European Animal Health & Welfare Research
COLLABORATIVE WORKING GROUP

Gap analysis on Animal Welfare research

Working toward common goal for researchers, farmers and the industry

Ministry of Health

Directorate general for animal health and medicinal veterinary product

Viale Giorgio Ribotta, 5

Rome, Italy

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Authors

Marina Bagni[1], Caryl Williams[2], Stefano Messori[1]

[1] Ministry of Health, Directorate general for animal health and medicinal veterinary product, Viale Giorgio Ribotta, 5, Roma, Italy

[2] DEFRA, Department for Environment, Food and Rural Affairs, Area 5B, Nobel House, 17 Smith Square,
London, SW1P 3JR

Collaborators

SCAR Collaborative Working Group Animal Health and Welfare Research.

SCAR CWG Animal Health and Welfare Research

Coordinator: Marina Bagni (Italian Ministry of Health)
Deputy Coordinator: Hermann Schobesberger (University of Veterinary Medicine, Vienna)
Management team: Romano Zilli (Istituto Zooprofilattico Sperimentale del Lazio e della Toscana), Stefano Messori (Italian Ministry of Health), Eda Flores (Istituto Zooprofilattico Sperimentale del Lazio e della Toscana).
Former coordinator: Alex Morrow (DEFRA)
AW sub-group (co-chairs): Françoise Divanach (Ministry of Economic Affairs, the Netherlands), Alain Boissy (INRA, France)

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Aim

There is an increasingly wide gap between research and industry, particularly for what concerns animal welfare science. The lack of agreed Strategic Research Agendas on the issue adds to this problem, since no consensus was reached among stakeholders in the sector. The divergence of aims between these parties might slow down progresses in the sector.

A consensus between industry and researchers in the identification of research gaps and future research priorities, taking into account their different perspectives, would provide an ideal platform for progressing animal welfare and providing clear benefits to industry and to consumers. Agreement on animal welfare research priorities would also facilitate the move towards the common good by improving animal health and welfare, profitability, environmental and production sustainability and consumer acceptance. In addition, research provides to policy makers the information necessary to ensure the regulatory framework on animal welfare being based on scientific evidences.

The aim of this work is to map, from relevant and reliable information sources, emerging research gaps on animal welfare, in order to define research priorities and to reach agreement on these within a broad number of stakeholders, including farmers, the industry, and researchers. In addition, the work will contribute to improving/establishing a better communication and synergies between the public and private stakeholders in order to promote research as an investment in the future (putting it at the centre of an EU plan for smart, sustainable and inclusive growth and jobs).

This report contains the methodology implemented for identifying gaps and future research needs, and provides an overview of the main results of the study.

Background

Contributors: Marina Bagni, Stefano Messori

The progressive reduction of public funding, as well as the increasing need for preparedness for emerging issues, make the prioritisation and coordination of research and the prevention of unnecessary duplication a fundamental priority.

In recent decades, several initiatives have been undertaken in the EU towards creation developing a coherent European research area and improving research coordination. In the animal health and welfare fields, a major role was played by the Collaborative Working Group (CWG) on Animal Health and Welfare Research of the Standing Committee on Agricultural Research (SCAR).

The SCAR has been a major catalyst for the coordination of national research programmes, where it helped initiate an integrated European Research Area. One of the aims of the SCAR is to progress the public-public and public-private collaboration in delivering innovation that tackles new challenges in the bio-economy area, which is linked with the growth-oriented approach of the Horizon 2020 Programme. The most strategic and final aim of SCAR is to provide research and innovation related policy advice toward research programme managers at national and EU level.

Several thematic CWGs are working under the SCAR, with the aim of coupling research and innovation and removing barriers to innovation in more specific areas. The development and implementation of Strategic Research Agendas (SRA), based on a common vision of how to address major challenges in the field of agricultural research, is one of the main activities of these CWGs.

