

Care and Welfare Oversight of Agricultural Animals Used in Agricultural Research



The Need for Agricultural Animal Research

Agricultural animal production is predicted to continue to grow as the world's population expands to 9.7 billion by 2050¹, largely because of increased dietary reliance on livestock and poultry products, including meat, milk and milk products, and eggs, in developing countries² (see Figure 1). Despite progress made to date in advancing livestock and poultry production practices, there are still many knowledge gaps in areas such as sustainable production systems, animal disease and eradication or prevention strategies, animal nutrition, and improved management practices, and research to support agricultural animal production is common. In addition, because animal production may shift in the future to countries with emerging economies, additional research will likely be needed to deal with alternative husbandry arrangements and eradication strategies for parasites and other disease agents affecting livestock and poultry that have not been well studied to date.

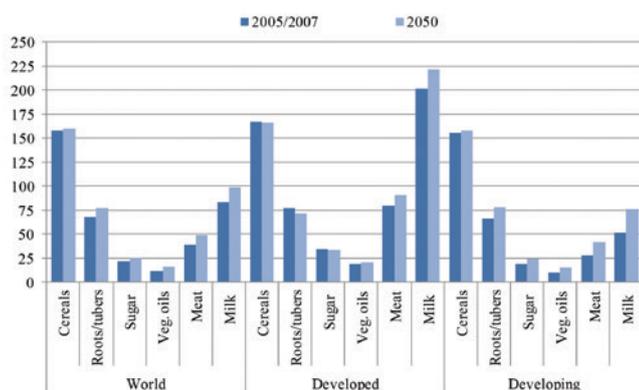


Figure 1: FAO prediction of world food commodity group consumption trends to 2050².

Agricultural species investigated for these purposes include cows, pigs, small ruminants such as sheep and goats, camelids, fish, and in particular, poultry; all vertebrate species that are widely considered to be sentient^{3, 4, 5}. In many countries around the world, this type of agricultural research is conducted completely or in part at federal- or state-owned research farms or centres, and on commercial herds or flocks. Because the purpose of this type of research is considered to be different from more traditional laboratory animal-based studies, the care, husbandry, and research oversight of agricultural animals used in these settings can be very different from that expected for the same species being maintained for biomedical research in traditional laboratory animal vivaria. For example, agricultural animal-based studies for food, fibre or other types of production-related research (e.g., determining efficient methods for animal

depopulation) may not require written protocols for animal use, ethical merit review or consideration of 3Rs principles, and the facilities or farms at which this research is conducted may not receive regular site visits or animal welfare audits by animal ethics committees, even in countries with developed economies (see 6, for example). This lack of comparable oversight has drawn significant public attention and criticism at times when deficiencies in the care and use of animals in agricultural research have come to light.

International Expectations for Humane Oversight of Agricultural Animals Used in Research

The World Organization for Animal Health (OIE), which consists of 180 member countries of a possible 196 from around the globe, defines basic standards and expectations for research animal care in Chapter 7.8 of the Terrestrial Animal Health Code⁷. All OIE member countries are expected to adhere to the conditions laid out in the Code. The OIE considers all research uses of any animal species covered in the Terrestrial Code, excluding honey bees but including livestock and poultry, to require similar principles of consideration and care. At the most basic level, these conditions include:

- implementing a formal institutional oversight system to conduct a priori review of proposed animal research, including consideration of ethical issues associated with the proposed research and acceptability of animal facilities where research animals are kept, as determined by annual facility site visits;
- assurance of specific training and competency by all personnel caring for, overseeing the care of, or using the research animals;
- provision of appropriate veterinary care to the research animals;
- ensuring that the research facilities and environmental conditions under which the animals are kept and housed are appropriate;
- assuring that the care and welfare of the animals are enhanced by good husbandry practices, including the use of appropriate resources to enrich the environment; and
- careful transportation of the research animals, when needed, to minimise adverse and unnecessary stress that they may experience⁷.

While it is beyond the scope of this article to consider all of the above programme elements in detail, two of them merit further consideration; ethical oversight of livestock and poultry use in agricultural research and personnel competence. Standards for humane care and ethical oversight of agricultural animals used in biomedical research are well-established in many countries⁸ as are public expectations

for appropriate animal welfare standards for livestock and poultry production^{9, 10}. It is not surprising, then, that specific guidelines have been developed in several countries and regions that define requirements for the care of farm animals used in agricultural research settings (for example, see 11, 12). In all cases, the use of agricultural animals in research must be scientifically justified and animal use should not occur if non-animal means are available that can achieve the same research objectives. Because the public contributes to federal and state research funding initiatives through taxation, it is especially important that federal- or state-funded agricultural research projects and agricultural research conducted by federal or state agencies occur with an eye towards public accountability and transparency, and include ethical review of the research being considered.

