NOTES

[1] Internationally known Foundation funded by sailor Ellen MacArthur and supported by industrial giants such as Google, H&M, Intesa Bank and the World Economic Forum

[2] Texts drawn up on the basis of the data available on the FAO website, livestock and environment section

[3] Susanna Bramante is an agronomist, scientific divulger and author and co-author of 11 scientific publications and numerous articles on human nutrition and its impact on health and the environment; in 2010 she obtained the title of Doctor Europaeus and Ph. Doctor in Animal Production, Health and Food Hygiene in Mediterranean Climate Countries. She runs GenBioAgroNutrition, "a blog supporting the Italian Agrifood, the Mediterranean Diet and Biomedical Research, against pseudo-scientific misinformation", which updates daily

[4] Sonesson U. et al., 2009

[5] European Commission, Guidelines for the use as feed of foods no longer intended for human consumption (www.eur-lex.europa.eu/legal-content/IT/TXT/?uri=CELEX:52018XC0416(01))

[6] The missing link - European Union action plan for the circular economy, COM (2015) 614 final, del 2.12.2015

[7] EPA, Sustainable Management of Food, Food Recovery Hierarchy (www.epa.gov/sustainable-management-food/food-recovery-hierarchy)

[8] Elferink E.V. et al., 2008

[9] Wilkinson J.M., 2011

[10] ISPRA, Rapporto 266/2017

[11] Global Feed LCA Institute (www.globalfeedlca.org/)

[12] Article 2 Directive 2001/18/CE of 12th March 2001

[13] GMO techniques use genetic engineering to modify genes through a process of transgenesis, i.e. the insertion of a foreign gene (the transgene) into the genome of a living organism

[14] World Health Organization, Food safety: 20 questions on genetically modified foods (www.who.int/foodsafety/areas_work/food-technology/faq-genetically-modified-food/en/)

[15] FAO, Weighing the OGM arguments: against, 2003 (www.fao.org/english/newsroom/focus/2003/gmo8.htm)

[16] Barilla Center for Food&Nutrition - BCFN (www.barillacfn.com)

[17] ISPRA, Report 231/2015

[18] IPCC 2013, characterisation factor for methane (Methane, land transformation: 28 kg CO_2eq/kg CH_4)

[19] IPCC 2006, IPCC Guidelines for National Greenhouse Gas Inventories, (10), paragraphs 10.4-10.5

[20] IPCC 2006, IPCC Guidelines for National Greenhouse Gas Inventories (10-11)

[21] Fabbri C. et al., 2014

[22] Primary data collected at the farms that bred adult cattle for COOP Italia in 2014. This data was used for the environmental product declarations, updated in 2015

[23] Official statistics on cattle and pig breeding (www.mangimiealimenti.it/articoli/1330-le-statistiche-ufficiali-sugli-allevamenti-di-bovini-e-suini)

[24] TKN = nitrogen Kjeldahl; total Kjeldahl nitrogen (TKN, Total Kjeldahl Nitrogen) is defined as the sum of ammoniacal nitrogen and organic nitrogen

[25] Average values referred to 1000 kg live weight of the animal; the real values can vary considerably due to differences in feeding, age of the animals and breeding management

[26] The operations chosen are as follows: Natural gas: Electricity, natural gas, at power plant / IT U; Hydroelectric: Electricity, hydropower, at power plant/IT U; Biogas-powered CHP: Electricity, biogas, at Mini CHP plant, energy allocation/CH U; Medium energy mix IT: Electricity, low voltage, at grid/IT (energy mix according to IEA OECD 2014 data)

[27] Council Directive 91/676/EEC of 12th December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources (www.eur-lex.europa.eu/legal-content/IT/TXT/?uri=CELEX:31991L0676)

[28] COOP, Environmental Product Declaration of the adult bovine brand COOP, Rev. 4 dated 05-12-2016 Registration No.: S-P-00495 - valid for 3 years

[29] Regulation (CE) n. Reg. 1774/2002

[30] Toldrà F. et al., 2012

[31] From Marino M., Pratesi C.A., 2015

[32] UNI EN ISO 14001: 2004 "Environmental management systems - Requirements and user guide"

[33] Holling C.S., 1973

[34] Definition provided by the Natural Capital Comitee, UK in 2013 (www.gov.uk/government/groups/natural-capital-committee)

[35] Water Stress Indicator (www.grida.no/resources/5586)

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[36] Further study of this calculation method is available in the Report: European Commission, Joint Research Centre, Institute for Environment and Sustainability. Characterization factors of the ILCD Recommended Life Cycle Impact Assessment methods. Database and Supporting Information. First edition. February 2012, pp. 15-16

[37-38] Frischknecht R. et al., 2008

[39] This is the calculation method ILCD 2011 Midpoint + V1.07, present in the SimaPro® software; the calculation factors, specific for each country, are reported under the heading water resource depletion.

[40] There are other similar methods amongst which it is also possible to quote the one proposed by Pfister et al. (2009) (Pfister S., Koehler A., Hellweg S., 2009) Assessing the Environmental Impact of Freshwater Consumption in LCA, Environmental Science & Technology (43) pp. 4098-4104) using a water scarcity indicator (WSI) for which a system of characterisation factors is used based on the relationship between consumption and water availability in different countries

[41] Water Footprint Network (www.waterfootprint.org)

[42] The WULCA group www.wulca-waterlca.org received the mandate from INPECT SETAC Life Cycle Initiative (Global orientation project on environmental impact assessment indicators of the life cycle) to guide harmonisation and the creation of common consensus for the category of "water use" impacts

[43] Texts and images are taken from the article "How to correctly calculate water consumption

of animal productions" by Giuseppe Pulina, Caterina Canalis and Alberto Stanislao Atzori published

in the Informatore Zootecnico, N.8-2018

[44] Atzori A.S. et al., 2016

[45] COOP, The Sustainability of COOP branded beef - The economic, social and environmental impacts of the meat supply chain, published in November 2013 and available on www.e-coop.it

[46] The data reported here is the average Carbon Footprint data of the two types of meat, including cooking. The reference documents are the two environmental product declarations published by COOP and available on the website (www.environdec.com). For further details, refer to the bibliography at the end of the chapter

[47] Environmental product declaration of frozen hamburgers under the Montana brand. Available on the website www.environdec.com

[48] Confidential LCA studies (source: LCE)

[49] The same impact was assumed for fresh and preserved fish

[50] By hypothesis, fresh legumes, canned and dried, have the same impact

[51] The BCFN source is the technical document supporting the Double Pyramid, 2015 version (BCFN, Double Pyramid 2015: recommendations for sustainable food) except in the case of vegetables, whose impact data derive from the technical document, 2014 (BCFN, Double Pyramid: food styles and environmental impact)

[52] Quantitative standards of portions taken from: SINU 2012. Italian Society of Human Nutrition.

LARN Levels of Reference Assumption of Nutrients and Energy for the Italian population

[53] Nutritional guidelines developed in 2003 by the INRAN working group (Created since June 2015 "CREA - Food and Nutrition", acronym of Council for research in agriculture and analysis of the agrarian economy - Research Centre for food and nutrition), from the Ministry of Health and the Institute of Food Science of the University "La Sapienza" of Rome, with the aim of developing a type of diet towards which the citizen should be directed, advising the appropriate changes. Specifically, the recommendation was considered related to 2,100 kcal every day

[54] Bach-Faig A. et al., 2011

[55] Online calculator that allows to evaluate the ecological footprint and overshoot day, in function of the resources consumed (www.footprintnetwork.org/it/index.php/gfn/page/personal_footprint/)

[56] WWF Online Calculator (www.racconta.repubblica.it/wwf-calcolatore-co/main.php)

[57] Impression Spending, COOP (www.e-coop.it/coopco2/)

[58] Rossi L. et al., 2018

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- United Nations Environment Programme: www.unep.org
- Water Footprint Network: www.waterfootprint.org

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FOOD SAFETY AND ANIMAL WELFARE

- THE CONTAMINATION RISK
- CONTROLS AND INFORMATION FOR CONSUMERS
- THE COMMUNITY FOOD ALERT SYSTEM
- ANIMAL WELFARE

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Introduction

MEAT AND CURED MEATS ARE COMPLETELY TRACEABLE, A GUARANTEE OF THEIR ORIGIN AND QUALITY

THE ITALIAN HEALTH CARE SYSTEM IS ONE OF THE MOST STRUCTURED IN THE WORLD, WITH 4,500 OFFICIAL VETERINARIANS INVOLVED

ANIMAL WELFARE IS IMPORTANT FOR ETHICAL REASONS, BUT ALSO TO ENSURE THE DEFENCE OF FOOD SECURITY AND IMPROVE MEAT QUALITY

The growing attention to the issues of food and its safety very often leads the media and social media to transform simple news into "food scandals". The reading of these news should always lead to a classification in different spheres: there are the aspects actually related to consumer safety, those concerning economic frauds (e.g. non-organic food sold as organic, but still safe) and those related to animal welfare. Furthermore, when we talk about security, we must distinguish between real or presumed aspects: indeed, very often the withdrawal of food products is done according to the precautionary principle because there is a suspicion that food is characterised by potentially dangerous contaminations. In these cases, it is advisable to avoid creating unjustified alarmism because the real danger is normally very low if not zero.

Italian consumers can rest assured: the quality and the food security, in Italy as well as throughout the European Union, do not represent only a regulatory cornerstone of the Union itself, but the real cornerstone of the community policy for consumer protection. In fact, the European strategy foresees the ***prevention of any risk for food safety along the entire production chain*** *and is based on the so-called "**One Health**" principle[1]: an integrated approach that* ***considers the links between animal health, health of products derived from them and human health to be indispensable****, to guarantee the latter a high level of life quality by protecting at the same time the health and welfare of the animals. The effectiveness of the controls is further strengthened by* ***traceability****, which allows to reconstruct and follow the path of a food from the consumer up to the primary agricultural production.* ***The Italian health care system is one of the most structured in the world****, recognised in Europe as a point of excellence thanks to the approximately* ***4,500 official veterinarians*** *involved in the numerous checks and analyses in the field of meat safety and quality. The issue of security is closely linked to that of* ***animal welfare****. . Maintaining a state of good psycho-physical health in animals is in fact an indispensable requirement to guarantee them adequate living conditions, but it is also a crucial element in guaranteeing the safety and quality of the food that derives from them. The evolution of public sensibility has meant that starting from the Eighties this theme was widely dealt with by the community and national legislation, that establishes minimum welfare conditions to be respected:* ***in many cases a violation of these rules is considered a criminal offense in Italy****. For this reason, it was decided to keep these two aspects, apparently unconnected, in the same chapter of this document.*

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1 THE CONTAMINATION **RISK**

When it comes to contamination, it is important to understand its origin. In general, the phenomena of contamination can be caused by the **use of drugs** in breeding or by **chemical and microbiological contaminations** that can occur in the production of feed, in breeding, in the transformation and distribution chain.