The CWG on Animal Health and Welfare Research (AHW), (established in 2005 and coordinated by the Italian Ministry of Health since September 2015), is specifically committed to promoting the sharing of information, implementing research coordination and developing a strategic outlook on animal health and welfare research. Several actions have been initiated through EU funded initiatives primarily focussing on animal health. These included three networks between research funders on animal health: the EMIDA ERA-Net (European Research Area Network on Emerging and Major Infectious Diseases of Livestock 2008-2011), the STAR-IDAZ Global Net (Global Strategic Alliances for the Coordination of Research on the Major Infectious Diseases of Animals and Zoonoses, 2011-2015) and the ANIHWA ERA-Net (European Research Area Network on Animal Health and Welfare, 2012-2015). Animal welfare was included in the ANIHWA ERA-Net.

Strategic Research Agendas (SRA) were produced in all of these initiatives. EMIDA represented one of the very first experiences in attempting to define research needs on animal health with a participative approach across Europe, delivering a European SRA on animal health. The STAR-IDAZ project, on the other hand, aimed at improving research coordination on the major infectious diseases of livestock and zoonoses globally, and at the building of a global SRA, represented the starting point to reach this aim. To get to a common SRA, foresight studies were gathered worldwide, where available, or initiated. ANIHWA produced its own SRA as well, involving a wide range of researchers and research funders. This SRA, while updating the EMIDA one regarding animal health, will also cover animal welfare in its scope.

Research needs and priorities on animal welfare were identified in the frame of other relevant sources of information, but this knowledge is not aggregated and not easily available to final users (i.e. research funders and industry). In order to be able to provide guidance on research areas and to obtain an agreement on priorities, relevant information will need to be aggregated and presented in a usable way to the end users, who will then be able to properly evaluate these needs and provide a ranking.

The lack of data is not the only barrier to the delivery of research innovation in the field on animal welfare. Several studies, including the ones conducted by the CWG AHW, highlighted as an increasingly wide gap in priorities between animal welfare research and stakeholders (mainly farmers and industry) , which is compromising progresses on the issue. In recent years, much of the delivered research was perceived by the zootechnical sector as not usable in the field due to high costs and lack of practicability. The lack of a proper communication platform between the stakeholders seems to be a major flaw of the system, compromising progress on animal welfare.

New synergies between public and private are much stimulated under the Horizon 2020 programme as well, which promotes research as an investment in the future and puts it at centre of EU plan for smart, sustainable and inclusive growth and jobs.

In progressing this framework, the identification and collection of agreed research needs on animal welfare, and their discussion and prioritisation through expert elicitation and focus group with the industry would contribute to the filling of the existing gaps and providing a starting point toward the first agreed international research agenda for the sector.

Methodology

The implemented methodology consists of several steps, each providing the basis for the following one:

- Desk study
- Prioritisation of the research needs
- Identification of main prioritisation outcomes
- Focus group

A detailed description of each phase is described below.

Desk study

Contributors: Stefano Messori

Animal welfare is an issue of growing interest, especially in western societies. In Europe, over the last ten years, animal welfare is growing at a double rate as compared to animal health research. In addition, several international bodies and organisations are putting efforts in providing useful tools to improve it.

The current analysis initially focused on the collection and analysis of documents issued by international organisations so as to start from positions already agreed by representatives of the sector rather than on the opinion of individuals (*i.e.* single scientific publications were excluded). In addition, only documents that referred explicitly to having identified research gaps or research needs were considered.

An online research was performed, collecting documents from the following bodies:

- World Organisation for Animal Health (OIE);
- Food and Agriculture Organization of the United Nations (FAO);
- European Commission (DG SANCO/DG SANTE);
- European Food Safety Authority (EFSA);
- Federation of Veterinarians of Europe (FVE).

In addition, other sources of information were analysed:

- outcomes of relevant EU funded projects (Welfare Quality, AWIN, AWARE, ANIHWA ERA-Net);
- opinions issued by relevant stakeholder representatives (Copa-Cogeca);
- European legislation concerning animal protection and welfare.

Despite the relatively broad number of sources investigated, only a few documents outlying research needs or gaps were identified and for inclusion in the study, and used in the subsequent steps.

