Advancing animal welfare science: How do we get there? – Who is it good for?

UFAW International Symposium 2019
3rd-4th July 2019
Site Oud Sint-Jan, Bruges, Belgium

Biographies of keynote speakers

Dr Joseph Garner
Stanford University, USA
'From expediency to necessity: Why science without welfare thinking isn't science worth doing'

Department of Comparative Medicine, and by courtesy, Department of Psychiatry and Behavioral Sciences
Stanford University
Stanford
California
USA

Laboratory animal welfare has traditionally used expediency to argue for changes in policy or practice – i.e. we have argued that "good welfare is good business" (e.g. in the case of nesting material), or that "good welfare is good science" (e.g. in the case of positive reinforcement training primates). This talk will argue that good welfare is a necessity – that science without welfare thinking isn't science worth doing, as evidenced by the current reproducibility and translatability crisis.

The scale of the reproducibility and translatability crisis is now widely understood beyond the small number of researchers who have been studying it and the pharmaceutical and biotech companies who have been living it. This talk will make the case that this is not a time for despair, but a time of intellectual excitement and hope, and that lab animal welfare is central to understanding and resolving both crises. The emerging literature on these issues contains recurring themes which represent a paradigm shift, and thus potentially the birth of a new discipline (which we have proposed be termed "therioepistemology"). At the micro level this is a shift from asking "*what have we controlled for in this model?*" to asking "*what have we chosen to ignore in this model, and at what cost?*" At the macro level, it is a shift from viewing animals as tools or reagents, to viewing them as patients in an equivalent human medical study.

The shift to viewing animals as patients forces us to not only consider their welfare, but also to consider how their welfare impacts science itself. Thanks to the groundwork laid over the last 15 years by a variety of authors, we not only understand many of the causes of poor reproducibility and translatability, but we also know the features of animal work that lead to reproducible work with a good chance of translation. This talk will outline six questions that serve as a heuristic for critically evaluating animal-based biomedical research for opportunities to make this shift in perspective. Of these six questions, one explicitly focusses on welfare, but in fact all six can be viewed as different perspectives on the welfare of the animals involved at the individual, model, and population levels. Accordingly now is a time for action where we manifest change in the *status quo* of how animal research is done, and in this new approach, good welfare is not expedient, it is necessary.

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The overarching theme of Joe's research is understanding why most drugs (and other basic science findings) fail to translate into human outcomes, the role that animal models and methodology play in in these failures, and developing new approaches to improve the translation and benefits of animal research while minimizing welfare impacts. Joe is an Associate Professor in the Department of Comparative Medicine, a Courtesy Associate Professor in the Department of Psychiatry and Behavioral Sciences, and a member of the Child Health Research Institute at Stanford University. Joe runs Stanford's Technique Refinement and Innovation Lab,

Further reading:

Garner JP, BN Gaskill, EM Weber, J Ahloy-Dallaire and KR Pritchett-Corning 2017 Introducing Therioepistemology: The study of how knowledge is gained from animal research. *Lab Anim (NY) 46(4):* 103-113. http://dx.doi.org/10.1038/laban.1224

Garner JP 2014 The significance of meaning: why do over 90% of behavioral neuroscience results fail to translate to humans, and what can we do to fix it? *ILAR Journal 55(3):* 438-456. http://dx.doi.org/10.1093/ilar/ilu047
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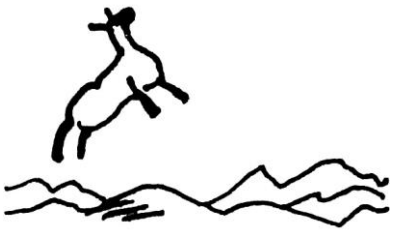