Ethical Review and Oversight of Agricultural Animal Research

Ethical reviews of the proposed animal research must be conducted formally by an animal ethics committee (AEC), which should consist, at a minimum, of an animal scientist, a veterinarian experienced in the type of research being reviewed, and a lay member of the public who represents community interests, but who is not an animal researcher and not otherwise affiliated with the research institution⁷. A written protocol for animal use that includes detailed information about experimental objectives and study design, experimental procedures, methods to minimise pain and distress, consideration of alternatives, refinements, humane endpoints, and final animal disposition must be prepared and reviewed by the AEC in advance of the work being initiated as well. Any substantive protocol changes following AEC approval should also be reviewed. In addition to contributing to the humane care and ethical use of agricultural animals, a *priori* scientific and ethical review of a project can contribute to research project quality, which helps to ensure that the research results can be published and disseminated through the peer-review process to the wider scientific community. Lack of publication of research findings can result in a waste of research funds and tax dollars, and unnecessary repetition of animal experiments by other researchers or agencies who are unaware of the research that has already been conducted in a field.

The principles of the 3Rs (replacement, reduction, and refinement) have become ingrained in the consideration of animals used in biomedical research and should also be used when considering research conducted with agricultural animals. While it may be difficult to reduce animal use when research trials are being conducted at a herd or flock level, appropriate estimates of sample and group sizes should be provided to the AEC. When invasive procedures or practices are being evaluated, the least number of animals should be used to obtain the scientific objectives, and pilot studies should be conducted first, to help accurately characterise sample sizes and expected outcomes, and to determine appropriate humane endpoints. Agricultural animal researchers and research facilities housing agricultural species are ideally poised to be leaders in refining common agricultural practices and improving farm animal welfare. This includes routinely

implementing the use of anesthetic and/or analgesic agents for common farm animal procedures, such as tail docking, dehorning, and castration; exploring the provision of various resources, housing options, and environments to animals to ensure animal comfort and permit expression of natural behaviours; and developing and promoting humane animal handling and transportation practices.

The final consideration for ethical oversight of agricultural animal research is the need for visits on at least an annual basis to the agricultural animal housing facilities or farms by the AEC. Whenever possible, this should occur when animals are present; however, facilities should still be visited if animals cannot be present, because it is common for agricultural animal research to occur on a cyclical basis and facilities should be in a state of readiness and good repair for future expected studies. Any findings that may adversely impact animal welfare or worker safety noted during these visits should be documented and sent to the responsible institutional employee and/or official for timely correction. In countries or regions in which animal research oversight is conducted by government- or state-funded agencies, consideration should be given to implementing independent, third-party research animal welfare audits for federal- or state-owned animal research facilities, to reduce the possibility of assessment bias and to enhance public transparency. AAALAC, International (www.aaalac.org) is an example of a not-for-profit organisation capable of conducting agricultural research animal welfare assessments. Facility visits are an important aspect of research quality assurance and can contribute significantly to animal health, safety, and comfort.

Personnel Training and Competence in Working with Agricultural Animals

Agricultural animal wellbeing will be significantly enhanced if personnel working with them are well-trained in humane, low-stress animal handling techniques. Personnel working with livestock and poultry in research settings should be closely supervised until competency is achieved and any training should be documented. Where appropriate, positive reinforcement training can be used to encourage animal compliance with research techniques. Use of these training techniques often increases the bond between animal husbandry caregivers and research team members and the animals they are working with. These bonds contribute to better and lasting care of animals used in research projects and should be encouraged¹³. As individuals become more familiar with particular species, opportunities may arise for personnel to refine research techniques to reduce animal discomfort and stress, for example, development of alternative less invasive dosing or bleeding techniques. As long as these new techniques are discussed in advance with researchers and the veterinarian and they do not interfere with the nature of the research being conducted, they should be implemented widely.

It is critical that those working with livestock and poultry in research settings be knowledgeable about species-specific behaviour, including the ability to recognise animal distress, pain, illness, and injury. This will ensure that animals that

are suffering are identified early and treated without delay. Having a solid foundation in animal behaviour will also permit personnel to determine whether provision of certain resources or environmental improvements are having a beneficial effect on overall animal wellbeing. Similarly, veterinarians providing support for livestock and poultry used in research must be competent and familiar with the species they are working with, in addition to being well-versed in local, regional, and/or national legislation and regulations concerning research animal care and use. The veterinarian plays an important role in advising the AEC about various animal procedures and husbandry needs, experimental refinements, alleviation of pain and distress, development of humane endpoints, and appropriate methods of euthanasia, and they should understand the full scope of their responsibilities and duties when working in research settings. Global recommendations for training of veterinarians working in research animal facilities are available¹⁴.