All the selected documents were analysed in order to extract information on research gaps or new research needs. Whenever possible, research gaps were translated into research needs. The identified research needs were included in a matrix table, according to the species and topic (i.e. with reference to the production destination or phase) to which these applied. The blank matrix is shown in **Table 1**. A separate line was added for each identified research need, for each species.

	Early life	Breeding stock	Rearing: indoor housing	Rearing: outdoor housing	Rearing: general	Transport	Slaughter	Killing	Other
Cattle_ Dairy									
Cattle_ Meat									
Equids									
Fish									
Fur									
Pigs									
Poultry_ Broiler									
Poultry_ Laying Hens									
Poultry_ Other									
Rabbits									
Reindeer									
Sheep_ Dairy									
Sheep_ Meat									

Table 1: Research need categorisation matrix.

The outcomes of this phase were circulated in April 2016 with the CWG AHW Members, who shared the list with national experts, who provided additional suggestions for the integration of the research need list, which were integrated in the list over the following months. The updated list, finalised in September 2016, was used as a basis for the following phases.

Research need prioritisation

Contributors: CWG AHW Members and selected experts

The prioritisation was performed in October 2016, involving specialists belonging to the SCAR CWG AHW. A dedicated survey was developed, in order to harmonise data collection, and circulated among all CWG AHW members, which were requested to contact relevant experts in the sector to provide the ranking. Prior to performing the exercise, the group was informed about the methodology development and of the expected results and aim of the exercise.

The experts were requested to provide scoring at three different levels:

- *Animal species/categories*: Experts were asked to provide a scoring, ranging from 1 (low priority) to 5 (high priority), for each of the listed animal species/categories.
- *Main topic/areas*: Experts were asked to provide a scoring, ranging from 1 (low priority) to 5 (high priority), for each of the listed main topic per each animal species/categories.
- *Research needs*: Experts were asked to provide a scoring, for each of the research needs presented on the list, on two aspects:

- *Animal Welfare relevance*: how much relevant is the research need, for which concern the ensuring of an improved AW status to the given species (1: low relevance; 5: high relevance)? Would the filling of this need ensure a better animal protection, or at least contribute to it, as compared to the current situation?
- *Urgency:* how much urgent is the filling of this gap (1: low urgency; 5: high urgency).

All experts received an Excel file containing different sheets, each containing all the identified research needs for one animal species/category, classified accordingly to the main topic, and containing the reference to the source from which the needs was extracted. On the right side of each Excel sheet, two columns were added to allow the ranking according to animal welfare relevance and urgency. One additional Excel sheet provided the possibility of ranking the relevance of the animal species/categories and of the topics per each species (**Tables 2** and **3**).

	Score
PIGS	
SHEEP_Dairy	
SHEEP_ Meat	
CATTLE_ Dairy	
CATTLE_ Meat	
POULTRY_ Broiler	
POULTRY_laying hens	
POULTRY_other	
EQUIDS	
RABBITS	
FISH	
FUR	
REINDEER	

Table 2: List of the animal species/categories to be ranked by the experts.

	Early life	**Breeding stock**	**Rearing: indoor housing**	**Rearing: outdoor housing**	**Rearing: general**	**Transport**	**Slaughter**	**Killing**	**Other**
Cattle_ Dairy									
Cattle_ Meat									
Equids									
Fish									
Fur									
Pigs									
Poultry_ Broiler									
Poultry_ Laying Hens									

Poultry_ Other									
Rabbits									
Reindeer									
Sheep_ Dairy									
Sheep_ Meat									

Table 3: List of the main topics to be ranked by the experts for each animal species/category.

Identification of main prioritisation outcomes

Contributors: Marina Bagni, Caryl Williams, Stefano Messori

The identification of the main prioritisation outcomes was performed in early November 2016, based on the outcomes of the research prioritisation returned on foot of the consultations.

The received scorings were collected and averages were calculated. Specific criteria were set for selecting the main priorities, using a funnel system:

1. *Animal species/categories*: selection of all species/categories with average scoring being > 4.0
2. *Main topic/areas*: : selection, for each priority species, of all topics with average scoring being > 3.5
3. *Research needs*: selection, for each priority topic of the selected species, of the needs with average AW scoring being > 4.0 **and** urgency scoring being > 3.5

The different thresholds of this multistep selection process were selected to identify a suitable number of research needs that could be discussed during a 3-hour focus group session. The selected needs, together with background information, were provided as guidance to the focus group participants.