In the case of drugs, it is essential to divide between those banned and those admitted with a regulated use, also to eradicate some false clichés: the most frequent concerns, for example, the one concerning the use of growth hormones that have been banned for some time in all of the European territory. Amongst the regulated and widely discussed drugs are antibiotics that can be used, only after medical prescription, with precise usage amounts and for the sole purpose of treating sick animals. Their use must be limited in time; moreover, the animal cannot be slaughtered without having complied with the so-called "suspension period", which guarantees respect of maximum residue limits (MRL) in slaughtered meat, established by law.

The presence of chemical substances may derive from possible contamination during the food cultivation phase: for this reason, the European approach to food control is very useful which originates at the beginning of the supply chain and puts under observation every phase of the transformation. Any microbiological contamination, finally, may be due to poor management of the supply chain, distribution or, above all, domestic food preservation.

1.1 Antibiotic drugs

Antibiotics (from ancient Greek: anti, "against", and bios, "life") are molecules originating both from fungal and synthetic species that kill bacteria or inhibit their growth. They belong to the largest group of antimicrobial compounds, used to treat infections caused by microorganisms, including fungi and protozoa.
Since the Fifties of the last century, antibiotics have been a fundamental means for controlling infectious diseases in the veterinary sector, thus contributing to the improvement of animal welfare and product safety of animal origin foodstuffs.
The benefits of using antibiotics are also countless for human medicine: many bacterial infections that up to 50 years ago could kill a person, such as pneumonia, are no longer a danger.
However, when the use of these drugs is excessive or not very controlled, it can trigger a phenomena of drug resistance by bacteria.

The phenomenon of the antibiotic resistance

The development of resistance is in itself a normal evolutionary process, a consequence of the genetic evolution to which micro-organisms encounter: when we assist an improper use of antibiotics,

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however, the phenomenon of resistance accelerates due to the natural tendency of microorganisms to "defend themselves" from active ingredients contained in drugs. "Resistant" bacteria, even if they are harmless, can pass from one organism to another transmitting the resistance to a pathogenic organism of the new guest.
Since the Nineties, the phenomenon has always been more widespread, to the point that in the first Global Report on antimicrobial resistance, published by WHO in April 2014, antibiotic resistance is identified as a "**serious and potential threat to public health**". The development of strains of resistant bacteria makes it indeed difficult to treat an ever increasing range of fairly common infections easy to catch, with the result that also the most common and simple diseases to cure, become potentially a lot riskier for health. To reduce this danger, in 2006 the European Commission **forbade the use of antibiotics** in breeding for non-therapeutic purposes (i.e. as growth promoters)[2] and has published guidelines for their correct use[3].

EUROPEAN AWARENESS CAMPAIGNS

Various initiatives already taking place in Europe aim to spread messages on the risks related to an inappropriate use of antibiotics as well as to inform about the prudent use of antibiotics primarily for human therapies. Among these, the main ones are the "World Antibiotic Week" promoted by the WHO and the European Antibiotic Day of the European Union, but also national information campaigns developed by individual member states.

Some of these are:

- **AUSTRIA** NAP AMR: The Austrian National Action Plan on Antimicrobial Resistance
- **BELGIUM** Antibiotics: use them correctly and only when needed!
- **DENMARK** Antibiotics: yes or no?
- **FRANCE** National Antibiotics Information Day
- **GERMANY** RKI: Antibiotic resistance
- **IRELAND** Under the Weather
- **ITALY** - *AIFA* (Agenzia Italiana del Farmaco): campaign "Without rules antibiotics do not work"
  - *ISS* (Istituto Superiore di Sanità):Seventh Day of antibiotics: bacteria more resistant in Europe
- **ENGLAND** "Antibiotic Guardian" Public Health campaign England: toolkit and information material on antibiotics
- **HOLLAND** Antibiotic resistance

Not just food: the various areas of diffusion of antibiotic resistance.
Source: European Antibiotics Day

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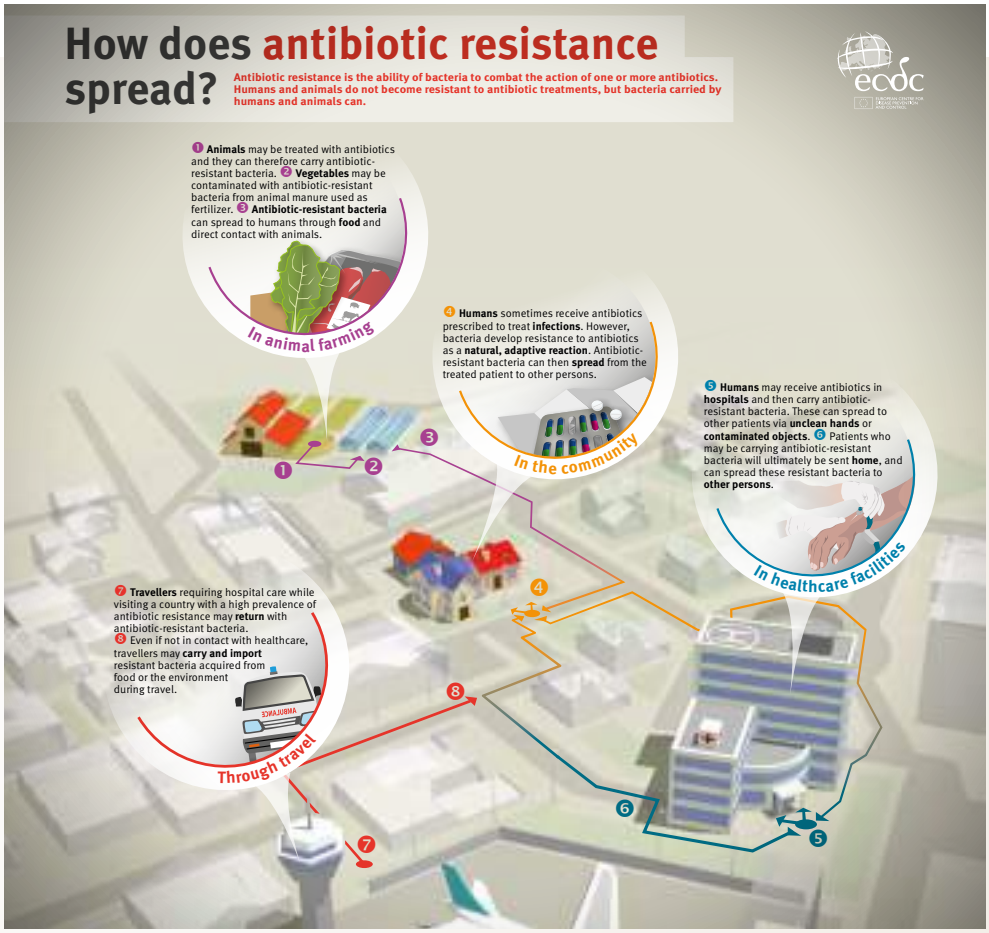
Premising that the use of veterinarian drugs is a prerequisite for animal welfare, their use must however be complementary to good barn management and adequate vaccination programs, which allow them to maintain a good state of animal health and minimise the conditions that favour the onset of diseases.

The theme of antibiotic-resistance is also at the centre of many **consumer information** campaigns on behalf of various governments and the WHO itself, as well as the object of targeted institutional strategies to promote adequate protocols of antimicrobial drug use.

How many are used

At the moment there are no sources that give precise indications on the quantity of antibiotics administered every year in Europe. To do a preliminary analysis we can however resort to the data provided by the ESVAC project (European Surveil-



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lance on Veterinary Antimicrobial Consumption), started in April 2010, with the aim of finding information from all over the European Union on the sale of antimicrobial drugs for animals.

In the Report are collected data related to the sale of antibiotics, the formulations of pharmaceutical products and medicated feed used in animal husbandry collected in 26 countries, including about 95% of the population of animals destined for food-production in the EU/EEA area. Before going into the analysis, however, it is opportune to make two premises. **The first is that the quantities of active ingredients sold do not match precisely the quantities actually administered to animals**. The second concerns the management of drugs: while in Italy and in Spain the veterinarians who prescribe the drugs are not authorised to sell them, in other European countries this practice is allowed, but the vets are held responsible for excessive use and, if they do not properly inform the breeder, suffer penalties up to the revocation of the possibility of sale (this is the practice foreseen in the Netherlands, Denmark, United Kingdom, to give some examples).

In order to make data comparable between different member States, the values for amount of antimicrobials sold were normalised by a specific species index called PCU (Population Correction

Map of the total sales of all antimicrobials for food-producing animals, mg/Pcu, for 26 countries in 2015.

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Unit)[4]. The latest report presents data on sales in 2015, and includes a chapter on the changes in the use of drugs that occurred between 2010 and 2015. In 2015, there were sold as a whole 8.361 t of antimicrobial active ingredients for veterinary use in the 30 countries in question, generally showing a sales decline of about 5% compared to 2010.

Analysing the proportion between the antibiotics sold and the weight of national livestock assets (mg drug/PCU), one notices that the highest sales are recorded in Cyprus, followed by Spain and Italy. Our country, although appearing among the first member States for the sale of antibiotics, is the one in which the greatest reduction is recorded (equal to -24%) between 2010 and 2015, passing from 427 to 322 mg/PCU. This reduction in sales is the result of continuous information and awareness raising activities carried out by the health authorities and by producer representative associations to incentivise a responsible use of veterinary drugs. There are still technical difficulties in the comparison of data between countries, as the respective databases are still not aligned. An activity of standardisation is underway that should make comparison more reliable over the next few years, based on standard indicators.

How to reduce risks

The descriptions of practices and dangers are useful to understand what the correct methods for risk reduction are: the cardinal principle for the use of antibiotics, especially in human therapies, can be summarised *"**using as little as possible, only when and how much is necessary**"*[5].

