal it will take 5 minutes for the animal to die, but it takes a long time to get a concentration above the head level depending upon the shed area.

While filling the chicken shed with any gas, it is necessary to switch off the ventilation system, provoking the increase of humidity built up and temperature built up; in this regard the ethical concern is that such dead are not humane because these animals should remain a long time in adverse conditions.

So, there is need for further research and development to see how to develop a system of rapid deployment of this and try to achieve a humane killing as rapidly as possible.

With relation to the use of carbon monoxide as a potential alternative, only a 3% of this gas is needed to kill an animal while you need 50% of CO_2 and CO_2, being heavier than air, is not a gas that will readily disperse into a large shed, because it's heavy, it should normally be delivered from a liquid source by using a vaporiser. Both gases are rapidly diffusible, but as carbon monoxide is lighter than air it has to start being filled from the ceiling to the ground, and it has its own logistical problems, because as it starts filling from the ceiling down and most of the ventilation start from the ceiling, the gases will escape and they never come down.

Then, it will be necessary to design an infrastructure to give solution to this problem of filling any of that particular gas mixture into a chicken shed. It would be necessary to have gas analyzers to monitor them above the head level of the birds, systems that could deliver large quantities of gas and achieve little concentration as rapidly as possible, and by infrastructure it is meant plumbing, regulators, vaporisers and others.

In addition to that, one of the problems will be to start filling from one end of the shed, expecting the gas to diffuse to the other end, if the gas such as CO_2 is aversive, chicken just go away, walk in front of the gas, and they pile up and suffocate each other. This issue should be investigated and evaluated and come up with a manual with a set of guidelines which administrate to have legislative set of framework and also to have the infrastructure with plumbing, regulators and gas diffusers and any other kind of things that is needed to carry out this job.

An idea that have been discussed is to put a camp tent in a chicken shed and reduce the head space so that we apply gas directly to the chicken head levels, but there are lots of questions with unknown answers and it is required to make some research developments to actually identify whether these gas mixtures are really feasible. But today they are potentially available, and they can be used without having to depopulate, particularly from the chicken growing alternative systems, or even in a macro cage situation. Unfortunately there is no scientific information to say how long it takes for the birds to become unconscious or how long it takes for the birds to die with these two gas mixtures. That information although is available for at least the three gas mixtures.

Now, other alternatives that can be considered are lethal injection, but the problem with the lethal injection is that they are expensive, they need veterinary supervision, a veterinarian involvement,

and most of the drugs that could be injected are classified as substances or drugs that only veterinarians can carry. Even for a veterinarian to carry a large quantity into farms, where he has a lot of people running around, he has to get a very close watch on what happens with these drugs.

Nevertheless, there are barbiturates such as chloral hydrate, ketamine or T61. It is known for sure that barbiturates and chloral hydrate and ketamine work very effectively in mammals, but there is no certainty if ketamine is a very good anaesthetic in birds. It immobilises, but indeed, it is a sedative in birds, it is not a truly anaesthetic drug. It might need very large quantities to kill some large birds and they will have to be administered intravenously, now, that involves very severe strain and skill, of course, on the part of persons that administers it intravenously. On the other hand there is some concern about the T61 because it has a mixture of one sedative and a muscle relaxing. Understanding this particular combination is that its rate of injection is not appropriate to the species according to manual instructions. The muscle relaxing set their effect earlier than the sedatives do, which means that they induce muscle paralysis or it can potentially induce muscle paralysis and death due to suffocation before the anaesthetic drug actually is in fact in the brain. Besides, there is no information evaluating the rate of administration for all species of farm animals, and that is another concern, because maybe people use them, but they don't seem to publish it, and there is not much published information.

Now, there are another two substances here, but these substances are not anaesthetic drugs. For example, the substances with no anaesthetic properties, that should be administered to unconscious animals only, such as potassium chloride, that decompresses the cardiac function, inducing cardiac arrest. Now, you cannot induce cardiac arrest in conscious live animals, so we must make the animal birds, and other animals, unconscious before we could inject it. Injecting these substances into the heart makes stop it faster and more efficiently than in administering intravenously, but then again these are speculative substances, that have not been actually scientifically validated, although in some articles they are reported as feasible and that they will guarantee animal welfare.

Now, alternatively, If it is considered the use of gas mixtures to make birds unconscious in the shed, for example, administering CO_2 in the broiler shed or into the chicken shed to make them unconscious. One of the problems in the chicken situation is that the broilers are grounding on deeper part of the ground level, in what is called mono layer, but if there are stairs stand set for broilers or either in the alternative system they could be perching into a very high level or if there is a back tree cages system, where the back tree cages would double the ground level, it is necessary to measure the concentration of the lethal gas mixture, at the level where the birds might be possibly be perched or living, not at the ground level. Another problem is that carbon dioxide frequently stratifies so in a stair system, it will kill the bird in the bottom stair, it may make the bird unconscious in the middle stair, and may do nothing to the birds that are perched in the top. Now, the problem is that if the birds remain immobile but conscious, they will be deprived from access to food and water, because they cannot get up and walk.

But in spite of that, the use of gas mixtures to make the birds unconscious in the sheds, and the consideration of injecting magnesium sulphate and potassium chloride to finish them off to kill, is quite a good option too.

Panels

NOTE: The texts of panels were transcribed from recording made during oral presentations, except those where it is indicated that the authors complemented them after the Seminar.

For the edition of said texts not always were available the PowerPoint drawings that would have helped in given a more explicit relation of the subject.

Challenges of Animal Welfare: Other Perspectives in an Institutional Frame[1]

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This presentation is based, mainly, in the role played by the Veterinary Medicine College related to animal welfare since a bill just began to be formulated on this issue, which was submitted to the Parliament on November 2003 sponsored by the Deputy Mr. Exequiel Silva.

From that date on, the Veterinary Medicine College has been the reference of all kind of concerns born not only from professionals of veterinary medicine, but also from public opinion, gathering and collecting all this information and consolidating, at the same time, the position and policies relative to animal welfare of the Veterinary Medicine College of Chile.

1. Introduction

Undoubtedly, in the international scope, the concern for animal welfare has been increasingly important during the last few years. In the case of the European Union, this concern has been translated in the drawing up of a number of guidelines that establish the minimum standards for farm animal protection, not only in cattle establishments, but also in relation to transport and slaughtering/killing.

On the other hand, the World Organization of Foot and Mouth Diseases, as a world animal health organization, is the leader, in the animal welfare scope, and in the elaboration of guidelines and basic standards with scientific bases. Proofs of this are the congresses organised by said organization. The first one, held in Murcia on December 2-4, 2003, which analysed the problematic present in that time and the future ones regarding issues such as:

- housing and handling of intensive farms;
- to create conscious among veterinary doctors regarding the new perspectives on animal welfare;
- to transmit society the concern of veterinary profession on animal protection and welfare;

[1] This text was extended after the Seminar by the autor.

- to give an alert sign to stockbreeders about animal origin foods and, to clinic veterinary doctors on the possible market losses;
- to increase knowledge to veterinary doctors on this matter;
- to inform about possible risks to human health, overpassing animal welfare limits;
- to use feeding products to cover deficient handlings in cattle farms.

Afterwards, the OIE held a World Conference in Paris on Animal Welfare, (February 23-25, 2004. (see: http://oie.int/esp/welfare_2004/Conference.html) where topics such as the following ones were discussed:

- to define the future role of the OIE related to animal welfare and its influence in decision taking of member countries, as well as the need to be transformed in a scientific referent on animal welfare, particularly through the elaboration of guidelines and international standards;
- to establish the OIE leadership on animal welfare issue;
- to disseminate the OIE activities to the widest amount of persons interested on this matter, in order to have their support;
- to approach animal welfare issue from scientific and trustworthy points of view, particularly in the scope of agriculture and fish farming;
- to look for methods to objectively measure animal stress;
- to establish guidelines and standards on animal welfare on a world level, with scientific basis;
- to examine the role of all interested parties in the frame of process development standards and to determine the most effective way to receive contributions.
- To promote bonds and links with international organizations that back up the OIE work and to determine the best way to contribute with this process.

2. Animal welfare definitions

Some authors define it as the absence of sufferings; others have adopted a wider perspective and define it as an adaptation measurement of animals to the environment. According to this last definition, an animal can be found in conditions that go from the total absence of welfare, when within the adaptation process he gets sick and he could even die, until achieving satisfactory welfare conditions, when adaptation process is not only possible, but it is also easy and without physiological costs to the animal.

Animal welfare is, thus, a human responsibility, that involves all related aspects, such as: adequate housing, handling, nutrition, disease prevention and treatment, responsible care, humane treatment and, when necessary, humane euthanasia. In the United Kingdom, the standards established for animal welfare are based in five "freedoms" that all and every animal deserve:

- free from fear and distress;
- free from pain, injury and disease;
- free from hunger and thirst;
- free from discomfort;
- free to express natural behaviour.

3. Animals' rights

It is necessary to point out that animal welfare is not the same as animal's right; this last issue has to do with a philosophic position related to some consubstantial rights of man that are also applied to animals. Veterinary medicine, due to its relation with food animal production, fibbers and others, cannot, then speak of animals' rights, but it has to be committed with animal welfare that is required to achieve such productive scopes. That is, in its work, veterinary medicine is related with animal welfare and not with animals' rights.

4. Role of the veterinary doctor in animal welfare

The role of the veterinary doctor regarding animal welfare is very wide in all the world and, Chile is not an exception, because on many occasions it is a referent of animal welfare, due to his/her experience, as well as his/her ethical and moral values related to this issue, that are needed by the governments, by the public opinion, the press, the legislative authorities, the judges, among others. For example, for legislation, the knowledge and scientific development of the veterinary medicine profession are very important with relation to animal welfare; so they play an important role in the legal regulations of the most diverse aspects related with this matter. A proof of this is the outstanding increase of works on ethology and animal welfare carried out in most of veterinary medicine colleges throughout the world, works that are seen in congresses and other specialisation events in almost all disciplines of the career and in all animal species.

Then, in many countries the veterinary doctors are most demanded professionals by the governments and by the public to solve all matters related to this problematic, apart from being directly involved in the development of scientific knowledge, in ethical, moral and philosophical values related to animal welfare.

The World Association of Veterinarians (WOV), accepts and confirms the leadership of the profession in the diagnosis, treatment and control of animal diseases, even though, it also recognises their responsibility to do their best to diminish suffering, pain and distress, by promoting animal welfare.

The WOV Stand Committee, adopted since the year 1990, a policy on animal welfare with a worldwide scope, establishing the need to respect the animal's needs because they are essential for their welfare.

Many are the veterinarian institutions that, throughout the world, have in their organization work teams that are in charge of surveying animal welfare. Unfortunately, in Latin America, few are the veterinary doctors that have formed this type of organizations.

5. Training of the veterinary doctor in animal welfare

Animal welfare, as a subject is absent in the curricular network of the different schools or veterinary medicine in Latin America, with the exceptions of the Universidad Autónoma of Mexico and the Universidad del Salvador in Argentine.

Considering the deep impact that this issue has in the public opinion, apart from the leadership that is executed by the veterinary medicine on animal care and the recommendation of the last World Congress of Veterinary Medicine and the Panamerican Congress held in Chile in the year 1992, animal welfare should, without any discussion be a subject in this career. Besides, all teaching and research activity should involve this concept.

Currently, in some universities the students of veterinary medicine can take a course on animal behaviour and welfare as an elective course, a very promising situation for the future development of the discipline. It is worth while to indicate, that this subject is presently very relevant and important for the students and, on many occasions, it is almost an unknown subject for many professional with years of experience in the veterinarian world.

6. Cattle breeding and animal welfare

A lot of talk has been done on cattle breeding and the position adopted on the issue of farm animal welfare, transportation and slaughtering, where the concept of food safety and environmental respect have been integrated. This means that, apart from avoiding unnecessary suffering of animals, handling models of production systems should be improved as well as the sanitary condition of stockbreeding.

Farm animal welfare, as well as transportation and slaughtering, are relatively recent lines of research which objectives are to minimize the unnecessary suffering and to improve the models of the same. The idea is to improve the sanitary condition of animals and also the final quality of the products.

During the next few years, the standards and regulations referring to farm animals handling, transportation and slaughtering are going to be increasingly strict together with animal welfare surveillance.

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Lately, it is being pointed out that science should always be the essential fundamental for settling the international criteria and standards on animal welfare. Within this context, the current research is looking for the corresponding parameters and indicators that show the level of welfare, for a flock as well as for an individual in particular. Different approximations can be used to measure animal welfare at farming scale, such as: productivity, animal health and diseases, physiology and behaviour.

One of the issues of particular importance has been the role of developing countries, where the importance of the need to cooperate with them in the scope of animal welfare, has often been pointed out and discussed; thus, the representatives of the OIE are working to "give them technical and financial assistance", in order to involve them in the adoption of animal welfare standards.