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Focus group

Contributors: Marina Bagni, Caryl Williams, Stefano Messori

Focus groups are used as a qualitative method in the field of human and social sciences, where a group of persons are invited to talk, discuss and share opinions about their perception about a particular issue. Interactive questions are presented to participants who then interact with each other, but are guided by a facilitator who present questions to participants while encouraging the free flux of ideas.

Stakeholders representing the farming sector, the food industry (i.e. meat, milk, and egg sectors), as well as researchers, were involved in this phase. The panel was selected according to the main outcomes of the prioritisation to ensure that participants would have the relevant expertise. Representatives of umbrella organisations were selected as much as possible representing different European countries.

The focus group was composed by 11 participants (5 from the research filed and 6 from the dairy, pork and poultry industry), and met for 3.5 hours on the 16th of November 2016, in London. Three facilitators supported the group meeting. Using the main prioritisation outcomes as a basis, the group discussed the main research priorities in an interactive way.

Particular efforts were dedicated in aligning the obtained outcomes to the European legislative framework on animal welfare, to ensure the delivery of research needs being in line with the norms in place and improving the implementation of current legislation.

The meeting was recorded as to ensure a good uptake of the discussion. The information gathered in the course of the meeting was analysed by the facilitator, and reported.

Results

Contributors: Stefano Messori, Marina Bagni

The **desk study** was concluded on July 2016. In addition to the bibliography, eight CWG AHW member countries provided experts which contributed to the research needs identification. Overall, 437 research needs were identified. Most needs were identified for pigs, followed by poultry, cattle, rabbits, small ruminants, equid, fish, fur animals and reindeer. The vast majority of needs were concerning the rearing of animals (207), followed by slaughtering/killing (84), transport (53), young animals (36), breeding stock (32) and other issue (25).

Twelve CWG members participated in the **prioritisation**. This exercise allowed selection of four main species/categories of animals, to focus for: pigs, laying hens, broilers and dairy cattle. For each of these species, the list of the highest priority topics (and relative scoring) is provided below, in **Table 4**.

PIGS	Average	POULTRY_ laying hens	Average
Slaughtering	4.3	Rearing: indoor housing	4.2
Early life	4.2	Rearing: general	4.1
Rearing: indoor housing	4.1	Slaughtering	4.0
Rearing: general	3.8	Breeding stock	3.8
Transport	3.7	Killing	3.6
Rearing: outdoor housing	3.6	Transport	3.6
Breeding stock	3.4	Rearing: outdoor housing	3.4
Killing	2.6	Early life	3.1
Other	n.a.	Other	2.0
POULTRY_ Broiler	**Average**	**DAIRY CATTLE**	**Average**
Breeding stock	4.2	Rearing: indoor housing	4.1
Rearing: indoor housing	4.1	Rearing: general	4.1
Transport	3.7	Breeding stock	3.7
Slaughtering	3.7	Early life	3.4
Rearing: general	3.6	Rearing: outdoor housing	3.2
Killing	3.4	Transport	3.1
Rearing: outdoor housing	3.4	Slaughtering	3.1
Early life	3.0	Killing	2.4
Other	2.0	Other	1.0

Table 4: Highest priority topics selected for the three main animal categories (in green).

For each of the priority topics identified for the four main animal species/categories, specific research needs were selected, based on their animal welfare and urgency scoring. The selected ones (which are presented below, divided by animal categories, in **Table 5**) were presented and discussed at the focus group. Some additional ones, that met the criteria for inclusion for animal welfare relevance but scored lower for urgency, were also included, to allow the focus group members to have a broader view of the situation.