The administration of antibiotics in animal husbandry, forbidden for preventive purposes, is always subject to veterinary prescription and, where possible, should be based on an antibiogram carried out on the bacteria isolated from the animal object of the therapy: this exam allows to check the sensitivity of bacteria to specific antibiotics, thus leading to the identification of a more adequate therapy. In addition to practices related to an adequate use of drugs on farms, the control of **maximum residue limits (MRL)**, is crucial, which constitutes the maximum concentration of active ingredients in food legally acceptable **not to put human health at risk**. To ensure compliance with the MRLs, the law establishes **a period of suspension** of drug administration before slaughter or placing foods such as milk, eggs and meat on the market. The control of the presence of antibiotic drug residues in food is entrusted to the National Residual Plan, which will be discussed in more detail in the paragraph on controls and information for consumers.

The Ministry of Health, which is responsible for monitoring, together with the Regions and the competent local health authorities, and supervising the administration of antibiotics to farm animals, has published **guidelines for the correct use of antimicrobial drugs**, in collaboration with the Italian Breeders Association (IBA), Federchimica, Assalzoo and the Italian National Federation Veterinary Order (INFVO).

The document introduces also the importance of **biosafety**, understood as all those devices useful to avoid the introduction of pathogen micro-organisms into farms (such as attention during the purchase of animals, respect of the rules of hygiene, control of supplies, etc.). The use of vaccination programs and the interaction between veterinarians and breeders are promoted, with the preparation of solid health programs and constant communication between the two parts.

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HOW ARE THE MAXIMUM RESIDUE LIMITS ESTABLISHED?

The definition of the maximum residue limits is the result of a process based on 4 successive stages:

1 *For each substance, the values of NOEL (No Observed Effect Level) are calculated through laboratory tests, the maximum quantity of a given active ingredient which does not give rise to biological effects when administered in the diet to laboratory animals sensitive to that substance.*

2 *Starting from the NOEL value the Acceptable Daily Intake (ADI), i.e. the amount of the substance that can be taken throughout the animal's life without the appearance of effects, is established.*

3 *On the basis of the ADI for animals, one calculates the ADI for humans, that is the amount of a substance that can be taken daily for life by a person without the appearance of any effects. The human ADI is obtained by dividing the animal ADI by a safety factor that varies from 100 to 100,000: in practice it is assumed that the man is at least 10 times more sensitive than the animal species on which the analysis was conducted, and that in the same human species sensitivity can vary up to 10 times.*

4 *Finally, on the basis of the human ADI and assuming that an individual eats for his whole life exclusively a particular food, the MRL is calculated for that specific substance in that particular food.*

EU GUIDELINES ON THE PRUDENT USE OF ANTIBIOTICS

In September 2015, the European Commission published a Communication relative to the Guidelines on the prudent use of antimicrobials in veterinary medicine. These guidelines, which are non-binding, are intended to define the principles for their prudent use in order to combat antibiotic resistance, indicating the measures that member States must consider when developing and implementing national strategies. To turn the guidelines into practice, the document was accompanied by a series of practical examples of their use in the various member States for the implementation of each ingredient.
The Commission highlights the fact that any use of antimicrobials (both in human and veterinary medicine) may result in the development of antibiotic resistance phenomena. The risk increases if antibiotics are

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used improperly, for example in a non-targeted way (collective preventive treatments or using on non-susceptible organisms), at doses below-therapeutic levels, repeatedly or for inadequate time periods.
The guidelines provide some general indications, and others more specific depending on the various animals. In general, the goal of a prudent administration is to reduce to a minimum the use of antimicrobials, delineating the use in cases of real necessity. In such situations, the prescription and ***administration of these medicines must be justified by an animal's diagnosis by the veterinarian****, and possibly supported by specific tests to determine the most appropriate choice of the antimicrobials. Prophylaxis should not be taken in a systematic way, but must be reserved for specific indications in exceptional cases. Where possible, an individual treatment of infected animals should be preferred (for example, by administering injections) to collective or group treatments.*
The narrow-spectrum antimicrobials are, in general, to be preferred to those with a broad spectrum. If an animal or group of animals suffer from recurrent infections that require antimicrobial treatment, one needs to take action to eradicate the strains of microorganisms, establishing why the disease is recurrent and changing the conditions of production, animal husbandry and/or management.
Finally, the use of antimicrobial agents that tend to favour the propagation of transmissible resistance should be avoided.

PARTICIPANTS IN THE CHAIN OF CONTROL

The Ministry of Health is responsible for collecting the sales figures of veterinary medicinal products from those responsible for their commerce (AIC).
The Livestock institutions are involved in monitoring resistance to antibiotics on farms, even offering diagnosis on diseases and zoonosis[6].
The ASL, within their institutional competencies, constantly monitor compliance with the provisions concerning the prescription of veterinary medicinal products, place the controls provided by the relevant regional medicine surveillance plans and perform inspections of final operators to monitor the records of shipping, delivery and of the stocks.
Finally, in all the Member States of the EU the companies must compulsorily keep for at least five years - regardless of whether the animal is still in the farm or not - the records of all medicines used in animals intended for food production, including the treatments with antibiotics.
The records are used to verify the use of antimicrobials in the farm, to observe trends and analyse changes.

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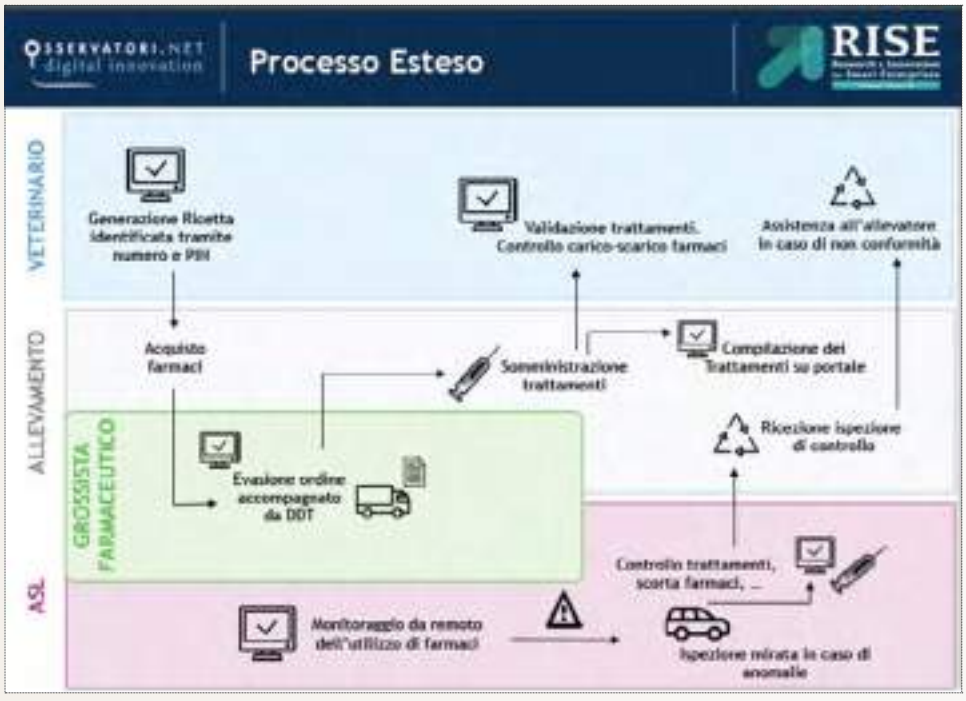
THE ELECTRONIC VETERINARY PRESCRIPTION MANDATORY

*The new **electronic veterinary prescription** (European law November 20th, 2017, n. 167 implemented by the Law Decree 25th July 2018, n. 91) will be mandatory from 1st January 2019 and will apply to the whole cycle of management of medicines and medicated feed/products intermediates intended for use in veterinary medicine, from prescription to supply up to the registration of information of the treatments carried out, without introducing new additional obligations or rules respect to the current legislative norms. It will involve the veterinarians, pharmacies and para-pharmacies, authorised direct sales wholesalers, feed mills, veterinary services of the Regions/local health authorities, the owners and/or keepers of animals for food production and the owners and/or holders of pets.*

The General Directorate of animal health and pharmacy veterinarians, in collaboration with the Livestock Institute of Abruzzo and Molise, has created the computer-



Phases and actors involved in the process of issuing the electronic prescription
Source: https://vc/informazioni.html

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ised system for the electronic veterinary prescription, already experimented in different Regions. Maximising traceability and transparency, the prescription of veterinarian medicines with an electronic format will favour the correct use of veterinary medicines and will detect real consumption, increasing, as a consequence, the protection of public health.
At the same time the digital document will make the pharmaceutical surveillance activity and health care risk analysis more efficient in addition to reducing the margin of error in its compilation. The electronic prescription, connected with the National Database will allow a considerable simplification of procedures with the possibility of inserting also vaccinations and eliminating the paper records of farm treatments. Finally, the digital prescription will reduce the obligations and costs, not just for the public administration, but also for the citizen owner of pets and for the breeder. Eliminated the obligation of resorting to the paper version, it will be much smoother for anyone to proceed when buying veterinary medicines providing your own pharmacist only with a VAT number and the four-digit PIN code generated by the computerised system at the time of the prescription insertion by the vet.

Amongst the strengths, the full sharing of data with all the players in the medicinal veterinary supply chain (medicals veterinarians, pharmacists, distributors, farmers), the simplification and the reduction of the procedures and obligations, the containment of the resulting costs imposed also by penalties for formal errors, the improvement of control activities and reprocessing of data useful for contrast of antimicrobial-resistance.

Extract of the information brochure on the new electronic veterinary prescription.
Source: Ministry of Health

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THE NATIONAL PLAN FOR THE RESPONSIBLE USE OF VETERINARY MEDICINE AND THE FIGHT AGAINST ANTIBIOTIC RESISTANCE IN POULTRY FARMING

UNAITALIA, the association of reference for operators in the poultry sector, initiated along with the Italian Society of Avian Pathology, a ***voluntary plan*** *aimed at promoting responsible use of antibiotics in poultry farming. The Plan was promoted by the Ministry of Health, which evaluated beforehand its contents, using a group of experts who will also examine the results.*

Specifically, the program aims at reducing the total consumption of antibiotics by 15% in 2015 and by 40% by 2018 compared to 2011. The results have been fully received, so much so that 2017 has registered a ***-63%*** *(data certified by a third body, starting from 2015). The Plan introduced, in addition to the ban on cephalosporin of 3rd and 4th generation, from May 2017, the banning of colistin in chickens. In general, a particular regard is reserved for more problematic antibiotics like fluoroquinolones and macrolides. Monitoring is planned for antibiotic resistance both in breeding and at the slaughterhouse. The strategy is based on the one hand on the promotion of prevention protocols, on the other the continuous updated training of operators. The operational aspects of the reduction scheme are divided into several stages, which include the promotion of best animal husbandry practices, the development of complementary and/or alternative systems that enable the reduction of operations with antimicrobials, the constant monitoring of actual consumption, the exchange of information between operators and their training. The next step will be adherence to the Classyfarm system.*

PREVENTION IS BETTER THAN CURING: THE "SUSTAINABLE BARN" PROJECT OF THE LIVESTOCK INSTITUTE OF TURIN

Design a barn to ensure the welfare and health of animals, while respecting the environment: this was the goal that brought the Polytechnic of Turin and the Piedmont Livestock Institute to realise the model of "Sustainable Barn". The project is a collaboration of architects, farmers, veterinarians and agronomists who have combined their expertise in order to identify a structure for cattle that would reconcile the functional characteristics with environmental sustainability, health care and wellness criteria and its insertion into the local agronomic reality. The design stems from the need to find more efficient solutions to make sustainable modern

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farming practices, while reducing the stress factors and poor welfare. The project has permitted the creation of an interactive and virtual mock-up model of a sustainable cattle barn.