A couple of years ago, the political responsible, the stockbreeders, and technicians on these matters had as a main concern to achieve a higher productivity of cattle establishments and to make them more competitive. In the last years a quantitative and qualitative change is being produced, from the legislative viewpoint as well as from consumer's demands. At present the key issues are: safety feeding, respect to the environment and animal welfare, apart from front edge production technologies.

7. Cruelty and ill-treatment

There is a difference between the concepts of cruelty and ill-treatment, because a number of problems have been produced due to the lack of clearness between them; for example, with reference to the subject of fines in the legislative procedure of the animal welfare bill.

Cruelty implies that there is an intention to damage, which is different from ill-treatment that occurs, many times, because of ignorance or because interest of any kind are given priority to those of the animals. This generates a lot of legislative problems and difficulties; such that it has been proposed that a separate legislation should be done for each situation, in the sense that cruelty is an offence (misdeed) that has to be punished by the crime tribunal and that ill-treatment is an offence that has to be processed by local police tribunals. If this situation would have been clarified since the beginning of the bill drawing up, maybe, today these problems would have already been solved.

Ill-treatment occurs most of the time by ignorance, permissiveness, lack of knowledge, or because the interests of the animal are left aside in order to obtain personal profit of different kinds.

8. Euthanasia and animal welfare

Euthanasia (from greek eu = good and tanatos= death) applied to animals means a neither soft, nor painful death and without agony and, it implies a fast insensitiveness that should be maintained until the animal dies. Definitively, animal euthanasia is "a humane death of animals carried out by specially trained persons". In the veterinarian practice, the euthanasia is applied, in general, to avoid suffering of animals affected by incurable or painful diseases or to animals affected by dangerous behaviours.

We can point out that, in the practice of this method in small animals, a special attention should be paid to the affective commitment of their owners before, during and after carrying out the procedure.

9. Control of canine and feline population and animal welfare

In Chile, historically dog's killing has been used as the only measurement to control street dogs. These methods have shown to be inefficient from the technical point of view and unjustified from ethical viewpoint.

To this regard, the supervision of the Veterinary Medicine College has been required, mainly in sanitary campaigns to control street dogs. This is an issue that has been treated together with other requirements of the society, such as canine reproduction control, that is being treated as a sanitary issue by the authorities, even though, it really is an animal welfare problem. In relation to this, the College has indicated that, killing as well as reproduction control are not adequate to control canine population; many veterinary doctors commit animal welfare failures and inclusive, fail to the Code of Ethics, because they make low cost sterilisations, with an enormous suffering to the animals as a product of wound infections, eviscerations and other problems, including the death of the animals. The solution to these problems is not dog's killing, but the elaboration of an integral project to define responsibilities, assignation of resources and most of all, the political will to carry it out.

In this context, the Veterinary Medicine College of Chile has proposed to the Health Authorities and to the congress, the implementation of modern and integral measurements to control canine population that include:

- corresponding legislation;
- registry and identification of national canine population;
- environmental control. Garbage collection and disposal;
- canine fertility control;
- education on responsible dog keeping;
- responsible authority, who at present does not exist;
- technical and financial resources.

With respect to the first point, there should be an ad hoc legislation that assigns responsibilities and resources to integrally solution this problem throughout the country. On the contrary, arbitrary measurements can be taken and they are isolated and inefficient, and they do not represent a definitive solution and, besides, they are not coherent with animal welfare principles.

10. Slaughtering and animal welfare

With relation to animal slaughtering, the most delicate aspect that has been widely studied and that cannot be avoided is the issue of knocking that is stunning previous to death. The Bill that is being processed, in its article 9 sets (sic): In slaughtering and killing of animals, rational methods should used in order to avoid unnecessary sufferings; the regulations will settle the industrial procedures not regulated by Law Nº 19.162, for animal slaughtering for consumption of their meats, furs, feathers and other products.

On the other hand, from the economic point of view, the procedures respectful of animal welfare during slaughtering have shown to be very efficient in improving the quality of the product.

11. Pain in animals and animal welfare

The ethical and moral imperative of veterinary doctors rises from the knowledge (as in no other profession) of the capacity of animals to feel pain.

The issue is a very controversial one; nevertheless, without questioning the different moral, philosophical or juridical currents that move from those who affirm that animals have rights, to the other end of those who treat them like things, there is a consensus to set the fact that there is a moral equality that the human being owes to the animals, mainly based, in the suffering capacity they have.

12. Animal's physical restraints and animal welfare

The other sensible aspect on this issue is physical restraint in cages and the way it is carried out, as Dr. Iñigo Díaz indicated in his conference "Housing of Productive Species". Although most of the time, to maintain the adequate conditions in these aspects implies an increase of costs in productive systems, this is not always real and, implements like sleeves that do not filter the light or without any obstacle inside them, give solution to big animal welfare problems without increasing production costs.

Manual and mechanical physical restriction methods mean to limit totally or partially all or some of the voluntary movements of the animal, with the objective of practicing clinical examination, sample collection, administration of remedies, treatments or handling.

The procedure used should permit, at least, to be able to carry out an adequate procedure, as well as to protect the animals and also the persons involved in the application of this procedure. If possible, restrictions should be planned, formulated and duly communicated before its application.

There exist certain landmarks that have generated a big advance in animal welfare, for example, the design of circular sleeves, that began to be used after an observation made by a researcher that suffered a syndrome similar to autism, that enables persons with a high and very particular capacity of observation. This researcher recognized that bovines showed a certain natural tendency to walk in circle, so he invented this type of sleeves.

On the other hand, in the bill, the issue related to livestock breeding facilities should be regulated by law before they are constructed; that is, the manufacturer should be approved before building or offering a product, in order to avoid that, after building the infrastructure he has to change it for not complying with animal welfare requirements. It is expected that the regulation stipulates this aspect.

13. Experiments with animals and animal welfare

The Veterinary Medicine College has declared that the use of animals in experiments related to scientific research; in particular the creation of bioethics committees is backed up to draw up guidelines that avoid unnecessary suffering of animals and that generate minimum standards that protect welfare of animals used for these purposes. These standards consider the research

known as "the 3 R's" used in animals: reduction of the number of animals to be used; refinement of techniques used to avoid unnecessary sufferings; replacement of methods for other alternative ones.

As mentioned before, veterinary doctors are committed (engaged) with animal welfare, but also with human welfare. From this point of view, they back up the regulated use of animals in the development and research of new drugs, vaccines, biological products and others that benefit not only men but also animals.

14. Animals fights and animal welfare

The Veterinary Medicine College of Chile opposes to animals' fights and it has repeatedly and publicly settled its position. It considers that in these events, animal's cruelty crime is configured, because the event is planned with anticipation: (date, place and fight program) for the enjoyment of people and suffering of animals. Besides, there is money involved in them (clandestine bets that are also illegal).

The veterinary doctors are opposed to:

- to provoke fights between animals and to promote the practice of shows that imply serious ill-treatment, health deterioration and even death of the animal;
- to use instruments or substances that provoke animal's death with suffering and being conscious;
- to remove, destroy or alter any member, organ or part of an animal for causes different to due veterinarian, sanitary causes or others expressly authorised by law.

In special, the Veterinary Medicine College of Chile has also declared that the issue of fights with dogs, are considered a crime for the cruelty they imply in the preparation of the animal as well for the fight itself; these should be punished by the crime tribunals.

15. Use of animals in advertising, sports and shows and animal welfare

It is well known the use given to animals for advertising, entertainment, sports and shows purposes, and the important role of veterinarians in promoting animal welfare, to avoid the use of techniques, procedures and substances that alter their physical potentialities such as performances, appearance, behaviours and others.

Within this context, the Veterinary Medicine College is constantly referring to the proper and coherent treatment of animals in publicity, as well as in sports and shows. Specifically, in relation to circus animals, it has been settled that the option is not to prohibit their work, but to regulate its use, to give them a worthy treatment and to educate the population. This message is coherent with animal welfare principles.

On the other hand, animal welfare has to be protected when animals are used for advertising purposes, press or TV, and it has to ensure that the message and treatment is the appropriate and coherent with the principles for the respect of animal's life and their environment, especially considering the high impact of these media in the culture and habits of population.

I understand the difficulties it means to oppose to sports that most of the time form part of the culture of a country, but the College has defended the position of modifying and improving the sport regulations that use animals, according to the principles of animal welfare, so animals receive a more humane treatment.

16. Use of animals in teaching demonstrations and animal welfare

The use of animals in teaching demonstrations was consigned in the law and the College is in favour of prohibiting in basic and high school education the use of animals for experiments and teaching demonstrations; but not in higher, technical and university education, unless it is strictly necessary and in a very respectful way, according to the principles of animal welfare.

17. Aggressive dogs

With relation to aggressive dogs and their eventual attacks to people, sometimes with serious consequences of death, the College has been very clear on this matter: they should not be stigmatised, because there are no aggressive breeds, although the possibility that there are some aggressive individuals is accepted. To face this problem, we suggest actions such as:

- to define the responsible authority on the matter;
- to rule on this issue;
- to register and identify the animals;
- to assign responsibilities of the animal's owners;
- to educate the population;
- to control street dogs.

18. Wild animals and animal welfare

The Veterinary Medicine College, together with the Society of Wild Animals Veterinary Doctors Specialists, on March 2003 held the Workshop "The Practice of Veterinary Medicine in Exotic Animals: Ethical and Legal Considerations", where different issues were discussed in accordance with the Agricultural and Livestock Service, SAG. The meeting originated a document that contains some points related with animal welfare, outstanding the collision of interests produced between the ethic and the legal condition: not all legal is ethic and vice versa.

To this respect, some conclusions are:

- The college considers that it is urgent to determine ethical and legal guidelines for the attention of these types of animals.
- There is small interest by the governmental institutions with respect to the real situation of exotic species; this is a worrying (disturbing) situation if we think that a wrong management of this issue could produce serious damages to the ecosystems of the country.
- The state should emphasize the issue of wild fauna, by dictating standards and regulations for their concern, to permit to watch over the preservation and handling of these species.
- It is required to promote the responsible ownership of exotics and wild animals. The veterinary doctors should inform the owners of these animals about the adequate handling, as well as of the existing legal regulations on these matters.

- Animal welfare should be promoted to be considered in the legal frame, in the veterinary medicine profession and in the population in general.
- Control of fauna at owners' , traffic and commercialization level should also be backed up,
- It is required to establish detailed parameters for the design of standards to maintain and handle wild and exotic species, as well as to achieve their incorporation in the legislation.
- Wild species potentially affected by contamination and human activities should be monitored.
- Public and private financing are required for the preservation of wild life.
- The role of the veterinary doctor should be defined in the protocols of capture and keeping of these species.

19. Latest agreements of the Veterinary Medicine College of Chile related with animal welfare

- To develop an ethical and moral commitment of the veterinary profession with the improvement of the animal welfare conditions in the breeding systems of all species destined for consumption.

- To back up SAG initiatives, relative to the need to advance in the issue of animal welfare, according to the effort to position Chile in an expecting place for the exportation of livestock products to the most demanding world markets.

- The commitment of the veterinary doctor profession with the education and conscious taking of the human resources related with the production processes, transportation and industrialisation based on animal welfare principles.

- To participate in the establishment of legislative and regulatory tools for animal welfare throughout the whole production chain, including transportation and slaughtering of animal species destined for human consumption.

In general terms, we are concerned to verify that there is more interest for animal welfare in a school of science or a school of arts than in a veterinary medicine school; thus, it is really urgent to compromise the responsibility of veterinary doctors in the development of ethical issues and of all principles associated with animal welfare.

Challenges of Animal Welfare: Other Perspectives in an Institutional Frame

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The Agricultural and Livestock Service (SAG) has the responsibility of certifying certain requirements for exportation products. For example, it has to watch over the compliance of the economical agreement with the European Union, in all the scopes of its competence. This includes issues of animal welfare as humane slaughtering of animals and, thus, the use of insensibilizing methods previous to slaughtering at the slaughter houses. The above is not a trouble to continue advancing in issues such as transportation and others that will be discussed later on.

The Inspection Regulation of the European Union indicates a set of activities and conditions that the exporter country has to certify and these should be verified by the Inspectors at the slaughter houses. Among them is the issue of animal welfare, not only with reference to transportation, but also of the premortem conditions and at the moment of slaughtering. Based on this, the SAG is responsible for the certification of the livestock products that are to be exported to Europe, tasks that should include the official inspection system.

On the other hand, SAG has traditionally been an institution concerned by the animal health. To this respect, the World Health Organization (WHO), defined in 1947, that health is not only the absence of illnesses, but also a condition of complete physical, mental and social welfare.

According to SAG, there are ethical and pragmatic elements that should be incorporated in the animal welfare issue. The first one, because the human specie has no right to act in inhuman way, affecting negatively other animals species; the second ones, because it has been shown that there are negative actions, on the quality of livestock products, of certain stressing elements to which animals are exposed before slaughtering.

Even though, welfare is a condition of subjective type (one "feels" to be good), and an important area of scientific research has been developed pretending to clarify and quantify the conditions of animals' welfare, as indicated in the conferences held before this seminar, which results, undoubtedly, contribute to clarify the ethical and pragmatic aspects already mentioned.