(a)	RESEARCH NEEDS: Pigs	AW	URGENCY
Rearing: general	The development and implementation of automatic data recording systems for animal-based measures should be encouraged, as well as information on appropriate analyses and interpretation of the collected data to allow the early detection of potential problems (EFSA 2012e)	**4.8**	**4.4**
Rearing: general	As an adequate management would benefit from improved early detection of tail biting outbreaks, research on the better understanding of the causal factors leading to tail biting (EFSA 2007c)	**4.3**	**3.0**
Rearing: general	Validation of a practical on farm assessment protocol for functionality of manipulable material based on behavioural measures should be carried out, in order to provide a sensitive tool-box measure for use also in docked pigs (EFSA 2014a)	**4.3**	**2.8**
Slaughtering	Aversion to gas mixtures and the mental state of animals during the induction of unconsciousness with gas mixtures need further evaluation to develop humane mixtures and to facilitate better understanding and determination of suffering in animals (EFSA 2004a)	**4.3**	**4.3**
Rearing: general	There is a need for further studies to provide guidance on how to house and manage undocked pigs under different farm circumstances without uncontrollable tail-biting outbreaks (EFSA 2014a)	**4.2**	**3.6**
Rearing: general	The further development and validation, from robust epidemiological data, of decision-support tools for customised assessment of tail-biting risk factors on individual farms is strongly recommended. Such tools could assist farmers to identify, and prioritise correction of, the most important hazards for tail-biting on their own unit (EFSA 2014a)	**4.2**	**3.3**
Slaughtering	Combined methods needs to be evaluated as it may be possible to develop equipment for pigs to induce unconsciousness and insensibility with non-aversive gas mixtures and then to subsequently kill them with electric current (EFSA 2004a)	**4.1**	**4.0**
Transport	Studies of the space allowances required for good welfare of piglets, feeder pigs, sows and boars in order to validate allometric equations for different vehicles and thermal conditions; Fan-assisted ventilation should have adequate capacity to ensure thermal comfort (EFSA 2011)	**4.1**	**3.8**
Rearing: general	An objective assessment of the effect of tail docking on tail biting under different housing and management systems is recommended (EFSA 2007c)	**4.0**	**3.1**
Rearing: general	Further research should be carried out into the causal relationship between the general pig health and tail-biting risk (EFSA 2014a)	**4.0**	**3.2**
Transport	Effects of sea conditions on the welfare of pigs in roll-on, roll-off ferries (SCHAW 2002)	**4.0**	**2.8**

(b)	RESEARCH NEEDS: Laying hens	AW	URGENCY
Transport	Handling during transportation	4.5	4.0
Transport	Specific thermal limits for point of lay hens and end of lay hens (EFSA 2011)	4.3	3.8
Rearing: general	Further research is needed to establish why problems of bone fragility and breakage are high even when good design principles are met (EFSA 2005b)	4.3	4.0

Rearing: general	More research is needed on strategies to reduce keel bone damage and vent pecking (e.g. genetic selection, nutrition, management) so that perches can be used safely by all hens. Methods for improving the accessibility of perches, e.g. optimum position and design of ramps, should be investigated (EFSA 2015a)	4.3	4.0
Rearing: general	Research is required to determine the maximum acceptable levels of dust (total and respiratory) for laying hens. It should include studies on methods of minimising dust levels, especially those with small particle size (EFSA 2005b)	4.2	4.0
Breeding stock	Selection of female embryos (to avoid slaughter of one-day males)	4.2	4.5
Rearing: general	Research should be carried out to determine the maximum acceptable levels of ammonia for laying hens. It should include ways to minimise ammonia levels, especially in non-cage systems (EFSA 2005b)	4.1	3.9
Rearing: general	Research into the use of animal based measures (ABMs) needs to continue in order to increase the knowledge of specific ABMs in different species and scenarios, and should include the study of essential attributes. The results will support EFSA to move to a quantitative risk assessment of AW (EFSA 2015c)	4.0	4.5
Slaughtering	The minimum currents necessary to achieve effective stunning and killing need to be established. The impact of electrical stunning (head-only or water bath) current waveform, frequency and the amount of current on the depth and duration of unconsciousness induced in poultry need to be clearly established using neuro-physiological parameters to understand the effect of these variables (EFSA 2004a)	4.0	3.6