Among the various aspects considered in the project, the reduced use of veterinary drugs stands out, thanks to a preventive approach towards animal diseases. The ventilation system has been studied in order to ensure the maintenance of an adequate and constant microclimate inside the barn, through the control of movement, temperature, air humidity and gas concentrations produced by the litter: these attentions permit the alleviating of respiratory diseases in animals, and consequently lower the share of administered antibiotics. Even the flooring and the litter are specially chosen so as to reduce the risk of foot injuries, with consequent reduction of the administration of anti-inflammatory drugs.
(www.izsto.it)

WHY CURED MEATS CONTAIN SALT

*The practice of adding substances to foods for easy storage is not a chemical or industrial invention, but is an **ancient tradition**. Some examples are the addition of an acid juice (such as lemon) to prevent the blackening of a vegetable, as well as the use of smoke from wood, especially ones rich in resin. In the specific case of meat, the use of salt. In fact, the ancient Romans already had observed that saltpetre was improving the production of cured meats and sausages, avoiding the browning of the meat and especially preventing the proliferation of unwanted bacteria. Precisely for this reason, in the production of **some cured meats** are added, in controlled quantities, nitrates and nitrites that, inter alia, have the property of maintaining the colour of meat. In 2003, the EFSA – European Food Safety Authority explicitly stated in an important counsel to the European Commission that "in most processed meat products the addition of nitrite (or nitrate) is **necessary** to prevent the development and production of toxins for C. botulinum".[8] Also EFSA has confirmed that the level of consumer exposure to foods with added nitrite and nitrate is adequate and does not constitute a danger, if these are consumed with equilibrium[9]. Thanks to the use of the refrigerator and microbiological knowledge, in addition to compliance with hygienic rules and to the exploitation of the bacteriostatic properties of spices and herbs, you can nowadays produce safe cured meat using **few preservatives**. In the PDO hams, for example, the **prolonged maturing process** makes unnecessary the use of nitrites, which in fact are no longer used in these products. As for all substances, also in the case of these compounds an **excessive consumption** can lead to negative consequences for health. Although it should be noted that nitrates are a component of many plant foods, the **nutritional balance**, repeatedly emphasised with the promotion of the Mediterranean Diet, is the way to valorise the benefits of each individual food reducing health risks.*

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1.2 Microbiological and chemical contaminants

A possible threat to consumer safety regards the possible contamination with microorganisms or chemical substances, which may come into contact with food (or with the raw materials such as animal feed) in the many stages of the process. In truth, these types of contamination are not specific to meat, but all fresh food. For this reason, it is essential to have a good management of all distribution phases that occur from the exit of manufacturing sites onwards, including domestic conservation. One risky practice is the poor upkeep of household refrigerators which, if not perfectly clean and not kept at appropriate temperatures, can be a source of contamination.

Microbiological contamination

Microbiological contamination is by far the most frequent cause of food alert. In this category belong contaminations by bacteria (such as Salmonella), parasites (Trichinella), viruses and fungi.

European legislation has intervened to safeguard consumer safety with Regulation (EC) No. 2073/2005[7], which establishes the microbiological criteria applicable to many foods, including all types of meat. It is the basis of the microbiological tests conducted by both official controls and by self-control: in fact, it not only obliges food operators to ensure that food complies with the safety and processing hygiene criteria, but also establishes that the authorities will monitor compliance, also through sampling and food analysis in the context of the supervision activities. The goal of self-control of quality management systems and systems developed by the agribusiness companies is that of minimising the risk of microbiological contamination through widespread control of the processes and, in particular, of preservative systems. Even if not included in the 2073, among the microbiological risks are also mycotoxins, toxins produced by certain fungi or moulds in plant foods such as peanuts, walnuts or hazelnuts, corn, grain or soybeans that can enter the food chain through meat or other animal products such as eggs, milk and cheese from cattle that have consumed contaminated feed. In addition to the controls implemented throughout the supply chain, consumer behaviour plays a key role: the best domestic conservation practices and proper cooking of food are fundamental to reduce risks.

Chemical contamination

The chemical contaminants include chemicals in the environment such as pesticides, heavy metals, and other debris that may accidentally enter the food chain during the food production process. Chemicals such as pesticides or medicines used for animal health are subject to strict regulations, and must pass strict toxicity tests for humans and the environment, before being admitted to registration with the European or National Authorities. Also for industrial substances, such as dioxins and heavy metals, there are strict controls, designed to avoid contamination of the environment and to ensure the protection of public health.

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2 CONTROLS AND INFORMATION **FOR CONSUMERS**

The quality and safety of food depends on the efforts of all people involved in the agricultural sector: farming, processing, distribution, storage and even in the consumer phase. In a nutshell, food safety is a shared responsibility from farm to fork.

To ensure the quality and safety of food throughout the chain, it takes, on the one side, operating procedures to ensure the healthiness of foods, and on the other, monitoring systems to ensure that operations are carried out correctly. The road to security passes through two obligatory stages: the attribution to the production world of the responsibility of safe food production and the execution of appropriate official controls carried out in an effective and coordinated manner among the different competent authorities.

2.1 Traceability and tracking

Often the two terms are used interchangeably, but they are not exactly synonymous, although they represent two sides of the same coin:

- **Traceability** means the ability to describe the path of a raw material or a quantity of production through the passageways from one business entity to another, within the production chain: from production, to processing, up to distribution. In essence, the flow of goods is accompanied by a flow of information, which are adequately recorded and retained at each step.
- **Tracking**, however, implies the possibility to reconstruct backwards the entire path of a product, from its final state to the starting raw materials.

These approaches are essential elements in the management of food security, because they allow the reconstruction of the characteristics and history of a food along the production chain, as well as ensuring a timely withdrawal from the market, when issues appear related to the quality or safety that pose a risk to the consumer. Since 2005, the legislation requires that all food products are properly tracked, involving in this process all the players in the food chain. The obligation of traceability also applies to products of foreign origin (in whole or in part), and permits finding the origins of the raw materials.

In addition to being a fundamental prerequisite for the management of safety and food emergencies, traceability has an important role ensuring the quality of the product: by a careful system of documentation, in fact, all the checks carried out on processes and products can be traced in every production stage.

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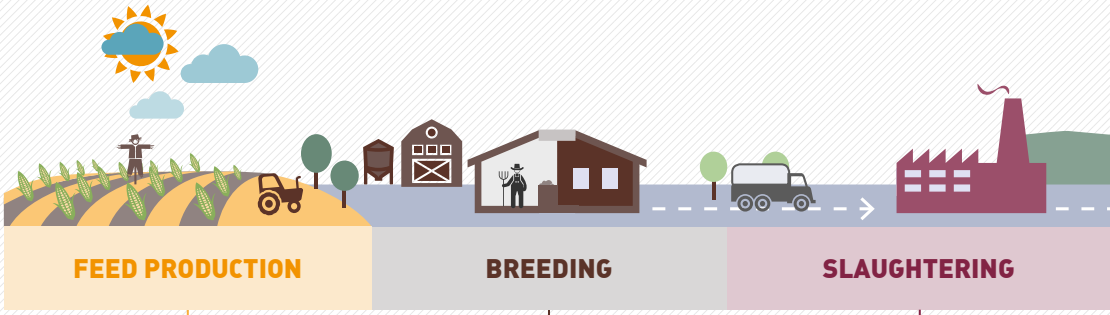
TRACEABILITY AND TRACKING OF MEATS

MAIN CHECKS PERFORMED



FEED PRODUCTION | **BREEDING** | **SLAUGHTERING**

Control of accompanying documentation

Analysis on raw materials and/or on the food

Control of possible veterinary therapies

Compliance with animal welfare standards

TRACEABILITY

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MEAT PROCESSING

DISTRIBUTION AND COLD CHAIN

Monitoring of compliance with health standards and animal welfare

Monitoring temperature compliance

Quality control of the product

TRACKING

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2.2 Institutional controls

In Italy, the protection of food security is entrusted mainly **official control** activities carried out by the **Ministry of Health**, in compliance with the food safety model introduced in the European Union by Regulation 178/2002[10], Regulation no. 882/2004[11] and subsequent regulations of the so-called "Hygiene Package"[12].

The Ministry operates at central level, with the General Directorate for hygiene and food safety and nutrition and, at regional level, with its Regional Offices. To these are added the controls of the Regions and Autonomous Provinces of Trento and Bolzano, through their territorial structures, Departments of Prevention of Local Health and public Laboratories of Official Control, such as the Livestock Institutes. The controls are designed to ensure that food and feed on the market comply with the regulations aimed at protecting **consumer's health, animal welfare** and prevent **food fraud**. In the first two cases one intervenes to ensure the safety of the consumer, avoiding contamination and preventing situations that could lead to the development of bacterial contamination.

In the case of commercial fraud, however, controls verify the conformity of the product with the characteristics declared by the manufacturer about the amount or source, and determine any tampering that could cause danger to human health[13]. In both cases, non-compliant or products considered dangerous are blocked before their arrival on the market, or withdrawn from the market.
The controls, which take place throughout the supply chain, cover both Italian or foreign products to be marketed domestically and Italian products destined for export. In general, the surveys provide a fully investigated product through inspections, sampling and laboratory analysis, or inspections of production processes with controls that may include also the staff assigned to the processing.