In general, animal welfare involves a series of environmental conditions as the absence of infectious diseases; adequate offer of food and water; protection from weather conditions; adequate constructions and transportation; adequate general handling measurements (cattle droves, treatments, humane slaughtering and others). Man can modify all these conditions in a positive or negative form.

To this respect, in 1979, the Farm Animal Welfare Council (FAWC), an independent advisory institution that belongs to the European Committee, determined that all farm animals have the right to the five "freedoms":

- **Freedom not to suffer hunger or thirst**: right to have fresh water and a diet to maintain strength and good health.
- **Right not to suffer from discomfort**: to provide an appropriate environment that includes shelter and an area to rest with comfort.
- **Protection against pain injures or diseases**: through the prevention or through a fast diagnostic and the corresponding treatment.
- **Liberty to express natural behaviour**: to provide enough space, adequate facilities and the company of animals of their own specie.
- **Protection against fear and distress**: to assure conditions and treatment that avoids mental suffering.

We have to ask: how are the national institutions related with these five freedoms?, what exists, what is lacking and what should be done? From these questioning raises challenges and pending tasks for the Agricultural and Livestock Service as an institution and the country, as a society.

Article 291 bis of the Penal Code establishes that, when animals are ill-treated, there could be a sanction with jail or fine to the responsible of such act. This legal body is the regulation usually used by police when there is a denunciation of cruelty against animals.

On the other hand, Meat Law (N° 19.162, 1992), gives the bases to act in benefit of animal welfare in a more strongly form than today is done; for example, Article 2, in its last sentence, establishes that technologies should be developed to diminish animal sufferings. Besides, this law stipulates an obligatory system of transportation and slaughter houses operation, and indicates a series of elements to be able to develop standards to regulate different aspects to benefit animal welfare.

SAG mission tackles the issues mentioned in the 3rd freedom: absence of diseases. Articles 2 and 3 of its Organic Law (N° 18.755 of the year 1989, amended by Law N° 19.283 of the year 1994) refer extensively to the issue of control, eradication and elimination of diseases, mainly of the infectious type.

Freedoms 4 and 5 are partially faced in the regulation on transportation of bovine cattle and meats (Decree N° 240) and slaughter houses with regulation (Decree N° 342, both of the Agriculture Ministry). The first one defines the structural conditions of the means of transportation and the way they should operate, journey length and conditions, as well as the responsibility of the driver, among others. Currently, there are some problems with maritime transportation that are more important than the terrestrial ones, because the latter has had important advances and progresses, basically, due to the improvement of transportation highways which has permitted a significant diminution of trip duration. Other aspect that favours terrestrial transportation refers to the fact that a higher amount of animals are being slaughtered in places nearer to the production centres, thus requiring less displacement of live animals.

SAG

Notwithstanding the above, it is necessary to continue improving the way to transport calves from Magallanes Region to the X Region and from there to the central zone of the country. Currently, calves are transported by ship, which means long journey of 3 to 5 days. The SAG has studied the conditions of this trip and is gathering corresponding antecedents, thus permitting to give some recommendations to improve maritime transportation conditions. In this case, the best solution is to replace the present system of transporting calves in trucks inside the ship, by terrestrial transportation through Argentine territory.

In the country there are no regulations to face of contents of freedoms 1, 2 and 4.

Pending tasks

Seven tasks have been defined as pending tasks to be faced:

- **Standards harmonization**: this necessity is based on a project with the European Union that will permit modelling and reformulation of national regulations, so as to harmonize them with said Union.

  In first place, the level of compliance with transportation regulations should be improved, basically in relation to their operation, the time that the journey takes and to give solution to transportation by sea, as indicated before; that is, not to transport animals in trucks inside the ship.

- **To extend the coverage of transportation ruling**: this refers only to bovine cattle transportation; thus, to make it extensive to other species of habitual slaughtering, such as ovine, pigs and equines, should modify its name and some contents.

- **To draw up standards for the transportation of poultry**: This aspect is not included in Law N° 19.162 (Meats Law); thus a legal and regulative back up has to be drawn up for the humane transportation of poultry.

- **To draw up standards for humane slaughtering of poultry**: For the same above mentioned reasons.

- **To explicitly incorporate to other species the issue of humane slaughtering**: This issue is being worked for semi-wild species such as captive wild boar and ostriches, among others, which should be clearly identified to be able to control and order compliance of corresponding standards, without any doubt.

- **To analyze the issue of animal feeding**: It is required to define what type of food can be used, especially in confinement ruminants. Some doubts have to be solved with respect to the use of some elements, basically, manure type.

- **To start the study of standards**: for housing of different species and other type of facilities.

Final comments

This presentation has summarized the current institutional situation with respect to the regulations on animal welfare and the field is open to continue the discussion. For the SAG, there are some tasks to be continuing working on them and it is open to incorporate other elements that can be internal or incorporated from the civil society, the academy or from other actors of the society.

Challenges of Animal Welfare: Other Perspectives in an Institutional Frame

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It is of fundamental importance that in Chile, each day more spaces are being generated to discuss about animal welfare. A proof of this is that, in less than two weeks I have attended to two events to discuss theses matters: today's meeting and the Congress on Veterinary Medicine recently held in Valdivia, apart from the next one that will be held in at the Metropolitan Technological University where a conference will be dedicated to this issue.

During these 11 years that I have dedicated to the works of Deputy, I have represented many bills, but for none of them did I received a big amount of questions, nor was I requested a meeting, as for the ones related to the project on animal protection, being in process in the Congress since the year 1995. That reflexes the interest of the common citizen for this issue, that although it does not have the technical focusing as it has been pointed out here in the previous presentations on this subject, it shows the approach of the feelings of the human being, which concern, from the commercial point of view, has influenced in the consumers organizations, which, to my judgment, determine the market that together with trading have permitted an important advance in the development of this issue, much further than to only a relation with the ethical parameters or the humanitarian ones that we could express.

Something similar occurred with the Law on Environmental Bases that would have not been possible only for the concern from the environmental ethical and social viewpoint, but most of all for the market pressure oriented to the certification of products and investments in the country.

On other aspects, if animals do or do not have a soul is an old theological discussion. Not pretending to philosophise now, I would like to take the moral issue included here, in the sense of the equality that the human race has with the rest of the animals. There is no doubt that they have the capacity to suffer, so the conclusion is that there is a moral equality that justifies, at least a concern on this subject, including the wide diversity expressed here. In this context, it is of vital importance that this subject has reached high relevance and that resources are being destined for its development, in difference with what occurred some time ago when it was necessary to have a productive goal to be able to discuss on this subject and obtain financing to make researches on animal welfare.

Even though the discussion of the Bill on animal welfare has been for more than 9 year in the Congress, it has had the merit of permitting release this issue to the public opinion. From the beginning of its discussion, many TV programs have been dedicated to animal welfare, and also a number of written articles published in the newspapers; many citizens organizations have acknowledge their point of view on this matter, although from a very different optic, including commercial and market interests.

It is my opinion, that currently in the country and in this discussion, three aspects should be considered to advance on this matter:

- **Commercial issues**: which should be urgently discussed, because aspects such as transportation, slaughtering, stabling, scientific research and others, can be easily transformed in tariffs barriers, when the bilateral and multilateral agreements, as well as the World Organization of Commerce (WOC), have established terms for decreasing tariffs. So, if today, these issues are not approached with corresponding seriousness and the necessary agility they deserve, serious commercial problems could occur, and ruin the achievements obtained by the country in matters of commercial integration.

- **Behavioural changes:** to permit the modification of the cultural focusing on this subject; which is one of the main objectives of this bill that is looking for the way to penalise behaviours rejected by most of citizens. Besides, the idea is to educate, not only through the incorporation , in school texts of primary and high school students, the concepts of animal welfare and its relation with the environment, but also through the changes that provoke the punishments to persons by the law, actions that are transformed in deep cultural changes throughout the time.

- **Establishment of an institution**: that effectively cares for this matter, and that should watch over the dissemination, promotion and application of all the principles that today are demands in other more developed countries, not in the economical sense, but as how they have integrated to the society these issues on animal welfare

  I think that currently, the Agricultural and Livestock Services, SAG, is concerned on this matter, and it has tackled it with anticipation, preventing the occurrence of the above mentioned problems.

It is a need to analyse animal welfare issue in all its magnitude and not just from the point of view of reductionism, as for example, only from commercial perspective, that is, of breeding animals, or from the point of view of pets, that tend to be the most evident for most of citizens. These focusing, as well as the lack of clarity of some of the concepts, have impeded the development of the issue in all its extension.

In this sense, it is fundamental the support of the technical and scientific knowledge of the professionals in the discussion and development of animal welfare. Many subjects have risen spontaneously in groups that are concerned of different aspects of the issue. For example, of those who hope that circus do not use animals in their shows, or those that are concerned about stabling systems, or that in a way, generate fears among these sectors. On the contrary, some parliamentarians express their fears in the sense of "threatens" for the future of pigs and poultry breeding; it is required, to carry out in that sector a work to approach this issue with a wider vision, not a reductionism one, in order to visualise that the demands that are being made are going to be advantageous commercial demands for those industries that adopt them as a criterion and as a standard, when the law is enacted.

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I think that the dispersion of interests have gone against the advancement of the project discussion, as well as the small clarity of the concepts and subjects to be tackled, all of which have been approached more from the point of view of sentiments rather than from the ethical point of view of men to the other animals.

The systematisation of the issue with a scientific vision will permit to define not only the technical parameters, but also the concrete elements that reject the fears and permit advances in the legislation on this issue. In this session we have mentioned which are the minimum quality standards, the need to study the requirements of consumers that are each time more exacting in other countries and the position of the World Organization of Animal Health (OIE), among others, in relation with animal welfare; nevertheless, apart from the analysis of these topics, it is required to make concrete actions such as the creation of an adequate institutionalism and the conscious taking of stockbreeders, in the sense that the concern for animal welfare is not an aggression to the farm breeding activity, bur a need for the near future.

In the present context of the country, the institutional challenges for the SAG and for the universities are very significant, likewise the role that should be played by the veterinary doctors; in this aspect, I fully support the declaration made before by the President of the Veterinary Medicine College of Chile, Dr. Luis Godoy.

In the public expression, animal welfare has not been a subject of interest of the veterinary doctors, but of groups concerned by the partial aspects that, many times, are fans or a little bit extreme with their positions, that do not have the scientific or professional support, and that are nor related to the present globalised world.

In said context, those who dedicate or are concerned by animal welfare, scientifically as well as technically, have the important mission and role to do in front of the public opinion, including in front a number of veterinary doctors, in the sense of sensitising them with regard to this issue in order to facilitate informed discussion in all its extension. An important aspect to be considered refers to the need to incorporate the concepts associated to animal welfare in the curricular network of the veterinary medicine career.

It is urgent in this moment, to develop a work in the short and medium term not only to achieve that the Bill is approved with the corresponding modifications, but also to orient the professionals of the area, so, from different positions, they can influence in the advancement of the development of this matter in the country; for example, by incorporating it in the planning of career courses; in the positioning of the Veterinary Medicine College with respect to this subject; in obtaining necessary resources to advance with the scientific researches and, among others, to reach a better coordination among the six veterinary doctors present today here in the National Congress, which is an historical fact.

These are the challenges that could be developed in the short and medium term to advance in aforementioned matters; and they involve, to a great extend, behavioural changes that, in the future, would also produce permanent cultural changes, thus facilitating the discussion and comprehension on this issue.

Value Attribute or Commercial Barrier: Animal Welfare from the Perspective of the Industry and the International Trading

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From the perspective of the national industry, especially, poultry and pigs, animal welfare is a relatively new issue, because in Chile this subject began to be known when the exportation to the European Union started to be made, that is, less than two years ago, situation that implied to know consumers' requirements from those latitudes.

The interest for this subject, moved the Association, and during the year 2003, together with Bristol University, organised a series of courses on poultry animal welfare and of major animals, always from the perspective of attribute value.

Some of the lecturers in this meeting have referred to animal welfare from the ethical perspective; nevertheless, my vision is purely productive and in this context I will make my presentation.

This panel clearly settles the disjunctive to define animal welfare, from the industrial perspective, as an attribute value or as a commercial barrier. Even though the industry includes the considerations of ethical order, we will mainly focus, in those of productive and commercial order. With respect to the first one, there are a number of components and elements behind this concept; in general terms, for the industry, the ethical consideration means to avoid unnecessary suffering of animals, avoiding also the alteration of productive parameters.

In the productive order, the industry considerations are related to issues such as daily profits, food conversion, final quality of products, not only of the animal itself, but also in the sense of avoiding injures to improve meat quality. Since the Chilean industry started, some five years ago, the exportation process to demanding markets such as European Union, Japan and Korea, a series of new concepts have been integrated to the productive process that were not familiar for us before or usually managed, and that today they constitute a basic element for the consumers of said markets.

In the commercial order, national industry has analysed the perception of consumers of those destination markets, regarding the importance of animal welfare and has integrated this information in its productive processes. To this respect, consumers see animal welfare issue as a condition inherent to the product and not to include this concept is considered as a negative fact; so, animal welfare is a quality factor and should be present in the production chain.