(c)	RESEARCH NEEDS: Broiler chicken	AW	URGENCY
Breeding stock	Reasons for footpad lesions and prevention of footpad lesions in broiler breeders and relation of footpad lesions and pain	4.3	4.0
Breeding stock	Understanding how to alleviate hunger in broiler breeders	4.3	4.0
Breeding stock	Further research on the relationship between hunger and feed restriction, as well as on better feeding strategies to better balance hunger and health problems and to reduce feed restriction is needed, to limit the negative welfare effects. This is particularly important in broiler breeder males (de Jong et al 2102)	4.2	3.0
Slaughtering	Aversion to gas mixtures and the mental state of animals during the induction of unconsciousness with gas mixtures need further evaluation to develop humane mixtures and to facilitate better understanding and determination of suffering in animals (EFSA 2004a)	4.2	4.3
Rearing: general	Studies are needed in order to develop practical methods for independent health and welfare surveillance and to objectively assess and record welfare indicators in broiler flocks (EFSA 2010)	4.0	3.8

Transport	There is a need for research to define ventilation regimes and loading strategies to ensure optimal air movement throughout vehicles for transportation of newly hatched chicks (EFSA 2011)	4.0	3.5

(d)	RESEARCH NEEDS: Dairy cows	AW	URGENCY
Rearing: indoor housing	Limited amount of scientific data linking the period per day of being tied in a tie stall to levels of disease and overall impact on welfare (EFSA 2009a)	**4.3**	**2.8**
Rearing: general	There is a need for in-depth analysis of the particular causes of lameness and development of automated locomotion scoring technology (ANIHWA 2015a)	**4.0**	**3.8**
Rearing: general	Research is needed to develop new ways to identify and quantify the complex links between (input) factors and welfare outcomes (consequences). This research would help in the choice of optimum combinations of measures for future welfare assessments. Such analyses will require access to large data sets.(EFSA 2012c)	**4.0**	**3.6**
Rearing: general	The effect on welfare of subclinical mastitis (demonstrated by increases in SCC without visible changes in the milk or the udder) should be further investigated (EFSA 2015b)	**4.0**	**4.0**
Rearing: general	A centralised database (platform) should be created where information on ABMs, sources and relevant documents, can be stored and shared. This platform would also promote communication and collaboration among scientists and with stakeholders (EFSA 2015c)	**4.0**	**4.2**
Rearing: indoor housing	Since leg and foot disorders are the major welfare problem for dairy cattle and leg and foot disorders are a problem even in well managed cubicle houses, alternatives to cubicles e.g. straw yards and improvements to cubicle house design should be considered (2009c)	**4.0**	**3.4**

Table 5 (a, b, c, d): The tables show the research needs for the four main species that were brought for discussion at the focus group. In green, the research needs meeting the selection criteria. The additional ones, that met the criteria for inclusion for animal welfare relevance but scored lower for urgency, are presented in yellow. For each research need, the original source is presented between brackets.

The **focus group** discussion allowed the identification of some more detailed priority research needs, some of which applied to all the selected species, while others were species/specific. These were further analysed by the facilitators, in order to put them in a format usable for research funders and research managers, and to be used for the implementation of Strategic Research Agendas. The outcomes are presented in **Table 6**.

ALL MAIN SPECIES
Investigate reliable welfare indicators, being suitable to be automatically collected, thus resolving the problem of data harmonisation.
Develop studies to investigate the economic advantage of earlier assessment of welfare related issues, as to