As for the meat sector, the controls are focused on farms, with regard to health and animal welfare, as well as slaughterhouses in the processing industries. Continuing along the chain of distribution, attention is drawn to the rules for labelling and compliance with consumer information requirements.
According to regulatory provisions, the controls are programmed on the basis of a risk assessment: the major resources are dedicated to those sectors which involve greater risks for consumer's health. Apart from this, the various competent authorities should operate in an integrated and coordinated manner in order to allow effective actions and reducing to the least the inefficiencies due to any duplications.
Complementing the official controls provided by the legislation, businesses in the food industries have to implement self-control plans in accordance with the principles of HACCP (Hazard Analysis Critical Control Points), which provide for the identification of their critical points and prepare, on them, monitoring and improvement plans.

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EUROPEAN AND ITALIAN RULES ON FOOD SAFETY

"Security from the farm to the fork". This is the principle of the strategy adopted by European Union countries for safeguarding health and consumer safety. In practice this means preparing a system of integrated control between the various subjects involved to guarantee compliance with the requirements of food products and for the welfare of animals and plants, whether they are produced within the EU or imported.

The general principles on which the legislation concerns are[14]:

- *integrated controls throughout the food chain;*
- *interventions based on the Analysis of Risk;*
- *primary responsibility of the industry for each product created, processed, imported, marketed or administered;*
- *traceability of products throughout the supply chain;*
- *consumer as an active part of food security.*

In addition, to ensure a scientific approach to issues related to food, the European Authority for Food Safety was established (EFSA[15]) in 2012, which, in collaboration with national authorities and in consultation with stakeholders, since then provides independent scientific advice and clear communication on existing and emerging risks. EFSA elaborates scientific and expert advice to provide a solid foundation for legislative work and to facilitate timely and effective decisions in risk management.

Especially for meat, the legislation is very detailed, both in the definition of the requirements of the production facilities and for product specifications and related control systems.

IS IMPORTED MEAT LESS SAFE THAN ITALIAN MEAT?

If we were to draw up a list of topics that generate most concern for consumers in relation to food security, the origin of the meat they eat would certainly appear up at the top. It is in fact a quite widespread belief that imported meat is "less safe" than homemade, a hypothesis which in reality is not confirmed by the facts.

Within the EU, the control system is harmonised by Community law and follows the principle of safety "from farm to fork": this means that the cattle are traced at every stage of the supply chain, regardless of the country in which it is bred, and cannot be treated with substances prohibited by the Union (such as, for example, anabolic hormones).

Meat coming from other member States, therefore must meet the same requirements as in Italy, and thanks to the obligation of traceability, information can be traced back at any time to specific phases of the supply chain.

As for the non-EU countries, however, the question becomes more complex. In some countries, in fact, the national legislation does not impose the obligation of traceability along the supply chain, giving priority to analytical controls on the product to be placed on the market, rather than supervising pre-slaughter. This does not mean that the products are less safe or controlled, because to obtain the importation authorisation in Europe, the companies must comply with the same requirements in force in the EU market.

Either way, in Italy there are various control points located in places of commercial trade, borders or at ports and airports: the so-called PIF (Border Inspection Posts) where the controls on food imported from other countries and the UVAC (Veterinary Offices for Community Compliance) involved in trade between member States are placed. P.I.F. are directly connected to the European food alert system: this allows, in the presence of a non-compliant product, to take swift action to prevent the placing on the Community market or eventually its removal.

The agro-mafias insert food into the market without the necessary checks and for this reason they must be prosecuted. The supply chains of meats, instead, spend resources to guarantee to consumers that the product, national or foreign, have the requirements of reliability demanded by the market.

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NRP AND CONTROLS
FOR THE DETECTION OF PROHIBITED SUBSTANCES

EU and national legislation lays down control measures for the presence of undesirable substances in food. In particular, each Member State must annually perform the National Plan for the detection of Residues (NRP), a structured program which aims at overseeing and monitoring the presence of residues of substances for livestock use, both illicit and authorised, and environmental contaminants in live animals and the feed from which they originate. The NRP consists in a series of samples prepared at national level adapted to the regional situation and carried out by the National Health Service, both on farms (primary production) and in the establishment of initial processing (slaughterhouses or the milk collection centres).

The analyses to reveal the presence of illegal substances are carried out by the laboratories of the Livestock institutes.

- *Category A: includes unauthorised substances for the treatment of farm animals. For example growth hormones.*
- *Category B: includes the veterinary medicinal products, for which the EU defines a maximum residue limit that cannot be exceeded in consumer products; and environmental contaminants such as heavy metals.*

In the event that the administration of prohibited substances is detected, or the content of residues of authorised substances or environmental contaminants were higher than the established limits, the application of sanctions would be implemented to protect the consumer such as the recall of dangerous products, the application of administrative and criminal sanctions, the conducting of epidemiological investigations to determine responsibilities and uncover any further treatments. For some substances, such as growth promoters, the NRP also adds other specific controls. The use of low concentrations means that the residues of these substances present in animal tissues are difficult to reveal by laboratory analysis. In this case, we resort to specific histological examination, i.e. tissue analysis, carried out directly on the carcass after slaughter operations: the use of growth promoters, in addition to increased enhancement of the animal, in fact also determines the alteration of some organs (sex glands, gonads, thymus etc.) whose analysis can highlight situations that deviate from the norm and, accordingly, permits the use of illicit substances to be suspected.

THE RESULTS OF THE NRP 2017

*In 2017, the implementation of the NRP has led to the analysis of **44,108** samples, of which 15,919 for the detection of residues of substances in Category A (equal to 36% of total analysis) and 28,198 for the detection of residues of substances in category B (equal to 64%). The samples that have provided irregular results for the presence of residues were a total of 39, equal to 0.09% of the total of the samples analysed. Of these, 2 were found not to conform due to the presence of residues belonging to category A and 37 due to the detection of residues of substances in Category B.*

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2.3 The self-control system of companies

According to European regulations[16], any activity that operates in the food industry has an obligation to prepare a plan of self-control according to the HACCP (Hazard Analysis and Critical Control Points). This method provides that each operator performs an analysis of potential risk factors for health resulting from its operations, and define one or more measures for the control and prevention of the risks. The HACCP Manual must be validated by the Health Authority (ASL) which oversees its implementation.

The HACCP self-control plan is based on seven principles:

1. Identify any hazard to be prevented, eliminated or reduced.
2. Identify the critical control points (CCP – Critical Control Points) in the phases in which it is possible to prevent, eliminate or reduce a risk.
3. Establish, for these critical control points, critical limits which separate acceptability from unacceptability.
4. Establish and implement effective monitoring procedures at critical control points.
5. Establish corrective actions if a critical control point is not under verification (exceeding the established critical limits).
6. Establish the procedures to be regularly applied to verify the effective functioning of the measures taken.
7. Prepare documents and records commensurate with the nature and size of the food business.

The plan must be applied and finalised at preventing problems and must provide for appropriate corrective actions to minimise risks every time there is a non-compliance. The plan includes general and specific measures. Those "**general**"are represented by common rules that apply to all processing areas and are inher-

INFORMING THE CONSUMER WITH THE PRODUCT LABELS

The labelling of meat, which has become mandatory the last 10 years, even though at different times for different products, is a system that requires the manufacturer to provide information to the consumer about the product they are about to purchase.

At European level, the matter is currently governed by Regulation 1169/2011, which establishes common rules for the labelling of the various species and serves as a coordination between the various sectors, ensuring consistency of the information contained in the different labelling systems.
Although there are subtle differences between the various species, in general the information concerns the country of breeding, slaughtering and, if applicable, processing of the product. This information can help the conscious choice of consumers during the purchase.

ent to the hygiene of operators, premises, equipment, processes and products, as well as the application of verification measures of the rules.
Those "**specific**", defined for each type of production process, aiming at the identification, evaluation and control of the specific risks of a biological, chemical and physical nature which could affect the safety of food products.
The dangers are evaluated according to the principles outlined in the "Codex Alimentarius" and the national and international legislation[17].

2.4 A purely italian safety: supply chain and the protection consortium

The Italian food system presents some peculiarities that, in addition to determining a strength in terms of quality and value, permits excellent safety levels to be guaranteed.

A first aspect concerns the presence of effective and well-coordinated **supply chains.** A product is made "in the food chain" when all the players involved in the production process are integrated and coordinated with each other: in this way an additional control, direct and complete, of agricultural and industrial production systems is possible on behalf of those who have product liabilities towards the market.

The purpose of the chain is to make transparent the relationship between the subjects involved in the production and processing of the final product, by developing a relationship of trust, with shared objectives between the parties involved. An added value to the chain is to minimise risk by simplifying the control plans. Products relating to controlled supply chains allow a better understanding of quality and food safety data, generally more detailed than the minimum requirements of the law, better control

PDO & PGI IN ITALY

Italy holds the European record for the number of PDO and PGI awards, with more than **261 quality products** recognised[18]. Due to the international importance of these designations, the awarded products are subject to strict and specific controls, in addition to the routine checks laid down by European and national legislation. In our country, the PDO and PGI products of the pig production chain are subject, as well as inspections of the national health system, to the annual inspections at farms, slaughterhouses, processing plants, ham and cured meats companies, carried out by two independent institutions designated by the Ministry of Agriculture, Food and Forestry.
These organisations certify the quality of raw materials and in particular compliance with the rules of production materials: a system which guarantees the acquisition of high quality products, made according to traditional recipes.
About a third of European PDO and PGI meat based products are Italian. In addition, the first 4 PDO Italian products for export volumes and market share belong to livestock chains: Parma ham, San Daniele ham, Grana Padano and Parmigiano Reggiano cheese.

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of product standards with respect to the expectations of the consumer and greater recognition through dedicated brands. In Italy it is estimated that about half the beef and the pork are produced in the supply chain, while for poultry meat in the production chain is almost complete.
A second aspect concerns the presence of numerous products identified internationally as gastronomic excellences such as those protected by the geographical indication trademarks.

The European Union protects the typicality of some food products through the recognition of **PDO (Protected Designation of Origin) and PGI (Protected Geographic Indications)**. These designations, recognised throughout Europe, are awarded only to those high quality products whose production takes place in defined geographical area, and for which there is a causal link between the geographical area and the quality or characteristics of the product and the characterising aspects of the production process[19].
In other words, the product should show a strong link to the territory, to whose name must be traced certain characteristics of the product itself. The function of these trademarks is threefold: to protect quality products from misuse and imitation; give consumers reliable information about the products they purchase; contribute to the protection of rural areas, whose socio-economic system often depends on the development of typical agricultural food production and quality.