Under these considerations, an important aspect is elasticity, that is, if the consumer is well-disposed to pay the cost of this attribute or if it only constitutes a wish or an interest, but when this aspect is reflected in a demand function, he is reluctant to do it. The perception of the industrials is that consumers are willing to pay for ethical attributes or, on the contrary, they punish a product as they perceive that it is not complying with the standards, at least with the minimum standards of animal welfare. These answers of the consumers clearly vary among the Europeans, North Americans and Chileans.

To this respect, today there is a high consumers' demand for information, and the idea of considering food just a basic need product has been left behind. From an economical point of view, currently, foods are one of the least represented items in the family budget or, in other words, feeding, together with clothing, is one of the goods that have shown the highest decrease of participation in expenditure. From rational behavioural viewpoint of economy, it is observed that, with the same income, persons demand for products attributes that were not demanded before, aspect that is clearly observed in the demands made on foods, and, thus, raises the necessity to know productive processes. Based on this, certification procedures begin to work, procedures that are very common and important, now a days in Europe.

Analysing this situation with a more economical and industrial vision, it is observed that there exists a correlation between the amount of involved resources and animal welfare. If we make a graphics of consumers' perception or the answer of the States with respect of animal welfare and its relation to incomes of countries, nobody could discuss that there is a direct relation between one factor and the other.

In short, for the domestic poultry and pigs industry, animal welfare is a valuable attribute as the importer country demands the same domestic standard level; on the contrary, it constitutes a tariff barrier if animal welfare is used as a condition to the imported products without being a demand established by their own producers.

To this regard, the OMC has consigned a principle referring to the concept of equality of national treatment; that is, the competence among producers should be made in terms of equality. Thus, if a country imposes another country conditions different to those demanded to their own producers, it is clearly not complying with this basic principle of International Trading.

What does the industry do and why?

The main motivation of the domestic poultry and pig industry is the productive and commercial order and it considers very specific issues such as daily profits, stress, meat quality, injures and consumers' perception. Among them there is a direct relation, situation that makes the industry visualise animal welfare as a necessary attribute to be incorporated in the production chain. It is worth while to point out that this is a generalisation and, obviously, among industrials there are different positions due to the fact that this is a relatively new issue, with which producers are not in line yet; nevertheless, during the last years important advances have been achieved with reference to comprehension of this matter, producing important changes in the perception of the same.

Another motivation of the national industry is the existence of national and international standards; these last, though not necessarily considered a requirement by importer countries they are required by consumers, fact enough to be considered as mandatory.

The industry has incorporated, during the last few years, new concepts oriented to a higher productivity based on animal welfare. For example, breeding based on best handling practices, is today a commitment of all productive companies and considered as an integral part of production. Industry has become aware of the importance that it has, in the productive order, the management of variables such as adequate space, light, temperature and ventilation, for the development and growth of animals. Currently, these matters are sensible not only for high management, but also at operational level.

We cannot ignore that, apart from the productive importance of aspects such as the generation of safe and free from disease environments or the issue of biosafety, there is certainly an animal welfare component involved in it. Although, aspects such as provision of food and water in

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necessary amounts are obvious, some cases have been reported, not too long ago, where these requirements have been infringed. For example, when ostriches breeding in the United States stopped being a profitable business, many of the stockbreeders released their animals to the fields, because the cost of feeding them was high. Although this and other cases are extreme, unfortunately they are real.

Another basic issue for national producers, is transportation; practices related to cattle droving, loading and unloading, animal rest and fasting, have a direct relation with injures and the final quality of the product. At present, the industry has also taken into consideration these practices, thus bad and wrong practices performed some years ago were very common, such as shouts, inappropriate unloading places, among others, today are notoriously improved and a cultural change is observed together with a different vision on this matter.

Subjects related to hoisting and insensibilizing are also of the highest relevance for the national poultry and pigs stockbreeders; this is reflected in each audit carried out in plants that export to the European Union, where, probably, these might be one of the most important and sensible issues, which are being given preferential attention.

Final comments

For the national poultry and pigs industry, animal welfare is a valuable attribute as it is being incorporated to the production cost and that, at the same time, diminishes unnecessary suffering to animals. Nevertheless, extreme positions that are specially concerned, should be avoided, particularly if we consider that, currently, a third of the population suffers from hunger and almost 5/6th do not participate in decision taking with respect to what they consume or how should their food be. Then, only a 6th of the population has the right to give their opinion and decide what the rest of the world has to consume. Behind this, there is an ethical component that should not be forgiven; if animal welfare is taken to an extreme situation, an increase of costs will be produced and, consequently, a direct fall of the amount of available food.

In short, the industry has to provide and guarantee adequate foods in quantity, price and general conditions, for every human being that live in the planet, thus taking due care of animal welfare.

Value Attribute or Commercial Barrier: Animal Welfare from the Perspective of the Industry and the International Trading

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This presentation shows how the Agricultural and Livestock Service, SAG has participated and will continue doing it in the different international forum on animal welfare, through its Division of International Affairs as well as its Livestock Protection Division; this issue has increasingly achieving relevance and, thus, it should be faced with the necessary information and with a clear position to permit negotiations of regulations and guidelines that are discussed in these instances.

Currently, the public sector is discussing about the adequate treatment of animals throughout the production chain up to their slaughtering. This discussion, that started approximately three decades ago in Northern countries, in Europe and in the United States, shows results in three aspects:

- The World Organization for Animal Health, OIE, at the beginning of 2004, starts to develop this issue related directly with animal's health and animal welfare, in the sense that prevention and control of diseases can be an important contribution to animals' welfare. As, obviously, the OIE is today a referent to the World Trading Organization, WTO, this issue is today a fundamental discussion, as well as the results and conclusions obtained from it.

- The place that animal welfare should have in the international trading is also a subject of discussion and analysis by the OIE and the WTO.

- Consumers' preferences have shown a change and they are tending to prefer products that include animal welfare standards; this demand is satisfied through commercial and marketing agreed strategies. This tendency places animal welfare as a value attribute that the consumer intrinsically recognises, or does not recognise in the product. Currently, consumers have the capacity to demand information if the product contains said attribute.

SAG participation in foreign trade

The SAG participates in the multilateral and bilateral scopes of foreign trade operation.

Multilateral scope: the agreement of Sanitary and Phytosanitary Measurements has the purpose to eliminate commercial fraud measurements, apart from promoting the establishment of measurements based on science, in order to maintain the commercial flow with the corresponding protection of sanitary conditions of the countries.

Based on this concept, the present international conference was organised; in order to reinforce the knowledge of the different aspects involved in animal welfare, the way that negotiations to determine guidelines that affect trade is effective and strongly sustained on scientific aspects.

Nevertheless, in the present agreements that rule the international trading, the animal welfare standards are not included as a reason to justify the restriction of importations; for example, in article XX of the GATT, in the technical barrier to trade (TBT) or in the Agreement of Sanitary and Phytosanitary Measurements (SPS). Then, there is a discussion on the concern of how to incorporate these aspects in the legal juridical frame of international trading.

Doha declaration states that, negotiations should consider aspects not directly related with trading (NTC's) including environmental and animal welfare scopes, in the context of the OMC Agricultural Agreement.

At present, countries can restraint importations only if there is risk for sustained consumers, apart from sound scientific bases. Notwithstanding the above, some countries have suggested, within the frame of *Codex Alimentarius* (Codex), the possibility to include standards that do not necessarily respond to consumer's hazards and, besides, they are not necessarily based on scientific arguments; for example, cultural and ethical aspects. Then, to other forums as Codex, it is being demanded a higher participation in issues that are society's concern.

In the multilateral scope, there are specific proposals, coming mainly from the European Union, (the EU), and from related institutions, as the European ONGs, that have indicated the option to incorporate animal welfare in the frame of the OMC. One of these corresponds to an extension of the Green Box, including animal welfare and the possibility to give subsides that are not markets distortedness.

Other proposal indicated, starting from bilateral agreements and out of the frame of the OMC refers to the harmonization of the standard that is being carried out by the SAG with respect to the EU, which, effectively, constitutes an important part of the philosophy of these international agreements.

On the other hand, the creation of voluntary tags that indicate the condition of certain attributes of products, the education of consumers and the incorporation of quality safety schemes, focused on aspects as animal welfare, are other of the proposals oriented to this regard.

In short, future improvements to animal welfare, in the multilateral approaches, are going to depend, in a certain grade on how these agreements are carried out in the world trade frame. Thus, forums as the OMC and the OIE appear as fundamental in the direction given to the definition and negotiation of guidelines and standards.

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Bilateral Scope: a near example is the Agreement of Social and Economical Complementation with the EU, by which Chile is proposing the application of the international trade philosophy oriented to introduce issues that are necessarily linked with trading, as animal welfare is. It has been explicitly indicated a work plan directed to harmonize the domestic standards on this matter, as mentioned before. Specifically, Appendix I C of Annex IV of the Agreement on Sanitary and Phytosanitary Measurements Applicable to Animal Trading, Animal Origin Products, Vegetable Products and other Goods, and on Animal Welfare, establishes the constitution of an Animal Welfare Plan Action.

Comments derived from the current international discussion

- In global terms, the application of animal welfare standards in the commercial scope can be shown as a good example of how these are being imposed in areas not considered until today, as culture and ethics. Although these positions could be sources of conflicts in the international trading, it is thought that, possibly, these issues will not easily be incorporated in the OMC discussions.

- Unavoidable, this will be a matter of negotiation and agreements in the medium range and, thus, it is required to prepare human resources to face this challenge in a positive way.

- It is highly probable that consumers' behaviour, especially in Europe and other countries of the North Hemisphere, to a great extend, will determine which will be the standards of animal welfare that will influence the international trading.

- Probably, it will be the impulse towards practicing private standards for animal welfare within a vertically coordinated system, the conductor of international trading of livestock origin products.

- Animal welfare is an issue that is currently being positioned in discussion centre, for which reason, it is being analysed in an adequate form to face the consumer in relation to commercial strategies, marketing and others.

Animal Welfare as a Differentiation Attribute in the Decision of Consumers' Purchasings[1]

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1. Introduction

As Dr. Francisco Bahamanode pointed out (p. 15), public debate in developed countries has increasingly settled with a stronger force in the questioning on confinement and treatment received by animals during breeding process. This has triggered systematic criticisms of environmentalists groups, which have notably influenced in consumers' perception with regard to this issue. They are whom, by arguing ethical-environmental reasons, that have changed not only their feeding habits, but they have also developed, in many cases, a tendency to purchase animal origin products, which productive process convey a high level of respect and good treatment to animals. Consumers' preferences for animal origin products, with high welfare standards, led commercial agents of food and agriculture chain, to supply said demand with the incorporation of productive, commercial and marketing techniques, in accordance with these new trends. Consumers' adoption of these concepts makes us think that we are in the presence of a new valuation attribute, which substantively affects their purchase decision.

Within the context of this Seminar, this presentation is related to animal welfare from the ethical-environmentalist perspective; we make a special point in the way consumers decide their purchase option for products differentiated under the animal welfare denomination.

[1] This text was extended after the Seminar by the autor.

2. Conceptualization of animal welfare

Public discussion on the issue of animal welfare started in the 60's. The classic book of Ruth Harrison, The Animal Machines, shows the serious problem suffered by animals inside breeding systems. The interesting point of this publication is the way the English author calls the attention of people to make a deep change in their behaviour and, at the same time, arouses the importance of having an open discussion to find the way to improve this situation. Afterwards, in the second middle of the 60's, the Brambell Committee is established in England, setting minimum standards for animal treatment. Both milestones, Harrison's book and Brambell Committee, are very important and conclusive contributions in the scope of animal welfare, and constituted a base of consultation and analysis during subsequent decades.

The concept of "Animal Welfare" has three dimensions, according to Duncan and Fraser (1997). The first one is feeling-based, in which the concept is defined in the context of subjective experiences of animals such as, for example, the emotions and feelings. This dimension is expressed by the decrease of negative feelings (suffering and pain), as well as for the promotion of positive emotions. Study methods that sustain this first dimension are located in the scope of estimations of animals' references, as well as in the search for physiological indicators. The second dimension is described as the functioning-based dimension; in it, animal welfare is analysed under the aspect of biological metabolism. Thus, indicators such as health, age, reproduction and physiological perturbations can be assessed through improved methods. The third dimension of the concept states that animal welfare increases when the characteristics of natural life conditions under which animals are living, are maintained. To this respect, naturalists indicate that only under these conditions the genetic resource can be plainly expressed and, with them, maximum welfare would be reached. This argumentation is known as animal performs.

There is not a sole definition to conceptualise the meaning of animal welfare. The interpretation depends, finally, of the author and the environmental ethical conception of the same. Thus, Hughes (1976) proposes the following definition: "A state of complete mental and physical health, where the animal is in harmony with its environment". The author coincides with the opinion of Hurnik *et al*., (1995), whom express that "an optimum environment is the one that provides the most appropriate combinations of factors that make it possible to maintain normal biological functions". The thesis of these authors underlines the importance of psychic welfare of animals, which is reached when there is a harmonic relation between them and their environment (Fraser 1995).