support the availability of farmers and other commercial stakeholders in sharing data.
Foster innovation and promote new approaches to solve problems that have been already identified but still lack adequate control measures (e.g. there is no necessity of new studies about the effects of dust levels at farm but focus on innovative ways to reduce dust).
Develop new research on positive welfare to build an evidence-base on the matter; although it would be a long way from being taken up by industry, it is important for the research pipeline to be set in to assess if moving forward or dismiss it.
DAIRY CATTLE
Investigate reliable indicators and biomarkers for dairy cattle lameness, especially for subclinical cases.
Develop studies to investigate the *peri-partum* period for the reduction of subclinical and production diseases focusing also on immunological competencies.
PIGS
Current stunning methods present flaws. There is need to conduct comparative analyses between the stunning methods in use to date (e.g. gaseous stunning) and new methods (e.g. LAPS) which could appropriate welfare levels.
Develop adequate dissemination and training materiel to allow the delivery of research results to end users.
Investigate the impact of sow prolificacy on piglets' welfare (e.g. viability, long term development effect), sows (e.g. metabolic pressure) and study strategies to find balance among the needs of piglets' and sows (e.g. restrain sow vs crushing piglets, number of udders).
BROILER
There is need to harmonise methods for automatic detection of foot pad dermatitis.
Hunger is a main welfare issue for broiler chickens. Genetic, as well as dietary, strategies should be investigated as to reduce the burden of this issue.
Current stunning methods present flaws. There is need to conduct comparative analyses between the stunning methods in use to date (i.e. gaseous stunning and waterbath stunning) and new methods (e.g. LAPS) which could appropriate welfare levels.
LAYING HENS
The killing of day old chicks is one of the main welfare issues in modern laying hens farming. Methods for the selection of female embryos should be investigated.
Implement studies to improve the docility of the animals which are housed in groups as well as to reduce bone fragility.

Table 6: List of the priority research needs for the most relevant species, as emerged from the analysis of the results of the focus group.

In addition to identifying priority research needs, other inputs emerged from the focus group discussion. It was interesting to notice that most experts referred, on several occasions, that in some areas the main problem was not the lack of knowledge, but the lack of political will (or commitment) to modify the current system in order to improve animal welfare. For example, other than the availability of relevant data, the lack of policies for data sharing, handling and management is one of the main limiting factors for the collection of ABM data, which would allow risk based interventions at farm level and the implementation of early warning system both at farm and slaughterhouse. According to the participants, the industry holds most of the relevant data and is reluctant to share it. The preferred way forward would be to stimulate an industry-driven process making clear how the sharing of this data would favour the sector at all levels, including the farmers (e.g. through better animal performance).

The industry participants highlighted that, even though some appropriate tools are already available to solve a specific welfare issue, these are not used in practice, due to other reasons (mainly economics). One common example highlighted related to transport. The participants recognised that, in order to stimulate the industry to adapt to new technology, economic levers would be necessary.

Conclusions

Contributors: Marina Bagni

The promotion of the direct participation of different stakeholders, such as industry, in drafting research and science policy was one of the goals of this exercise. The effectiveness of scientific communication depends on the quality of relationship between participants and in particular the level of trust among those involved: experts, institutions and all the intermediate subjects and stakeholders. Relationships can also be compromised for other reasons, such as the knowledge gaps between the stakeholders (e.g. an inequality of scientific understanding between participants, overuse of scientific jargon by experts when disseminating information to non-experts). Knowledge must be strengthened among stakeholders and the confidence in the institutions involved in the veterinary research, disease prevention and control must be reinforced. One of the possible strategies could be in placing scientific data at stakeholders' disposal, in a correct, clear and understandable way.

Awareness on the issues led us to perform a gap analysis of research needs using focus groups which are widely used in social science investigations. These allowed us to approach the task in a different way and obtain a wide and complete perception of priorities from stakeholder. We found the exercise highly beneficial for extracting views on animal welfare and recommend its use be considered for other areas.

Some critical areas for research emerged through this exercise, and are listed in the results. Different priority issues were identified for the different species, but some common area seems to exist, such as the identification of new reliable methods for assessing animal welfare. Improving stunning methods appeared as another transversal issue, concerning both pigs and poultry.

Lastly, this exercise highlighted that research gaps are not the only limiting factor to the improvement of animal welfare. In fact, policy and economic issues were often mentioned as a major impairment, especially in some areas. Raising the awareness of the industry concerning the advantages for the sector of improved animal welfare standards, as well as identifying innovative solutions for increase market values of products or win - win solutions, providing advantages at the animal performance level and on AW, would prove beneficial for increasing the uptake of technological solutions and the use of data.

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