VOLUNTARY LABELLING IN THE POULTRY SECTOR

Italian legislation foresees the possibility, for operators who wish to do so, to provide voluntary and additional information on the label other than that required by law.
To achieve this, however, a particular set of voluntary labelling procedures must be followed, which are recognised by the Ministry of Agriculture: in the poultry sector, the first and most comprehensive is the one developed by UNAITALIA, representative of 99.98% of the producers who use voluntary labelling.

In addition to the information prescribed by the law, the guidelines state that you can enter specific information relative to:
- the food: for example, no GMO, free of animal flour and/or added animal fat, vegetable food etc.),
- the kind of farming adopted: raised on the ground, outdoor, extensive covering, etc.,
- the genetic type,
- animal welfare measures: more space in breeding areas respect to the legal limits, the presence of natural light in infrastructure dedicated to breeding, presence of straw bales or perches to encourage natural behaviour, and recently the reduced use of antibiotics.

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3 THE COMMUNITY FOOD ALERT SYSTEM

To notify risks (real or potential) in real time for the health of consumers, a system of Community rapid alert (RASFF) was established, which, through a network of spreading information, permits a rapid and coordinated action. In practice, the RASFF constitutes a network of "contact points", identified in the European Commission, in the EFSA (European Food Safety Authority), the ESA (Supervisory Authority of the European Free Trade Association) and at national level, identified by the authorities in individual member Countries.
All parties involved exchange information in a clear and structured way by means of protocols that ensure the homogeneity of the reports: the Ministry of Health is the Italian point of contact. In case of serious and immediate risk (for example, of a toxin such as botulinum), further to providing immediate seizure of the products, the emergency procedure can be supplemented with press releases to inform the public on the risks linked to the consumption of a particular product and the mode of delivery of the food to the competent local Health Authority.

3.1 Different levels of alert: when is it right to worry?

The Alert System foresees **four types** of communications that are sent to the member States depending on the severity of the situation:

- The **Alert Communications**: are sent when food or feed which present a serious risk are on the market and where action is needed quickly for their withdrawal or recall. The RASFF member that identifies the problem and takes proper action (e.g. product recall) starts the alert with the objective of giving all members the information to verify whether the product in question is on their markets, so that they can take the necessary measures.
- **Informational Communications**: are used when a risk is identified in respect of a food or feed on the market, but other Member States are not required to take rapid action. This is because the product has not arrived or is no longer present on their market or because the nature of the risk simply does not require such action.
- The **rejections at the border**: concern consignments of food and feed undergoing an exam and rejected outside the EU borders (and the EEA, the European Economic Area) when a health risk is detected. Notifications are sent to all EEA border posts.
- The **News**: all information feed that have not been sent as a warning, but which also contain useful news for the safety of consumers.

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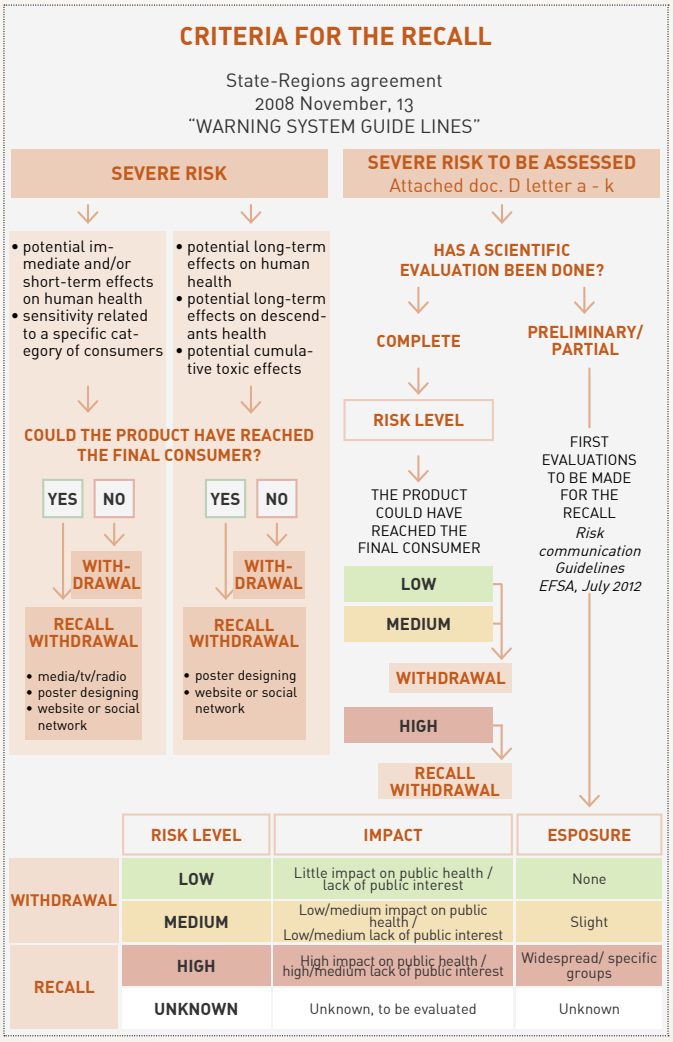
NOTIFICATIONS TO CONSUMERS

Consumers are explicitly warned (with direct and multi-channel communications) if a dangerous product, which has already been sold to consumers through the distribution network, is to be recalled from the market.



Source: Ministerial note - Procedures for the recall by OSA of non-compliant products www.trovanorme.salute.gov.it/norme/renderNormsanPdf?anno=2016&codLeg=54999&parte=1%20&serie=

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3.2 What are the risks that generate alerts?

Each year the results of the notifications to the RASFF system are collected in a report published by the European Commission and then translated by the various Member States. The annual report represents an extremely useful tool for getting immediate information on which food categories were most subjected to criticism during the course of the year, as well as the type of risk detected.

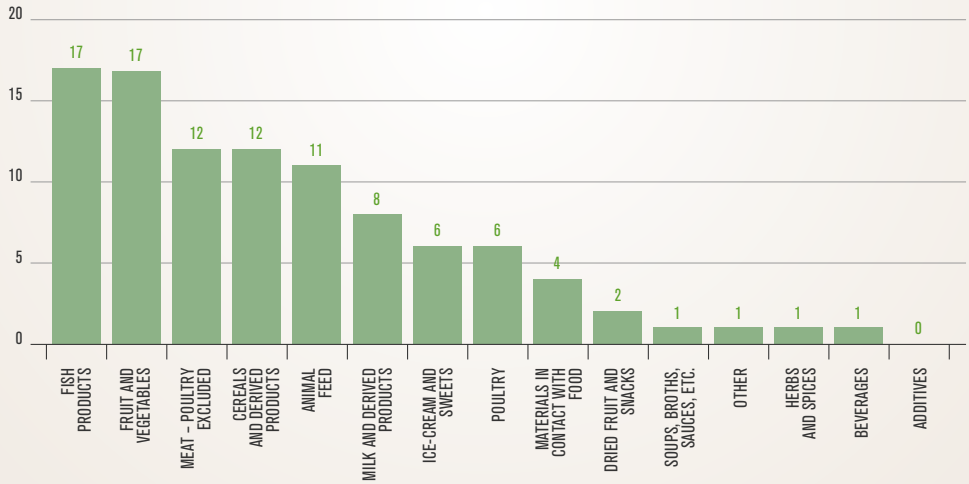
From the analysis of the report dated 2016[23], it emerges that notifications are gradually decreasing, while most warnings concerned the contamination by microbiological pathogens such as Salmonella and Escherichia coli (total 782 notifications in 2014), and the presence of residues of pesticides (435), mycotoxins (383) and heavy metals (285).

NOTIFICATIONS IN ITALY

Overall, in 2016 there were **2,925** notifications[20],compared to 2,967 the previous year. The comparison with previous years reveals a decrease in alerts: in 2012 received notifications were 3,436, and 3,721 in 2011. The country most subject to notifications turns out to be Turkey (276), followed by China and India.

Looking at the situation in our country, Italy has proven to be the **first member state for the number of notifications sent** to the European Commission, thereby demonstrating intense and thorough monitoring activities throughout the country, with a total of 415 notifications (equal to 14.2%), while in 2015 the notifications issued by Italy were 511 (17.2%).

Italy is the thirteenth in the ranking for the number of notifications received, with a total of 105 national products reported as irregular (compared with 155 notifications in 2015). The type of irregular products are heterogeneous: the highest number of notifications concerned fishery products, followed by animal and dairy products.



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4 ANIMAL WELFARE

4.1 The foundations of animal welfare: five freedoms

The interest for animal welfare, as we understand it today, can be traced to **1965**, the year the **Brambell report** was published, the first scientific paper on the subject commissioned directly by the British government. The document is specifically related to farm animals and sets out the **"five freedoms"** to be protected to ensure animal well-being, not only as absence of disease, but as a state of good overall physical and mental health. These conditions, taken and "institutionalised" in 1979 by the Farm Animal Welfare Council (FAWC), are still the basis of international legislation on animal welfare.
The five freedoms recall the respect for the fundamental and basic needs of each animal, the protection of which is vital especially in captive conditions.
Although these requirements are still the basis of Community legislation, in reality the debate on this topic has not yet found a clear definition.

Most experts agree to see animal welfare as a balance between the individual and the environment that surrounds it, where "environment" refers to a heterogeneous group of factors including the physical environment (facilities, density, microclimate etc.), interaction with other animals and humans, the absence of disease or predators[21]. The adaptation to these factors can vary in intensity from case to case: the animal can be, for example, in a good level of wellness compared to some factors such as the breeding structure, but in a low level for others, such as the health status.

FIVE FREEDOMS

1. FROM HUNGER, THIRST AND MALNUTRITION
by ensuring the animal access to fresh water and a diet that maintains full health

2. TO HAVE AN ADEQUATE PHYSICAL ENVIRONMENT
giving the animal an environment including shelter and a comfortable resting area

3. FROM PAIN, INJURY, DISEASE
foreseeing them or diagnosing and treating them quickly

4. TO EXPRESS THEIR SPECIFIC BEHAVIOURAL CHARACTERISTICS
of their species providing the animal with sufficient space, proper facilities and the company of other animals of their own species

5. FROM FEAR AND DISTRESS
ensuring the animal conditions and care that do not involve psychological suffering

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From this consideration emerges that one cannot talk about health only in terms of its presence or absence, but also that wellbeing varies from very bad to very good[22]. To testimony the strong interest on the subject in recent years various projects have started to measure the level of animal welfare, based on specific and objective indicators that can reflect the psychophysical condition and the level of stress of animal health: some of these are the Welfare Quality® and the RIBECA project. Also in the Rural Development Programmes animal welfare has found ample space. In particular, Measure 215, relative to payments for animal wellbeing, financially supports the dissemination of methodologies and farming conditions with high animal welfare content, more than the minimum limits imposed by specific regulations, with the aim of increasing the competitiveness and profitability of livestock farms.
Although the scientific community has established the characteristics of animal welfare and its measurement mode, in the public opinion the perception of well-being is far from unique and maintains a strong characteristic of subjectivity, due to ethical considerations. In other words, if for science there is a substantial agreement on how to define the state of animal welfare, in common understanding the conditions considered "adequate" vary according to the conception of the animal itself and the adopted perspective.