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3. Animal welfare and consumers' perception

An important number of consumers are today willing to pay a higher price for those livestock products produced under alternative methods, even though this purchase means a higher expenditure, in comparison with the same product processed under traditional production conditions. On the other hand, alternative commercialisation forms make it possible to reach better prices for products; we have, for instance, the case of those special programs in the meats markets that are presented under the denomination of "respect for animal welfare" or "environmental care". Different studies, as the ones we will analyse below, point out this trend to consume products categorised under the mention of animal welfare.

In general, the demand for meat products is influenced not only by consumers' income or by the prices of the products, but also by other conditionings that affect the change in the demand; these are commonly called, structural changes or changes of preferences. Under this concept, it is understood that factors such as an increasing environmental conscious taking concept and changes in the demand for quality, in the consumers' tastes and in their preferences, as a consequence of advertising or else, as a consequence of determined regional and zone patterns (Giltsch, 1999). To this respect, environmental conscious taking is a valuable and important factor at the moment of studying the consumers' behaviour when deciding to buy a product. The environmental conscious is understood as a feeling, a valuation, and knowledge or, also as a disposition or trend (Brandt *et al*., 1988).

To this respect, Meffert and Kichgeorg (1992) make differences among three dimensions in the position of a consumer with a more developed environmental conscious. First, the cognitive dimension, that joins (links) the subjective knowledge of the consumer with the ecological consequence of his behaviour; second the affective dimension, that joins (links) feelings, believes and opinions of the individual with ecologic aspects, their problems and controversies, and finally, the behavioural dimension, that joins (links) individual behaviour intention with the solution of the ecological problems associated to a demanded product.

At the beginning of the seventies, a gradual change started to be perceived in the behaviour of the European and American citizens, manifested by the progressive consumption of ecological or alternative animal origin products. The reason of this change has its origin in two aspects: on one hand, the search for new products that do not damage health and on the other, the transformation of consumers' behaviour protesting for the ill treatment to which animals are submitted during productive processes. (Verbeke and Viaene, 2000).

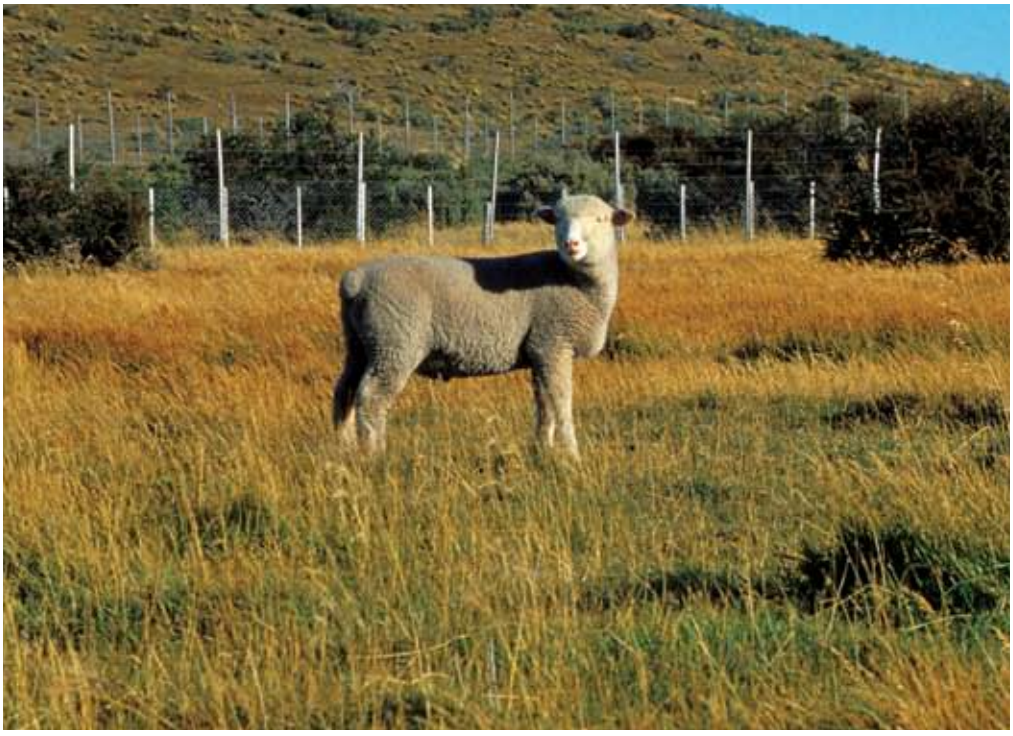
Throughout the years, the consumption of alternative meat origin products has increased, especially in developed countries. As an example, we can mention England, Germany and Switzerland, countries where there has been an important increase in the demand of these products during the last 20 years. Meat producers of these three countries, state that consumers perceive ecological production methods (alternative methods) as positive, reason why they choose these products. Likewise, they express their convincement that the ecological meat markets are presented as an interesting commercialisation option. To this regard, it is observed a permanent increase of demand for meat products produced under systems respectful with the environment and under conditions of animal welfare. (Eastwood, 1995).

The opinion of the specialists is that animal welfare is one of the most important reasons for the increase of such demands. As indicated by a study carried out in France in the year 1998, more than 80% of the polled people were willing to pay more for animal origin products processed

under animal welfare conditions (Latuoche, 1999). We have to point out that the author used the Contingent Valuation Method as a methodological tool for the inquiry referring to the willingness to pay (WTP). Similar results are presented in the study carried out in Germany, which analysed the demand of consumers from six European countries, for meat products produced under confinement conditions, according to the adequate animal welfare standards. The author could prove that, more than 90% of polled consumers were willing to buy products originated under this type of production system. (Glitsch, 1999).

Similar tendencies have been proved in a study of valuation contingency developed in the United States during the year 1995. According to Bennett and Larson (1996), an increasing interest is observed in consumers for animal welfare, which is expressed in the increase of the willingness of persons to pay for animal origin products which production methods are amicable with the environment. The results of this study show that there is a positive correlation between higher dispositions of the consumers to pay for a change of production methods, from traditional ones to those specially designed under strict animal welfare standards. Thus, the price of a dozen of eggs produced extensively was 18% higher than a dozen of eggs produced under intensive breeding conditions. The percentage tendency observed here coincide with the results obtained by Hughes (1995), who pointed out that consumer's WTP increases in products originated under non traditional methods.

The demand for environmentally sustainable agricultural and livestock products, together with the corresponding legal modifications, has permitted the introduction of new techniques and methods in animal breeding. In the same way, the creation of alternative markets for livestock products has made it possible to develop new quality products, thus incentive livestock production with high standards of animal welfare. A clear sign of this trend is the increase of extensive pig breeding in England, that is, the animals are no longer confined, and they are bred in wide and



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comfortable spaces, under environmental conditions similar to their natural conditions. The number of companies has been duplicated during the last 10 years, reaching near 20% of pig premises under this breeding system. Similar behaviour has been seen in the English poultry industry, which production of eggs from non stabled laying hens has increased from 6 to 11% since 1991 to 1994 (Whitemore, 1995).

In the case of Denmark, it is estimated that in the year 1998, 15% of the pig cattle existences were under breeding systems associated to high levels of animal welfare. As a result of the remarks of Danish consumers, special production systems have been created, basing the quality of the final product in the use of methods amicable with animal welfare and in the adequate management of marketing.

In a study carried out in England in the year 1994, consumers' perception was analysed in relation to the demand for laying hens fresh eggs. The production of eggs under two different confinement systems was compared (free and caged). The aim of the study was to discover the criteria behind the purchase decision process of consumers. The results showed that laying date, price and breeding method were the most important criteria required at the moment to take their purchase decision. When inquired about the most significant reasons to buy a special type of eggs, 37% of polled persons declared that animal welfare of laying birds were the main purchase reason (Fearne, 1996).

Analysed studies permit to observe a clear consumers' trend to pay more for meat products and by-products of animals which origin were breeding systems with high animal welfare standards.

4. Economical valuation of consumers' perception in front of "animal welfare" attribute of differentiation

The question is recurrent: how can money value be determined or how can we quantify valuations associated to changes in the welfare of individuals, in function to the attributes of differentiation? To face this unknown answer, the economical analysis has developed some methodologies oriented to find out which are these attributes and valuations, and how to quantify them.

In the case of feeding products, two methods have been regularly used to give an answer to this question. The first one, called Contingent Valuation, is based on the valuation made by the consumer of an item in front of a change in the original state of the valuated goods. The theoretical principle of this method is simple: individual preferences for the goods are changed into currency valuation measures asking directly to consumers their willingness to play in front of a change in the quality of determined goods. Through this process, and with the help of written, verbal or visual information, this situation is moved to a hypothetical market. In a figured sense, the offer comes represented by the interviewer and the demand by the polled consumer, transforming the questionnaire in the hypothetical market (Villalobos, 2001). The fact that the valuation obtained depends finally on the opinion expressed by the person, from the information received, is the explanation of the name given to this method.

The second method, called Selection Experiments (*e. g.* set analysis), the persons select an option in function of a combination of attributes already analysed. For example; the price of the goods: (with or without the condition of product animal welfare), the quality of the product: (with or

without inspection seal), or else, types of containers: (size and condition of the container). In this case, it is possible to decompose the goods in function of a set of attributes.

As part of the research developed by the Department of Agrarian Economist of the University of Talca, carried out in the year 2003, a consumers' perception study was carried out in the Metropolitan Region, applying contingent valuation method. The main objectives were:

- To find out about consumers' willingness to pay (WTP) for animal origin products produced under animal welfare conditions.
- To determine the most significant variables in the WTP.
- To analyse environmental conscious-taking of polled persons
- To analyse the possibility to apply this type of methodology to consumers.

This study was carried out in two communes of the Metropolitan Region: San Pedro and Isla de Maipo, both characterised for their rural and semi-urban condition, respectively. The first one is located 110 km far from Santiago and the second one is 40 Km far from Santiago. We have to point out that, in both communes, almost a third of national pig breeding is concentrated. Personal interviews were made, following recommended methodology by the NOAA panel of experts (Arrow, *et al*., 1993). The poll was applied to a random sample of 382 persons: 150 from San Pedro and 232 from Isla de Maipo. The rate of answers was 100% and 60% of persons interviewed were women. The ages of 42% of the sample were from 33 to 47 years of age; about 65% of interviewed had completed their primary education and almost 60% had incomes of less than 350 dollars per month.

For the analysis of consumers' behaviour in front of the concept of animal welfare and willingness to pay (WTP) for meat products " ecologically produced", two main aspects were considered as decision factors at the moment of designing the hypothetical scenery: the level of confinement of animals during breeding process and the level of legislation in front of animal treatment. The scenario settled the difference between both productive systems, one of the "traditional" types with livestock practices that did not consider specific animal welfare conditions, and the other the so called "alternative or ecologic", in which it was considered practices in accordance with worldwide established standards of the International Organization for Foot and Mouth Diseases. As the study was carried out in a zone of high concentration of pig breeding plants, it was considered necessary to circumscribe the scenario to meat products of this specie. With this purpose, the persons that were interviewed were asked about their WTP per one kilogram of pork meat produced "under animal welfare standards", compared with a kilogram of meat produced under "traditional conditions". The price offered was higher than $250 for a cut of pork loin with the denomination of animal welfare in its process.

The main descriptive results are described as follows:

- When comparing both production methods (traditional and ecologic), most of interviewed persons (65%) expressed their concern on the treatment received by animals under the conventional method.

- In the case of this group, there is a positive correlation between the educational and ethical-environmentalist variables of polled persons. This correlation is negative when it is analysed from the age point of view. That is, the concern for animal welfare is higher when the persons have a better educational level and less as their ages increase.

- 20% of interviewed expressed a positive disposition to pay more for 1 kilogram of meat produced under animal welfare conditions.

- 12% of interviewed showed a positive disposition to pay; nevertheless, budgetary reasons impede them to materialise such payment. If this group had the possibility to pay the cost, the addition of both percentages would rise to 84%.

- The 16% of the rest of the group indicated that by no means would they pay more.

On the other hand, the result of the regression analysis carried out, gave a coefficient (R^2), being its R^2, adjusted to 26%. Both valuations comparatively represent a high result, in relation to other researches. To this respect, Green and Tunsdall (1991), settle that valuations over 20% are considered as significant results for contingent valuation. On the other hand, Mitchel and Carson (1989) say that the minimum valuation for R^2, should not be less than a 15%. Valuations obtained from R^2, permit to conclude that independent variables that were considered in this model clarify WTP variation. The result of this analysis is represented in table 1.