Conclusions

There are clear international expectations for the care and use of farm animals in agricultural research, which are very similar to those in place for traditional laboratory animal species used in biomedical research settings. While aspects of animal husbandry and environmental management may differ in production animal settings, there should be no substantive differences in the process for ethical review of proposed research or oversight of research animal care and use. All personnel working with agricultural animals in research settings must be competent and knowledgeable to ensure that animal care is optimised. In addition, adequate veterinary care must be available during regular working hours as well as after hours to ensure that animals are well cared for and remain in good health. While the additional costs associated with having an appropriately staffed animal facility may be viewed as a detractor, this is balanced by the moral imperative to provide good care to animals used for research purposes and the need to ensure that all research conducted with animals is of high quality. Federal and state funding agencies and federally- (or state-) operated agricultural animal research facilities have an additional level of accountability to the public and must ensure that research conducted under their oversight occurs with all due consideration for animal wellbeing, with appropriate resources, and with sufficiently independent animal ethical oversight. In this way, the public can be assured that the research is necessary and is being conducted with appropriate care.

References

1. United Nations, Department of Economic and Social Affairs, Population Division (2015). World Population Prospects: The 2015 Revision, Key Findings and Advance Tables. Working Paper No. ESA/P/WP.241.
2. Alexandratos N, Bruinsma J. 2012. World agriculture towards 2030/2050: the 2012 revision. ESA Working paper No. 12-03. Rome, FAO.
3. Canadian Council on Animal Care. 1993. Guide to the Care and Use of Experimental Animals, Vol 1. CCAC, Ottawa, ON. http://www.ccac.ca/Documents/Standards/Guidelines/Experimental_Animals_Vol1.pdf Last accessed Feb 4, 2016.
4. Treaty of Lisbon amending the Treaty on European Union and the Treaty establishing the European Community. 2007. OJ C 306/1 http://publications.europa.eu/resource/cellar/688a7a98-3110-4ffe-a6b3-8972d8445325.0007.01/DOC_19 Last accessed Feb 4, 2016.
5. National Research Council. 2011. Guide for the Care and Use of Laboratory Animals, 8th ed. National Academy Press, Washington, DC. <http://www.nap.edu/catalog/12910/guide-for-the-care-and-use-of-laboratory-animals-eighth> Last accessed Feb 4, 2016.
6. U.S. Agricultural Research Service. Findings and Recommendations on the Animal Care and Well-Being at the U.S. Meat Animal Research Center to the Secretary of Agriculture and the REE Under Secretary. Pre-Public Hearing Report Date: March 9, 2015. http://www.ree.usda.gov/ree/news/USMARC_AWHR_Panel_Report_PrePublic_Hearing_030602015.pdf Last accessed Feb 4, 2016.
7. OIE. 2015. Terrestrial Animal Health Code, 24th ed, Vol 1, Chapter 7.8 Use of animals in research and education. http://www.oie.int/index.php?id=169&L=0&htmfile=chapitre_aw_research_education.htm Last accessed Feb 4, 2016.
8. Thulin JD, Underwood WJ. 2015. IACUC Considerations for the Use of Livestock in Translational Research. *ILAR J.* 56(1):139-46.
9. Swanson JC. 2008. The ethical aspects of regulating production. *Poult Sci.* 87(2):373-9.
10. Council Directive 98/58/EC concerning the protection of animals kept for farming purposes. OJ L221/23. <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31998L0058&from=EN> Last accessed Feb 4, 2016.
11. Canadian Council on Animal Care. 2009. Guidelines on the Care and Use of Farm Animals in Research Teaching and Testing. CCAC, Ottawa, ON. http://www.ccac.ca/Documents/Standards/Guidelines/Farm_Animals.pdf Last accessed Feb 4, 2016.
12. Guide for the Care and Use of Agricultural Animals in Research and Teaching, 3rd ed. 2010. Federation of Animal Science Societies. http://poultryscience.org/docs/ag-guide/Guide_for_the_Care_and_Use_of_Agricultural_Animals_in_Research_and_Teaching_3rd_ed.pdf Last accessed Feb 4, 2016.
13. Bayne K. 2002. Development of the human-research animal bond and its impact on animal well-being. *ILAR J.* 43(1):4-9.
14. Bayne K, Bayvel D, MacArthur Clark J, Demers G, Joubert C, Kurosawa TM, Rivera E, Souilem O, Turner PV. 2011. Harmonizing Veterinary Training and Qualifications in Laboratory Animal Medicine: A Global Perspective. *ILAR J.* 52(3):393-403.



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