4.2 Animal welfare in modern livestock

As with all food products, also livestock production is constantly increasing and this involves, on the part of the operators a constant search for efficiency. This, one should admit, has over the years resulted in some critical situations regarding some aspects of sustainability, such as animal welfare, which have been put into second place compared to the economic factor, which has always been the main driver of a productive enterprise.
It is also necessary to observe, however, even though not always at the same speed among the various industrial sectors, that things are changing and many entrepreneurs have started considering animal health among the subjects relevant to the sustainability of their business, especially when the vision is far-sighted: it is only in medium or long-term horizons that investment without immediate return, such as those of animal welfare, give their fruits.

In the case of livestock, the principles laid down by the five freedoms should be guaranteed mainly by paying attention to the rearing phase, but also to transport and slaughter. To regulate these and other factors the legislation, first Communitarian and then National, intervened establishing specific criteria that represent minimum thresholds to be respected. Intervention in legislature has been joined, with a remarkable growth in recent years, by the development of a large number of standards and voluntary initiatives, brands and certifications to ensure compliance with certain characteristics in breeding, permitting, among other things, a higher level of well-being. It is for example the case of awards for animal welfare and standards for breeding proposed by nongovernmental organisations such as Compassion in World Farming and the RSPCA, or product standards such as organic, for the attainment of which are provided stringent requirements for farming conditions.

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WELFARE QUALITY®

Welfare Quality® (www.welfarequality.net)) is a research project funded by the European Union to thoroughly examine the studies on animal welfare, and identify measuring parameters. Launched in 2004, the project was attended by forty-four institutes and universities, representing thirteen European countries and four Latin American countries that have co-operated in an integrated manner in order to implement monitoring systems in breeding to improve animal welfare on the farm.
Welfare Quality® ended in 2009 with the presentation of the first protocols for measurement and classification of animal welfare on the farm, addressed respectively to cattle, swine and poultry.
The identified systems are based on a combination of scientific methods of detection of well-being with the classification criteria of the farms into four categories, from "poor" to "excellent". The assessment of animal welfare is based on four principles: adequate housing, proper nutrition, good health and appropriate behaviour. Within these principles, twelve welfare criteria, distinct but complementary, have been highlighted.

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MEASURING WELL-BEING:
THE RIBECA PROJECT

RIBECA, "Application of an innovative system of evaluation of animal welfare in beef cattle farms", is a two-year project, funded by Mipaaf and coordinated by the CRPA Foundation, involving 7 Piedmont and Veneto beef cattle farms run by young farmers and their associations, Asprocarne and Unicarne. The project, which ended in November 2015, was aimed at developing an innovative system of detection and welfare assessment in cattle for fattening, taking into account the recommendations of the EFSA Scientific Opinion (2012) on the welfare of beef cattle: the indications provided in this Opinion concern structural and managerial aspects, such as the types of housing, unit surfaces to be assigned to each animal, head per box, floors and bedding materials, control of the microclimate inside the barns, distribution of food and drinking water, human-animal interactions, mutilation and disease control.

The evaluation system perfected as part of the project involves both the assessments carried out directly on animals based on the Welfare Quality Protocol®, and the assessments of the farm environment and management procedures based on the IBA Protocol (Wellbeing Index of the Farm), a methodology developed by the CRPA in collaboration with the Department of Agricultural Management Systems, Food and Forestry (GESAAF) of the University of Florence.

The project led to the development of a checklist for the detection of animal welfare and an input program, calculation and verification of the requirements of current legislation and the EFSA recommendations, used directly by farmers on their own farms.

The evaluation system involves the compilation of a specific company checklist at the livestock farm, the inclusion of data collected in a special software, the calculation (automatic) of the obtained scores and the positioning of the company in a wellbeing classification (1 = company with poor level of welfare to 6 = company with high level of welfare), the identification of critical points, possible improvements and assessments also of their economic viability. Recently, the CRPA has developed a system of animal welfare evaluation similar to RIBECA, used in pig breeding and fattening.

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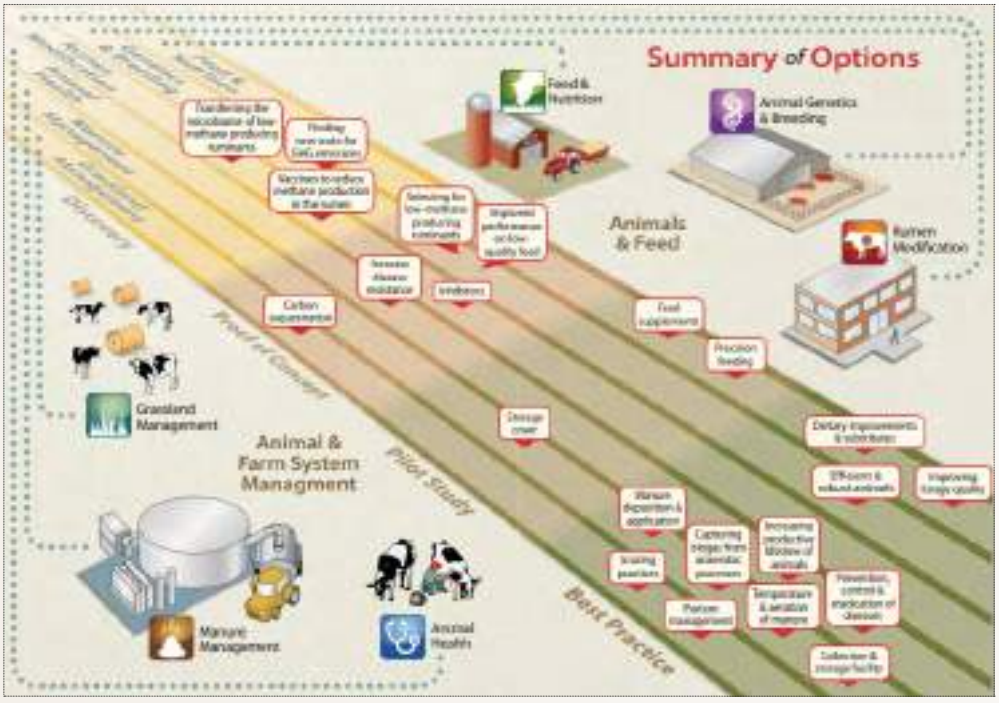
THE SAI PLATFORM
(SUSTAINABLE AGRICULTURE INITIATIVE)

In order to catalyse a change in the food industry, some producer companies of wide consumption goods have established, in 2002, the platform for "Sustainable Agriculture Initiative" (SAI Platform).
Today the initiative involves 90 companies in the food and drinks industry. Their goal is to increase knowledge of sustainable agriculture and communicate with an increasing number of stakeholders. Among the various initiatives there is the standard "Farmer Self-Assessment" (FSA) that was designed for analysis and improvement of sustainability on farms.
The standard, designed for the analysis of the European context, has been the subject of a pilot project to adapt it to the Italian reality focusing attention on the aspects considered relevant. This test had main players such as INALCA, DQA - Agri-Food Quality Department and Coldiretti and has permitted to identify possible improvement actions as well as any measurement tools.



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SURVEY ON THE MAIN ASPECTS OF SUSTAINABILITY
FOR ITALIAN BREEDERS AND STAKEHOLDERS

One of the preparatory activities for the improvement of sustainability in the livestock sector is aimed at examining and, where possible, measuring the perception of the sector's operators on the topic. For this purpose, the collaboration of Coldiretti with INALCA allowed to engage a heterogeneous sample of farmers in the beef industry as well as public subjects and private individuals of particular importance (MiPAFF, McDonald's, COOP, Barilla...), with the aim of understanding the aspects and related practices of sustainable management of most interest. The themes touched from the survey are those mainly involved in sustainability issues such as company management, environmental impacts, animal well-being, ethical and social aspects. In practice every stakeholder was asked to assign a score that allowed to quantify applicability or relevance of that aspect compared to its presence in the bovine supply chain. The elaborations have identified that among the most relevant topics are to be ***found animal welfare, the management of the company, ethical and social aspects****. On some themes the two samples offer very discordant results. An example are the related questions to the reduction in use of antibiotic drugs and fight against illegal hiring: both the questions registered a high interest score for stakeholders (companies and public institutions) and very low for breeders. This dichotomy highlights how some themes related to sustainability are interpreted and lived completely differently inside the supply chain. This discrepancy underlines once more the importance of drawing up transversal and integrated guidelines at all levels of the livestock supply chain for sustainable development at all levels of the livestock supply chain.*

Questionnaire questions — Animal welfare / Company management / Ethics and social	Breeder results	Stakeholder results
What value is attributed to the correct management and improvement of animal welfare	4.64	4.73
Importance of management and decrease in the use of antibiotic drugs	4.13	4.73
Importance of fighting illegal hiring and, in general, the respect of collective agreements at work	3.77	4.73
Importance of financial stability and investment planning	4.43	4.55
Importance of a balanced diet for livestock and adequate space for animals	4.62	4.45
Importance of correct management of company safety and health care	4.45	4.36
Importance of fair remuneration and freedom of association	4.40	4.36
Importance of the company's environmental impact *(consumption of water. emissions and management of manure. maintenance of biodiversity)*	4.06	4.18
What value is attributed to the transparent management of company ethics?	4.36	4.18
Importance of the company's ability to integrate local communities (job creation) and to support the territory	3.68	4.18
What value is attributed to the culture of corporate and managerial improvement of the farm?	4.23	4.00
What value is attributed to the management of environmental aspects?	4.15	4.00
Importance of energy efficiency management and use of renewable sources	3.87	4.00
Importance of proper staff training through the organisation of specific courses	3.68	4.00
Importance of an improvement plan in the selection of suppliers *(animal genetics. food outsourcing and national origin)*	3.89	3.91
Importance of a commercial positioning and access to the company market through the definition of contracts	4.23	3.73
Importance of the choice of sustainable supplies and raw materials	4.02	3.73
Importance of the company's ability to adhere to production chains aimed at conserving traditional breeding and processing systems with reduced environmental and climatic impact (e.g. designations of origin)	3.72	3.64
Importance of management and improvement of well-being during transport	3.45	3.64
Importance of management control and access to finance	3.85	3.55

Results of the questionnaire sent to stakeholders and breeders, complete with all the questions ordered according to the priorities expressed by the interviewees (1 minimum - 5 maximum). The topics of greatest interest were highlighted, mediated on the basis of the results of the analysis of the questionnaires compiled by breeders and stakeholders.