Table 1
Result of the estimation OLS for the Sample (N=382) with WTA as an endogen variable

Variable	Coefficient	Error-St.	t-Stad.	Prob.
Constant	-0.372	0.452	(-0.75)	0.411
Income	0.301*	0.041	(10.7)	0.000
Age	-0.011*	0.005	(-2.32)	0.016
Education	1.795*	0.387	(4.11)	0.000
Level of Information	0.302*	0.435	(4.05)	(5.02)
Environmental Awareness	0.450*	0.437	(5.10)	0.001
Education^2	- 0.544*	0.103	(-4.90)	0.000

R^2	0.270	Dependent medium variable	1,262
R^2 adjusted	0.262	S.D. dependent variable	1,382
Regression S.E.	1.187	F-statistics	34,874
Sum of the Residual Squares	531,249	Prob. (F-statistics)	0.000

Source: Author's calculation

The interpretation of the regression coefficients permit to conclude that: as it was expected, the positive sign of regressor "Income" confirms that interviewed persons with a higher level of income have a higher WTP. On the other hand, Education regressor follows a trend, that is, the higher the level of education is, the higher their WTP is too. Nevertheless, as we can see through Education^2 regressor, interviewed persons with higher level of education give proportionally less money than those interviewed with a lower level of formal education. The sign of the Education^2 regressor permits to appreciate this trend, confirming the principle of this decreasing marginal rate. In relation to the age variable, and according to the sign of the regressor, we can appreciate that older people have a minor WTP. If we observe this trend, it cannot be explained by itself nor can it be associated to the socio-economical or cultural context, constituting a "proxy" type of indictor for determined circumstances as, for example, the way in which the different ageing groups were educated on environmental and animal protection aspects.

The environmental conscious-taking variables of the interviewed persons and the level of information supplied for decision taking have positive signs. This show that, the level of sensibility as well as the quality of the information they were provided with, plays an important role when facing the decision of paying more for an ecological product that has been offered. The results are promising in the sense that, under the model conditions, benefit function is significant to the average one.

5. Conclusions

- The results of this study, as well as those observed in analysed literature, permit to conclude that the ethic-environmental implications of the consumers is an important decision factor at the moment of deciding to buy a product.

- Consumers' trends are directed to reward all the efforts that the food and agriculture chain makes in virtue of improving the confinement conditions and animal treatment.

- Animal welfare is not only a technological problem, but also a moral one. Consumers' sensitivity in front of this issue makes us study, in a scientific way, the technical and economical implications of productive transformation that should be developed in the medium range.

- Contingent Valuation Method has permitted an effective determination of consumers' WTP when facing new production methods that involve an improvement of confinement conditions and animal treatment.

- This multivariate model permits to infer that independent variables such as age, income, education, environmental conscious-taking and the level of information describe the WTP of interviewed persons.

- The increasing concern of developed countries, in matters of legislation in favour of animal protection, added to the different cooperation agreements subscribed by our country; permit us the forecast that Chile, will be faced, in the medium range, to a demand by its commercial partners. This oblige us to act with corresponding anticipation, defining technical standards to promote a technological change at livestock production chain level, making these changes compatible with the economic implications that said transformations will carry out.

- It is necessary to continue studying very thoroughly all changes produced in the consumers' habit of national population. These results will permit to detect the need to look for new alternatives of commercialisation for those emergent market niches. The incorporation of Chile as a commercial partner of the most important mega markets of the world, offer us, as a country, new opportunities, but at the same time new challenges from the commercial-technical point of view.

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Ethical Attributes of Animal Welfare: Consumer's Perspective

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The World Society for the Protection of Animals, WSPA,[1] is an organization with more than 500 members of 126 countries; it is a consulting organization for the United Nations in cases of disasters and also for the World Health Organization, WHO, in the case of zoonotic and vectors control. In this context, the year 2003 a number of contracts were formalised with the WHO to carry out TV publicity throughout Latin America, relative to management of vectors in domestic animals populations, as rabies, among others.

On October 2004, there was a contribution to doctors and veterinary doctors of all the islands that were affected by hurricane season. Nevertheless, one of the biggest campaigns that the WSPA carries out is farm animals' welfare.

Following I will let you know the works carried out by the Society during 2004 in Latin America, as well as inform on the consumers' perceptions with respect to animal welfare in this continent.

Four or five years ago, a document with concepts on animal welfare started to be drawn up; this document was translated into Portuguese, English and into Spanish.

20 years ago, we were in the middle of a deaf dialogue, trying to win the impossible battle without including the veterinary community. Thus, a curriculum was planned for veterinary medicine students, giving information to the students on new trends, laws and techniques, as well as on philosophy and the route taken by the world. This is applied, in some 24 faculties of veterinary medicine in Latin America and in the future some 50 more will join in Mexico and 12 in Brazil. The issues to be treated have a specific chapter for farm animal, even though; they include all issues related to animal welfare.

[1] www.wspa-international.org

Then, the Society was in charge of the reports of the situation of the different countries that were considered important or emblematic for the production and possible exportation based on farm animals. Participant countries were Brazil, Mexico, Argentine, Colombia and Costa Rica; this latter, with the purpose of having a comparative data of minor countries. Some time was required to understand all levels, characteristics and production possibilities.

It was known the initiatives developed by CATIE, that is an institute formed by Kellog Foundation, consisting in cages for chickens made of bamboo, that are systematically moved from one place to another in the field, so chicken can feed with grass.

Another initiative carried out was the invitation to representatives of countries such as Japan, South Africa, India and Argentine and, we hope countries like Brazil and Chile can be added to this list, to form a team work that will gather in Brussels on the year 2005, to try to approach two divergent positions regarding non-tariff measures, because these are considered as the most pernicious situation or as a great opportunity. This group is trying to find ways to use them as opportunities, through learning from the European Union, while it continuous trying to find out which are the means of their respective countries.

In Argentine a strategy was developed to get information. This defined that consumers' sector, in spite of being more numerous, was going to be out of the study possibilities; so this was focused to the service of animal health, and in special, in the commercial sector and in the supermarket chains. Based on a country study requested before, works began to implement the legislation that raises the minimum standards of animal welfare in all farm animals breeding of the country, apart from providing the mechanisms of higher standards for those that want to accede to other markets. Another work is being proposed for the chains of supermarkets to raise the offer of these products to consumers; finally, a small survey was carried out to medium-high class consumers to prove and sustain our positions about supermarkets chains.

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In another scope, it has been observed that there is a certain fear that some stockbreeders call themselves "organic" "pasturing" or "animal welfare", among others. This would complicate even more the consumers' perception with respect to these issues. For the case of Mexico, Ecuador and Costa Rica, this is a matter that is closely related to economical social classes: obviously, low social class are going to continue eating the cheapest meat they find: Nevertheless, in practice, the idea of healthy eating is the most important for an important segment of population, more than the idea of animal welfare or of ethical considerations, which directly depends on their economical capacity and also, on the information available on this subject.

Obviously, Latin America is not in position of comparing to Europe in terms of currency levels, although some studies show that financing solvency is becoming strong in many countries of the continent, which makes us think that there is a tendency to look for better quality foods.

Two terms have been used in this meeting. One is "brand" and the other is "certifications". With respect to the first one, a company of supermarkets can invest enough money to create their own brand, saying that this is amicable with the environment and with animals, among others. Thus, they can achieve changes in the perception they have of their clients for the products they offer. On the contrary, the certification is recommended to avoid the differences and confusions in information.

Lack of information harmony is the most dangerous thing that can occur in this moment and is the most concerning problem for the future development of this market.

Recently, a survey was made in Buenos Aires which preliminary results indicate that 90% of people understand or believe they understand and know the needs of cattle breeding methods and a 70% do not know poultry needs. An interesting aspect is that 70% of pet's owners are the persons that know most about these issues.

With respect to the knowledge of pasturing, animal welfare and organic concepts, disinformation and confusion were remarkable; on the other hand, there was no relation made with the concept of animal ill-treatment and farm animal welfare. Nevertheless, seal, whales and other species were mentioned, species that Argentines are not commonly related with, thus reflecting the information given by conservationist's organizations throughout the years in that country.

As matters of interest, in contraposition of aforementioned concepts, people also mentioned issues of transportation and slaughtering.

In short, the WSPA is looking for the best existing systems, where they can work together with society to carry them out; besides, it is considered as fundamental, the existence of a higher conscience-raising of these issues in consumers, so all initiatives that present this orientation are supported. It also contributes with domestic market development, because animal welfare should not only be promoted for exportation reasons.

On November 2004, and due to all these developments, the Governor of La Pampa province in Argentina, offered to change, yearly, 180 cattle heads to high standards methods of animal welfare. Then, there is a very interesting possibility for countries, in spite of the latest decisions made by the MERCOSUR, to stop for a couple of years all negotiations, including the discussion on these issues, in the sense of advancing to be prepared when the subject begins to be discussed again.

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In November 2004, the Director of WSPA campaigns was in Colombia, participating in an activity for the preparation of launching, in an international forum in Mexico, of the study "Intensive Breeding of Farm Animals: The Next Health World Crisis?" This document is directed to officers of the health system of the different governments, more than to the general public. The basic motivation is to inform health departments about the implications in people's health, the consumption of farm animals that use antibiotics, among others, together with the generation of residues that pollute the environment.

This publication includes antecedents about the industrial environment, of the factors that have to do with this activity, of the food systems and diseases produced by these, their resistance to antibiotics, and the chemical elements included in food, apart from different studies of cases carried out in Japan and Brazil.

The Head of Virology of Holland Public Health Ministry, pointed out that this study is a god starting point to discuss about this subject, and this is precisely what is being done, when it gets to the different health departments of Latin American countries. We can say that, 22% of farm animal breeding of the world is in Latin America, without including exportation that is expected to be carried out, especially from Brazil.

For the year 2005, the WSPA hopes to extend the group that is going to meet in Brussels and, in general, to increase the participation of Brazil in the different activities developed by this Society. Work with Argentine and Mexico continue going on and it is expected to find the opportunities to carry out joint works with Chile.

Ethical Attributes of Animal Welfare: Consumer's Perspective

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The European Group of Animal Welfare is located in Brussels, because the European Union is a federation of countries and its headquarters are in Brussels, where they lobby the European Community. The European Group is one of the organizations that have pushed many of the changes that have been happening together with all their allies to lead this organization to the point where now animal welfare has become an issue on regulations.

The original idea of this presentation was to show a portrait of what European consumers area about; nevertheless, when I started to write this I realised that it was quite an impossible thing to do, as well as to try to describe how consumers of the American continent are. This, because Europe is very varied, especially after the incorporation of ten new states to the Union in 2003.

The information presented here is based on a range of different surveys carried out in different countries and although the markets are always changing, I will try to describe them in order to understand them better how to access them. Three aspects will be described: the concern of consumers and the thought behind them; its effect in the markets and finally how said concerns really are reflected in the markets, how do they work, which are the real facts that are being producing. Is Europe really a market where animal welfare is working out?

In the last twenty years in Europe an increasing interest has been observed for a clean and wholesome living, as it would if living in the countryside: Although in many parts of the world the countryside seems to be a place where services are obtained, where people get older faster and, if the income increase, they prefer to migrate to the city. In Europe the opposite is true; people want to obtain necessary resources to leave the city to a more wholesome like lifestyle because they work under stress and they have to work longer hours and people feel they are removed from their natural world. Within this concept animal welfare finds a favourable place and is supported by an increasing number of environmental organizations.

Another relevant aspect has to do with the quality of food and the concern for life, and health; although this last aspect has been poorly handled and public feel that diseases such as Bovine Spongiform Encephalopathy and avian influenza, among others, as well as dioxins contaminations constitute a threat for health in general.

There is also the perception among consumers, the lack of transparency by the governments and their conclusion is that they need to take control of the situation and so they need to know more of what they are eating; in this context, animal welfare is also a subject that has an important place and that is valuated by consumers.

A third aspect refers to what is called the diseases of modern life: as that of the heart, and cancer, that are affecting a lot of Europeans and that are multifactorial, which origin in a great extend is based on a stressful lifestyle and the consumption of inadequate food and not at all safe.

In this sense, each time more people have left the consumption of red meat and of unwholesome foods and they prefer to buy friendly animal welfare products. This is an alternative that is currently occurring and that has a great influence in the markets.

Although the aspects already mentioned are not fundamentally related to animal welfare, surveys indicate that this is an indicator of the type of food, because consumers expect that a friendly animal welfare product would also be a wholesome product; that is, a product that permits to have a control of life quality, and that is also a help to reach a healthier style of life.

Independent of the scientific opinion on this matter, these are options of consumers that are defining the markets and their star products.

Surveys also reveal that, mainly in Scandinavian countries, Germany, the United Kingdom and Ireland, there is a great interest by animal welfare; specifically among 90% of French and Italians are concerned about this issue, although curiously a 76% of Italians,(who are very fond of veal meat) have never heard of veal crates or confinement areas for these, about which many people have animal welfare concerns. Then it seems that the concern for animal welfare is independent of the level of knowledge of the techniques used for animal breeding.

Another aspect that influences in the concern of consumers for animal welfare is their interest for pets, because they tend to think that domestic animals think and feel, situation they extrapolate from other types of animals.

On the other hand, education also influences in the perception of animal welfare; in general terms, the higher the level of education is, the higher is their concern on this issue, and this is stronger in women than in men.

Then, concern for farm animal welfare has to do with two aspects: human feeling in the sense of asking what can animals do for me? (Can they give me health, wholesome foods); as well as the concern for animal feelings, that can be considered an ethical approach to the issue, concerns that is visualised, mainly in the United Kingdom, Ireland, France and Germany. In other countries occurs all the contrary, thus implying that there are two different markets, although for an important segment of consumers animal welfare is an integral part of animal health.

In relation with the acceptance of production methods it has been observed that the most accepted by consumers are those related to milk and lambs production and the less accepted are those used with poultry and deer. In this sense, European consumers look to associate the product that are obtaining from Chile with a production with high standards of welfare; nevertheless, if they are only considering, for example, poultry and eggs production, the balance will not be favourable. But, I ask myself, if those positive images of "pet" cows inserted in open extensive pastures will be

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influencing in the perception of European consumers and if that is likely to increase the chance to sell poultry products to Europe. This suggests me that it actually does.

In order to try to know the preferences of consumers, we asked what is that people considers as the most important elements of the production systems that influence in the farm animal welfare: is it the possibility to be able to develop their natural behaviour? Are their slaughtering or transportation conditions?, is it its access to the outside or the space?, is it feeding?

Consumers think that, in current intensive breeding, animals are given good quality food and that this shows a concern for animal welfare. In Europe there are hundred of million of people that consider that their own feeding is an important issue, thus with reference to the market, in terms of animal welfare, food is also an important issue on this matter.

Another important aspect to be considered, is that it seems that there is not a big difference among Europeans and that the European language is only one: "Farm to Fork", Nevertheless, the language that has been used has been one for transportation and another for slaughtering, and that we have not focussed in other important aspects that occur in the farm, nor have we considered that European consumers require some type of assurance based in a wholesome and clean production, including foods.

Summarising, what I have tried to point out is a picture of concern that, on one side includes health and, on the other, the concern for ethical aspects; the quality of health in animal welfare is visualised as an indicator of this. It can also be observed a restriction in the divulgation of available information, including the scientific and technical knowledge; this should be directed to the consumers and it would be interested to know how they perceive these issues. Even though the fundamental issue is animal welfare, it is the consumer that defines how markets work and it is to them that we should give the answers, with or without reasons.

With respect to the market, I would very briefly like to point out that not all consumers are equal in all European countries. Probably, in general, they all eat a lot of eggs and drink lots of milk; but,

if we analyse the consumption of poultry, in Germany, they prefer pork meat, in Ireland they prefer chicken and in Ireland and France, they prefer lamb and beef. The biggest markets of deer meat are France and Italy. Then the main point in this is the variations in the consumer's preferences.

The National Food Centre, that is a Norwegian body, made an important research based on two main questions: how has consumption changed in the last few years?, are you eating more or you are eating less?, and if you have changed, have the consumers reduced their feeding due to animal welfare?

The two products on which a higher interest was shown correspond to beef meat and poultry; a 37% of surveyed people answered that they eat less beef and a 7% eat more, that implies that there is a 30% of people that is eating less during the last five years. The contrary happens with poultry meat: a 17% eat more poultry, which is very positive.

But, do these results have a relation with animal welfare? The main reasons of these changes are due of the impact in the human diet and, secondly, the interest for animal welfare and, also, for the quality.

People perceive, mainly in Occidental Europe, that their styles of life are not healthy and they are worried by the content of their food, specially when they eat in couples; when they have children their worry is higher and, specially they are worried by the organic and for the products that include animal welfare; another important factor, of course is, the higher cost of these type of products.

To this regard, it is concluded that animal welfare is an important factor in the reduction of red meat consumption, although not the most outstanding one; nevertheless, as indicated before, animal welfare is an indicator of foods quality and, thus, of human health, so animal welfare is represented in those two areas of the market.

Again, another question rises: if animal origin products consumption is reduced. Are these ethical concerns? The answer is, in general, no; the investigation indicated, there is no observation of a great concern for the treatment given to the animals, with exception of bovines, mainly with the form of transportation and especially in the time during which BSE had been detected. The general impression was that the beef industry was low.

As indicated, there are concerns related to health and quality, and others with the ethical aspects and with the constraint on the information; on the other hand, in the market, products with high standards of animal welfare are increasing little by little and of course, are decreasing those with low standards. Nevertheless, the concerns of ethical order are not the main motivations, they are an issue but not the prime one, in fact, when people see animal welfare as an indicator, health and quality issues fall into the ethical concerns. Notwithstanding the above, this is not reflected in the markets.

Then there are 5 barriers that seem to influence in the consideration of ethical order for animal welfare to be expressed in the market: the **information**, that is not enough; people does not know which is a product of quality with a high level of animal welfare and which is not; the **availability** of products: you may want to buy a farm chicken, but for that you have to go very far to buy it. The **influence** is an interesting barrier and the economist will say that if we are buying an animal welfare friendly chicken, then this puts pressure on the industry to change the way to make business and obtain better welfare standards. Nevertheless, the consumer does not consider this aspect and when he has to buy the chicken he does not want to pay extra euros because

he simply does not believe that it is going to make any difference in the industry. On the other hand, there is a **dissociation element**, which means that people does not want to think in issues related to animal welfare. Besides, the **cost** is another subject, not in the sense that it may be very expensive, but, due to our bargaining mentality that flourishes when we are at the till. To this respect, an environmental economist says that, If people is asked how much would they pay for maintaining equality of products, most would say "very little", because "it is my right to have products of equal conditions, I am not going to pay more for them"; but, if the question is all way round: how much would you like to be compensated for living in a city with polluted air?, then people , most of them would say "well, a lot of money, it is my air and I have rights". With respect to animal welfare, at large, is the same question with the same sense and people is always on a bargaining mood. Then when people get to the till, they are given the opportunity to pay extra money for obtaining products with higher standards of animal welfare, but we do not accept due to our bargaining mood.

So, these are the barriers that seem to stop the considerations of ethical order for animal welfare to be expressed in the market. In order of importance,, the main subjects were information and availability of product and the costs were surprisingly low down. In Europe, consumers are having problems to transform ethical commitment over animal welfare, in shelf products; that is a very common behaviour in consumers.

There are two aspects that I would like to comment very briefly and which actually go beyond the markets. One of those is farm assurance, where animals are raised under certain standards of animal welfare and the producer is certified as such, which is communicated to the consumer (labelling), so they can buy a product with those characteristics. The other aspect is the role of governments that face the situation, where consumers require that products with animal welfare quality reach the markets. It can be noted that assurance in producing centres can be a way to address these issues.

On the other hand, consumers are concerned by animal welfare, which is not being expressed in the market and, in that case, that is one of the failures of the markets; nevertheless, in production centres or in the farms they address this issue giving an adequate information through the use of a logo that indicates that the product has a high animal welfare standard. Thus, problems with little information have been faced; everything indicates that farm assurance certification is going to be expanded through out Europe and most of the organizations that certify the production establishments are now thinking how to apply these guarantees to importers from outside.

Other aspects studied consisted in asking: there is being a food scarce, some toxic poisoning elements were found in the meat: whom do you trust to give you good advice about this problem. Many persons answer that in the market, the government, the feeding industry, the consumer's organizations, the family, the scientifics, the agricultures, the supermarkets and the fruit industry; there are many actors involved. Nevertheless, consumers in Europe trust, mainly in themselves, in animal welfare organizations and in environmental organizations, then comes the agricultures, the scientifics and the governments, the supermarkets and the food industry.

Most european consumers think that the government should be concerned about animal welfare, because they do not trust the supermarkets, the industries and the processes. They want to pressure the government to do their jobs in an adequate form, technically and to ensure that animal welfare is being considered in the corresponding levels; as a result, it is reasonable to think that the consumer has an important quota of power, especially if it is considered that they are part of the voters of each country.

Thus, they are searching that the government give reliable information, to ensure the availability of polices relative to animal welfare, though, mainly, the great pressure are that consumers do not trust that markets will worry about this aspect. In short, consumers need governments to use their influence to make laws, to produce policies that ensure animal welfare and definitively, to have the confidence that these are designed to ensure that the products they buy are animal welfare friendly. Though the context of this are the markets, not only the markets will decide which are animal welfare standards of products that are to be imported, from example, from Chile, but also the pressure that exercise the government on the elaboration of quality production assurance schemes.

To this respect, and very briefly, business that are expected in Chile are visualised through those concerns which are based on health and quality concerns, which are effectively expressed in the markets, with the corresponding increasing protection of animal welfare. These significant ethical concerns are being integrated to the industries, through for example, the quality assurance production schemes, but they are also working through retailers and with transporters; the idea is that they start to strengthen said effect in the market, which would also occur through the democratic pressure of voters. That is, it is a pressure over the governmental policies to reinforce their power in the market; the effect of these policies have already been seen, and they will have to get stronger to have, in the following years, a stronger market and also an increase in the demand for products with high animal welfare standards and a decrease of the demand for those with low standards.

On the other hand, I would like to reaffirm two aspects: the fact that, in opinion of the scientifics as well as of the European producers, these mentioned issues are changing all the time and they will reinforce more, with important implications for Chile, so it is necessary to institutionalise the mechanisms to achieve continuous improvements.

The second is that the consumer is not necessarily well informed with respect to the technical details and what they are looking for is the commitment that product are elaborated considering animal welfare.

My recommendation to this respect is that it is required to make sure that animal welfare is part of the processes that lead to the final products, all of which should be reflected in their brands.

The Food we Eat: Connecting Animal Welfare, Food Quality and Consumer Satisfaction

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What I want to talk about today is, in a way, similar to what Dr. Peeling already mentioned, although I will look at it from the prospective point of view. So, "making connections" is , probably one of the most important things that we need to do; and there is a range of different connections of which Dr. Peeling talked about, about the market place and the complex that this can be. In short, what is going to make the market functions is to achieve the various connections through it, some of which I will indicate here.

In relation with the title of the presentation: It is required to take animal welfare together with food quality and consumer satisfaction, meaning to establish connections up and down the elements of the food chain; so as producers are aware of what consumers are wanting, also consumers preferences can be actually translated and connected back to producers, and that is an issue of problem that we have in that at present.

We can also connect animal welfare with economic and government policy formulation, because that is one of the key drivers, as we heard Dr. Peeling earlier, a key driver in terms of achieving animal welfare improvements.

We need to have connections between producers (that is, farmers) and the consumers and one of the problems with that, is that they are often via retailers, food processors and the food service sector, the catering sector, and these are not easy connections to create.

[1] Presenter.

We will start with an analytical framework of how welfare policies stand. We need, to relate welfare to economy and policy and we need to be able to find out what is the relation between them, in a true economic style, through a classic supply and demand type analysis in the sense that there is a demand for animal welfare that can be which can be measured as how it is valued, that is how is that animal welfare actually valued. In that context, animal welfare is the offer in this equation and it is required to determine what does it cost to provide animal welfare and try to do an analysis on this in order to see what the economic structure framework within which we are working can be.

Numerous surveys that have taken place both in Europe and in Chile, support the speculations with respect to the value attached to animal welfare; this is rising over time with rising incomes, food security, awareness and social values.

The concept of animal welfare varies widely according to the type and species of animals, so their perception differ whether they are companion, farm, vermin or wild animals among others.

It is also observed that in general animal welfare is not generally very price responsive, but it is income responsive, as Dr. Villalobos pointed in his presentation. Income responsiveness means that as people have increasing incomes, there is the willingness to pay extra for the animal welfare attributes in the food which at the same time increases purchases of these "welfare friendly" products.

Once they reach a point of making a decision and go for these products, they are not very price responsive; in other words, the actual price they pay for welfare friendliness is not a very important feature in terms of purchasing decisions, but more important in this increasing is this income level of increase.

Within the European Union we see an ever increasing levels of income and therefore an ever increasing ability in this choice to be purchaser of product on the bases of welfare.

So, how do we define and measure welfare? According to John Webster, welfare is the ability of an animal to sustain fitness and avoid suffering, which we might interpret as to stay fit and happy; on the other side, Don Broom, defines it subtly different, though very important: "It is the animal state as regards to its ability to cope with its environment".

This is a very qualitative definition, but very interesting that we should ponder on in terms of understanding the broad terms what animal welfare is. This is a great problem, especially when we are trying to compare welfare across different systems.

For example, in Europe people has developed the ability to select eggs according to labelling, to select stake from different production systems. Then how can we actually measure welfare quality between those systems?(*e. g*. free range vs. barn reared vs cages vs. enriched cage and others) how can we measure if capacity is not in the system?

Some persons, for instance would say that free range agrarian is a system where by 20% of the birds are severely compromised due to natural social behaviour, where the law of the strongest prevails, while caged eggs production is a system where by the 80% of the birds have moderately compromised welfare because their freedom care they have their normal behaviour compromised pattern is not available to them.

Finally, how do we take a decision to decide that we have chosen is best or worse? We tend to think that free range production eggs are a better welfare system. Nevertheless, we at the moment do not have quantitative analysis consistence to allow us to make that decision quite clearly. Thus we need and "index welfare" if resources use decisions and choice decisions is to be based on welfare. This is what government decides, they decide how to allocate resources, but we also need a welfare index to allow choice decisions by consumers to be taken.