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Extensive or intensive breeding?

Today the issue of animal welfare is directed especially towards intensive farming, generally accused of offering lower conditions of animal welfare and respect in comparison to more "traditional" and extensive forms. Behind this statement there is a complex issue, namely the inability to objectively define what are the characteristics of an "intensive" or "industrial" farm.

Although the term "intensive" is commonly used both in legislation and in common language, there is actually not a unique and precise definition. One of the few references is in the **European Convention for the Protection of Animal Husbandry** of 10th March 1976 which defines intensive farms, "*that primarily employ technical installations managed principally by means of automatic devices*". A definition both broad and vague. A second suggestion, more specifically, is provided by **INEA** (National Institute of Agricultural Economics) in a report from 2012, in which it identifies the intensive rearing livestock as a way in which man has the control of both of space available and of animal resources. However, even in this case, there is some ambiguity: as in the case of "pasture grazing" farms when the animals are sheltered in warehouses when there is intense cold or snow: in this case one necessarily turns to food rations, thus the "resources" available to the cattle, and the space to be assigned to each of them are controlled.

When the judgement of the well-being is based on the conditions and on the place of farming, one tends to look favourably on pasture grazing in preference to those in the barn, considered more "industrial" and less respectful of standards of animal welfare. In reality, **both methods have advantages and weaknesses**, and it is important to remember that they refer to different breeding requirements, which are derived from the characteristics of the territory and the fertility of the soil, but also the economic sustainability of companies.

In the case of **confined** breeding (barn, sheepfold, pigsty, henhouse, etc.) which obviously provides less space, the management of the animal is more **precise** and **accurate**: the animals are checked daily, with the possibility of a timely detection of problems of various associated nature, for example, in diseases or nutritional problems. In this case, also, it is easier to prevent any harmful infectious diseases for livestock or humans, important especially in highly humanised environments.

In breeding in the **open** (pasture grazing, open-air) typical of northern European countries or America, which have large agricultural areas, the animal is left in the wild for most of its life. In this case there is certainly more freedom of movement, but you must consider that the production cycles are getting longer and the degree of control in the event of illness, bad weather or predator attack is less. It is therefore clear that the choice **between extensive and intensive is not so distinct**, both because there are no fixed definitions, and because both breeding models have advantages and disadvantages that need **to be judged with a global vision** that takes into account many aspects. Therefore, in general, the type of livestock breeding is not the only criterion on which to base the measurement of well-being: it is not the case that a structure with high densities, but handled scrupulously, providing an environmental enrichment and innovative

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infrastructures, necessarily offers conditions of wellness worse than one with a lower density, but handled with less care.

What the law says: minimum criteria to be respected

A first step in the evolution of the legislation is represented by the Amsterdam Treaty of 1997, in which animals are defined as **"sentient beings"** and are no longer considered only food. Subsequently, in the White Paper on Food Safety published in 2000, the Commission proposed a set of standards by highlighting the close relationship between animal welfare and food safety.

The significance of the issue of animal welfare at legislative level, finally, is also found in the Common Agricultural Policy (CAP), which has included since 2007 animal welfare among the criteria required to be met in the context of so-called **"conditionality"**, subordinating the economic support for farmers with compliance to a series of sustainable requirements that specifically concern animal welfare[23].
Within the complex **body of legislation** currently in **force**, it is possible to distinguish **horizontal and vertical legislation**. The first dictates the lines of appropriate behaviour in all species of food-producing animals, while the second enters into the specifics of certain animal species.
With regards to horizontal legislation, amongst the acts developed by the European Commission these should be remembered:

- **directive 98/58/CE** disposes the minimum standards for the protection of all animals on farms, containing provisions regarding animal control, freedom of movement, livestock buildings, automatic systems, feed and mutilation;
- **regulation (CE) No. 1/2005** on the protection of animals during transport, which lays down the provisions concerning the liability of operators and the training of animal handling personnel and the controls based also on the use of new technologies, space during transport, the duration of the journey and the pauses, the rules for long journeys and for animal handling operations during their loading and unloading;
- **regulation (CE) No. 1099/2009** on the protection of animals during slaughter, which instructs on the provisions on the responsibilities of the slaughter house, staff training, housing modes in the lairages and animal movement, innovative systems of stunning and killing the animals and the verification of their efficiency.

The vertical legislation concerns the **different species of animals for income** and, in particular, the following categories of production: breeding and fattening pigs, calves (i.e. bovine from 0 to 8 months of life), laying hens and broiler chickens. These rules aim to establish criteria relating to the management and structural aspects finalised at protecting the animals, setting minimum requirements for the elements that affect the welfare conditions of the different species, such as housing density, environmental control, paving, supply of food and water, etc.

The crime of animal mistreatment

The acknowledgement of Community indications means that Italy is in line with other European countries in terms of safeguarding the minimum conditions of animal welfare. A peculiar aspect of Italy, however, is made up of the larger number of controls resulting from the pres-

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ence in the Criminal Code of the **offense of cruelty to animals**. Article 544-ter of Law 198 of 2004, amended by Law 201 of 2010, states that there is a crime when an animal is subjected to injury, abuse, unbearable conduct or hardships, or to treatments from which cause damage to its health or moreover when it is subjected to the administration of prohibited substances. The offense is connected with the **exercise of the profession**, and all persons who come into contact with the animal in the breeding, transport and slaughter are punishable.

The inclusion in the Criminal Code leads to a **widening of the prohibitions** with respect to the provisions of the Community legislation (any act involving unjustified suffering to the animal is potentially punishable), but also to a widening of the

	BREEDING	TRANSPORT	SLAUGHTER
EGG LAYING HENS	DIRECTIVE 98/58/EC, concerning the protection of animals on farms. DIRECTIVE 1999/74/EC and DIRECTIVE 2002/4/EC, concerning minimum standards for the protection of laying hens.	REGULATION (EC) No. 1/2005 of 22nd December 2004 on the protection of animals during transport and related operations.	1099/2009 of 24th September 2009 on the protection of animals at slaughter.
CHICKENS FOR MEAT	DIRECTIVE 98/58/EC, concerning the protection of animals on farms. DIRECTIVE 2007/43/EEC laying down minimum standards for the protection of chickens kept for meat production.	REGULATION (EC) No. 1/2005 of 22nd December 2004 on the protection of animals during transport and related operations.	REGULATION (EC) No 1099/2009 of 24th September 2009 on the protection of animals at slaughter.
PIGS	DIRECTIVE 98/58/EC, concerning the protection of animals on farms. DIRECTIVE 120/2008/EEC laying down minimum standards for the protection of pigs confined for rearing and fattening.	REGULATION (EC) No. 1/2005 of 22nd December 2004 on the protection of animals during transport and related operations.	REGULATION (EC) No 1099/2009 of 24th September 2009 on the protection of animals at slaughter.
CALVES	DIRECTIVE 98/58/EC, concerning the protection of animals on farms. DIRECTIVE 119/2008/EEC laying down minimum standards to protect calves confined for rearing and slaughter.	REGULATION (EC) No. 1/2005 of 22nd December 2004 on the protection of animals during transport and related operations.	REGULATION (EC) No 1099/2009 of 24th September 2009 on the protection of animals at slaughter.
BOVINE	DIRECTIVE 98/58/EC, concerning the protection of animals on farms.	REGULATION (EC) No. 1/2005 of 22nd December 2004 on the protection of animals during transport and related operations.	REGULATION (EC) No 1099/2009 of 24th September 2009 on the protection of animals at slaughter.

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spectrum of the persons responsible for monitoring. Any supervisory body active in the sector of food business operators (from the traffic police to the NAS – Italian Food Anti-sophistication police) can in fact carry out controls and file a complaint. It should also be remembered that in Italy a "National Plan for Animal Welfare" has been active since 2010; it defines the criteria and monitoring programs by the competent Sanitary Authority with the aim not only to verify the application of national and Community legislation concerning the **protection of animals on farms**, but also to provide information, explanations and guidelines for the breeding of various species.

The pursuit of excellence: standard and voluntary criteria

For more virtuous operators maintaining animal welfare is not a "plus" accessory, but the daily modus operandi, and results in a number of specific practices well-integrated into the business management system. Not only, in addition to the practices established by law, the most sustainability-conscious organisations have **voluntarily** decided to implement action protocols or to adopt additional protections on the welfare of farm animals. In this context, in Italy, there are many initiatives, promoted both by institutional entities and associations, to improve farming conditions further: obviously these excellences **only represent the "best practices"** to which the industry is leaning towards (or should lean), with time tables and effectiveness which vary from case to case.

Among the notable initiatives there are certainly those of a few international non-governmental organisations, who have rallied to ask producers to ensure additional measures of animal protection than those provided by law. One of these is **Compassion in World Farming (CIWF)**, an NGO present at global level since 1967 that promotes more respectful animal wellbeing farming systems. Since 2007, Italy has started an **Animal Welfare Award** program, through which it promotes the use of voluntary measures to protect specific-species animal welfare. The measures vary from award to award, but can be attributed in general to the following main areas: a **density** of less breeding within the limits of the law, the absence of systematic **mutilations,** the presence of **environmental enrichments** and adequate space so that the animals behave naturally.

Another case is represented by brands and voluntary certifications, such as **organic**, for the attainment of which certain animal welfare criteria must be met. In general, **organic livestock production is closely tied to the land,** and the number of head to rear depends on the area available to the farm. The farming method should meet the ethological and physiological needs of the animals, thus allowing the expression of natural behaviour and ensuring adequate living conditions. The facilities for breeding must also ensure sufficient free space available to the animals and allow outdoor access, even in winter. Animals must be fed with vegetable products obtained by the organic production method, possibly grown on the farm. As for veterinary treatments, remedies should aim to stimulate the immune system of the animal. A maximum of two drug treatments per year are permitted.

Finally, there are many companies that, despite not joining standard or special certifications have voluntarily developed additional protocols containing measures to protect animal welfare.

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