As Dr. Gimpel indicated in his presentation, the level of perceived animal welfare can be graphed (axis y) *versus* the activity of livestock productivity (axis x); we are developing these ideas in the Council during the last 5 to 6 years and a fundamental support has been my co-author, John MacInerney.

In the described curve, we can observe a point that shows the "natural welfare that corresponds to animals that are in their natural environment; if they are domesticated, we will consider that we are increasing its welfare taking them to safe environments where they can live free from predators. So there is initially a rapid increase in the welfare curve, they it levels off until we reach a second point. That corresponds to certain equilibrium between welfare and livestock productivity. So as we make further attempts to increase livestock productivity at expense of welfare or a perception of animal welfare, the curve starts to descend and we reach a point which we might call minimum welfare.

We can also graph a curve that shows the boundary between what we might call "cruelty" (below that line) and the acceptable housing conditions (above that line). In other words, below the third point shown in the graph the animals are suffering frank cruelty, and for most of the legislative regulations that we have, that is the target that legislation moves on. Thus, as productivity attempts to push beyond that, we can see that there is a systematic collapse and animals under this cruel system will start to die, and therefore we rapidly see a loss in livestock productivity.

Unhopefully, there are many systems in which animals are experiencing this curve, developing curves as occurred between the second and third point already mentioned, because they are maximizing livestock productivity without having cruelty as such in animals.

As the curve increases welfare, livestock productivity is reduced, so it can be determined the cost for the increase of this and the cost to change from one welfare standard to another.

We can also determine a cost for each one of the activities that form part of the whole production process ("farm to fork") which produce a direct impact in the agricultural systems. Though these values are hypothetical, they are bases in solid economical analysis, which permits to set a price to the final product.

There are different elements that show the significant impact in the costs of livestock production, such as, for example the BSE (Bovine Spongiform Encephalopathy); thus different aspects are regulated as the banning to the use of hormones (for growth, for example); limits of transportation times have been defined in a maximum of 8 hours; banning of sow tethers and sow crates, an attempt to ban broiler systems and another attempt to ban battery cages, which is currently being implemented in the European Union.

In relation with the minimum standards of animal welfare, these are dictated by law. So, even when there exist animal welfare policies, it is required to visit production facilities, slaughter houses, examining transports, and processes, among others, to ensure that they are in force.

In the UK at present they are considering licensee for livestock keepers, whom should comply with these minimum legal standards or else they will lose their licenses.

On the other hand, consumers expect that animals are produced by systems that comply with adequate standards of animal welfare, more than for systems that comply with minimum demanded by law. Thus, we ask if animals are public goods and how deep should government involve setting these standards. In reality, for example, quality assurance schemes in production are established by dealers and they constitute the legal minimum standards that are working.

One of the most important changes that the United Kingdom is implemented, as part of the interest in quality assurance schemes is the transparency with which they were made. In the year 2002, the Council (FAWC) had published a report on these schemes in the farms and one of the major criticisms was that the standards used in the elaboration of these schemes were not transparent; then consumers that were purchasing according to these systems did not know which were the values used in them. This changed significantly in the last two years and I think that this is going to be widely applied, as it has been observed in the development of assurance schemes in the production centres in Europe.

This brings us to the next themes which is information and labelling and trying to ensure that there is adequate information associated with the way in which markets approaches are developed, in order to ensure consumers do know what is they are purchasing This is also related to consumers' education, for example, the concept that Chile could embark upon the target of brand name of Chile in it as a source of sound, reliable, trusted and products that comply with what people consider to be the appropriate standards.

In addition, there are incentives and sometimes disincentives that suggest producers or hint the people to achieve these appropriate standards, not high standards, and these are things like taxes and subsides; and in some cases these are consumers' subsides.

Consequently, the market should develop, in terms of advertising, in promoting special high standards in order to appeal to this specific sector of the consuming public that prefer to pay for those products, with high welfare standards, that show to be in that curve sector next to the second point, but we already saw. Nevertheless, there is a wide range of consumers that would purchase anywhere between C and B, that show lower welfare standards.

In this situation there is a very significant need for effective labelling that contain necessary information to help people in their purchasing decisions, obviously, it need to be reliable and it need to be well policed.

This bring us to FAWC philosophy that focused in advocating for the last 5 to 6 years, on attention on the farm level and through the slaughter issues. Nonetheless, in these last few years the Council has focused its attention much more towards "farm to fork", especially with respect to what happens after the animal slaughtering, because the impact of that backward into influencing to what has happened into pricing slaughter. These concerns carried through to the food products are transformed into a characteristic of the product. This is one inevitably logical conclusion of what we have been talking earlier.

Animal welfare is thus, the prominence of food and not just about farming practices; to this regard, during the last years there has been quite a fundamental change of view, so we now think about provenance of food we consume, considering from the practices carried out in the farm, to the transportation and subsequent processes.

On the other hand, if adequate animal welfare standards are only applied in the domestic agriculture of a country, this asymmetry will fail to meet social preferences. So, the inevitable conclusion that one reaches is that animal welfare standards relate to the food we eat, not just the food we produce, then this, obviously has implications for international trade polices and that is what we have been talking about in this meeting.

So, the different conditions related with the production have to been applied to not only domestic agriculture, but to overseas agriculture as well, and become an attribute of the food we eat no matter where the food comes from.

Then, what are we making for choices then? Evidently it is required to provide the necessary information on welfare, in order to allow consumers to satisfy their own preferences and to decide whether they want those appropriate standards or the high standards, in other words, there needs to be differentiations in the way in which that information is provided, because they offers the means by which they can express their preferences right the way back down the food chain, and that bring us back to the necessary connection that we talked about earlier. This connection needs to come back to domestic and overseas producers and that currently depends in a very important form upon retailers. As Dr. Peeling indicated, people trust at supermarkets and retailers is not at all high.

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Then what we need to do is to ensure that our connection does take place between consumers and producers, because it is the consumers' perception the support for those Chilean producers that are orienting their markets to European consumers. This connection permits to develop very profitable markets to welfare defined products, again whether they are appropriate or to whether they are higher in quality and if they are welfare defined then this is an important potential for higer profitable markets.

Complementary, how to develop specifically non ambiguous labelling related to animal welfare? This is a major question and secondly, how can third countries take advantage of opportunities? As indicated before, this opportunity was raised by the OIE and I believe that it is very significant, although they are also potential barriers created by the World Trade Organization (WTO).

On the other hand, Free trade is actually about consumers' choice, it is not about producers' protection, for unless producers are producing for what consumers want to choose to purchase. Then, it is a very short term strategy, and a lot of what we are hearing about WTO and General Agreement on Tariffs and Trade (GATT) is targeted at producers' production, it is much more important to consider a consumer choice and base our decision on said choice.

Within the WTO and GATT, we have two issues that are important to understand: SPS that is Sanitary and Phytosanitary regulations, that for example allow countries to reject imports on the basis of public health concerns or because of notifiable diseases that carry exporter countries, and the TBT, the technical barrier to trade; are the accepted barriers that are allowed within WTO.

Now, at present, animal welfare is not included in either of these as a mechanism of being able to control a trade and it is the consumer's choice is what really is the driver, and one of the things that WTO also does is that it does not permit mandatory labelling, but voluntary labelling, and this maybe acceptable, for example labelling of coding according to countries of origin.

So, my point of view is that we can work within these fundamental her of addressing consumer's choice rather than producer's protection with which to reach very profitable agreements for the countries, mainly lateral or multilateral agreements. In general, most lateral agreements are very hard to achieve and they take lengthy negotiations, and that's what the WTO is basically, it's an attempt to make multilateral agreements, So, I believe, that agreements that are going on or those that already were defined, for example between the European Union and Chile, are better options and would lead to great progress for both countries.

So, there are challenges that underline what I am putting forward here, as the promotion of animal welfare and definitively, research to design, improve and define the methods to be able to measure animal welfare. We need rigorous welfare assessment systems methodologies to permit the measurements of welfare indexes and then compare between different productions systems so that we can put definable and reliable quantification on those systems. We also need welfare research to find ways of improving these welfare productivity trades of, so we can improve animal welfare with no loss of productivity or we can increase productivity without compromising welfare.

These are clear targets and I think that the European Union and the Framework Assist Program is very gratifying that this program is specifically looking at trying to address this sort of issues which again can have major impact on the way that we can take on animal welfare.

An finally, I would like to acknowledge my colleagues at FAWC who contributes to the development of this philosophy over the last 5 to 6 years, which we called "Welfare Standards of the Food we Eat", and that have been applied quite strongly and also an special acknowledgement to my co-author of this paper professor John MacInerney, that is also a member of FAWC.

Conclusions

Future Lines of Action in the Issue of Animal Welfare in Chile Conclusions and Challenges

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In this seminar we have heard excellent presentations and planned objectives have been achieved. We have had the participation of national excellence and, the best specialists of our country have represented different sectors, as well as in the international scope, which has favoured an open discussion.

Nevertheless, I would like to focus in the Government work, through the Ministry of Agriculture and particularly through the SAG, because this is the institution that is developing the policy to back up the exporter's process of Chilean livestock products. Within this context, we are going to focus the future development of animal welfare.

Orientations to future works

Above all, we will follow the recommendations of the World Organization for Animal Health, OIE. We were on February this year in the global conference in Paris; we have a specific work plan for the Chile-European Union Agreement signed by them, in which we will concentrate the components that is promoting the OIE: terrestrial and maritime transportation, slaughtering and killing in sanitary emergencies.

Also, and this is a very clear decision, we will work with the different actors: with the scientific world, the private world, consumers and the rest of the public sector, because the SAG is not the only institution that is working in this line, the Ministry of Health is also working on it, as well as other research institutions. Although consumers are not yet well organised, we invited some organizations, because we are interested in their opinion; we have also to consider consumers of purchasing countries. We are an exporter country and we hope to be a great exporter of livestock products, thus, our concentration in consumers will not only be at domestic level.

With respect to international relations, understanding that we are working with other countries in the scope of cooperation, we are a country that is learning on this issue and we are open to form joint ventures with others and to learn from their experience. From our commercial partners, we have to understand which are their regulations, consumers' thoughts and that of the strategic partners. To this respect, we are working, for example, with the rest of the MERCOSUR countries, we are all exporters of livestock products and we have clear positions of what we require to discuss in order to generate a dialog with the South Cone and, if possible, with the rest of America.

Specific and concrete tasks

The first is the institutional coordination, that is, the Service has to have a sole position and all involved characters should be oriented to that only line of work.

In second term, we will create an external consulting scientific group, formed by the best specialists of the country, either from the universities or from private research entities that might, in a way, conceptually contribute to the regulations we define as an official sanitary service.

The third task is to develop a work agenda with the industrial world, to be structured and not sporadic; that is, to define a working plan in relation to the activities that we are going to carry out. Today, we have a work agenda with the industry in different items for sanitary, safety and opening of markets issues, and it will be expanded to animal welfare issue.

Other scopes of action

We will actively participate commenting the guidelines of the four components that have been worked by the OIE: terrestrial and maritime transportation, slaughtering and killing at sanitary emergencies. Dr. Gallo participated in the ad hoc commission that elaborated a draft that has been distributed, and in regard to it, as a country, we will make active comments and will establish the validity of our opinion, as regional that take our positions to the OIE, as well as organizations in itself. To this respect, I want to be emphatic. As a country we will promote OIE's orientations; nevertheless, we are against those orientations that are transformed into international regulations that hinder trading with other countries, in spite of the important influence of consumers toward the exporters. This is the position defended by Chile and the rest of the exporters' countries of the Americas.

Training of our personnel is a priority aspect, as declared by our friends of Teramo, Italy. So, we are highly interested in sign and agreement with them and with other entities that want to have an agreement with us, so the employees of the Service are trained in the scope of regulations as well as in the application of said regulations.

Another line of action that is also fundamental refers to continue supporting research that sustains a base line of the four aforementioned components. It is necessary to know, exactly, the situation of Chile with respect to these components, and also to have a wide internal discussion with scientific base about other matters that might not be included in the four components, as raw material production.

We also require to disseminate knowledge shown in this seminar by the publication in Spanish and in English and also electronically; this last will be located in the institutional website[1] thus facilitating the contact among the different specialists.

Finally, we hope to maintain an annual routine of seminars, as this one that is finishing now, in order to focus the actions of SAG with respect to the four above mentioned components, the recommendations of the OIE and the work with the European Union. We hope, also, to support other activities of institutions related to animal welfare with a scientific focusing, specifically animal welfare of pets and of animals of circus and Zoo, apart from the Law of Animal Protection, among others.

In the name of SAG, and the Direction of the institution, I give my thanks to all expositors that accompanied us, national as well as foreign ones; it has been a privilege to have you here. I would also want to thank to the organisers of the seminar, especially to Leopoldo Stuardo of the SAG and to Pablo Villalobos of the University of Talca, Chile.

[1] www.sag.gob.cl