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which provides 3Rs support services for researchers on campus. Joe is an internationally recognized expert in the behavior and welfare of laboratory mice, including awards from the National Center for the 3Rs (UK), the American Association for Laboratory Animal Science, the Swiss Laboratory Animal Science Association, and the Universities Federation for Animal Welfare. Joe also works extensively in human health, both as a researcher and an advocate. Joe's current human health research is focused on animal and human studies in autism, trichotillomania, and compulsive skin-picking. The question driving all of this work is "Why does one sibling become ill and another does not?", and the goal is to identify biomarkers leading to screening, prevention and personalized treatment options. Joe's advocacy work includes service on scientific advisory boards for the Trichotillomania Learning Center, the Tourette Association of America, and the Beautiful You MRKH Foundation.

Joe's work is available via a number of different websites:
Stanford website: med.stanford.edu/profiles/Joseph_Garner
Papers: scholar.google.com/citations?user=JThS8LMAAAAJ
Mouse ethogram: www.mousebehavior.org
TRI-Lab: http://med.stanford.edu/compmed/research/services.html

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Professor Linda Keeling
Swedish University of Agricultural Sciences, Sweden

'Assessing animal welfare: biology, methodology and technology'

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Swedish University of Agricultural Sciences
Uppsala
Sweden

This talk highlights some of the advances to identify aspects of an animal's biology that are relevant when assessing its welfare, as well as some of the challenges that still remain. I will also present examples of different methodologies and technologies already used in commercial practice to monitor animal welfare, those on their way to be implemented, and speculate about some new areas in the future.

Using technology to monitor and control the housing environment is routine on most farms and it is increasingly being used to collect animal-based measures on farm, during transport and at slaughter. Thanks to these new technologies, and modifications of existing ones, we can record relevant outcome indicators at the individual and group level quicker and more often. Whereas a decade or so ago, the limiting factor was the time needed to collect animal-based measures, the only limitation now seems to be the time needed to analyse them. Besides benchmarking levels of particular indicators, continuous data collection allows us to detect small deviations in an indicator and this has opened a new world of possibilities regarding early warning and notification systems. The potential to collect large amounts of behavioural data is also contributing to our understanding of individual differences and, perhaps in the future, to new animal-based welfare indicators.

Continuing to look to the future, it is of interest to speculate on how this big data on outcome indicators from animals can be used together with data on the housing and management to improve animal welfare risk assessment. This may lead to new advice on how better to prevent problems, but how far into the future is smart housing, that responds in real time to evidence on how well animals are coping? It is also interesting to speculate, given the money potentially to be made from market differentiation and niche products, that this information on the animal may have a market value in its own right, and not only as a tool for the farmer. Also, how can indicators of animal welfare be linked with indicators of environmental sustainability and sustainable development in general?

In summary, there are many new and exciting possibilities in the area of animal welfare assessment. In our rush to use these new technologies and big data, it is nevertheless important to not only collect more data because we now can, but because these data are biologically meaningful and relevant.

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Linda Keeling is Professor of Animal Welfare at the Swedish University of Agricultural Sciences She has a background in ethology and manages an active research group dealing with basic and applied questions related to welfare assessment, affective states in animals and the effects of early experience on later behaviour. She is coordinator of the Centre of Excellence for Animal Welfare Science in Sweden and a member of the EU Platform on Animal Welfare.
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Dr Hans van de Vis
Wageningen Livestock Research, The Netherlands

'Challenges associated with assessing and improving the welfare of farmed fish'

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World-wide approximately 360 finfish species are reared for food production in aquaculture. Finfish represent a class of animals in which there is huge variety regarding phylogeny, behaviours and habitats. Due to this diversity, the welfare needs of fish can differ noticeably. In addition, these welfare needs also depend on their life stages.

For finfish a wide range of rearing systems are used. These rearing systems can be grouped in two categories: i) land-based (e.g. ponds); and ii) water-based, for instance cages. During rearing fish are also subjected to a large variety in handling operations.

Obviously, the variety in finfish species, rearing systems and handling operations, present a challenge to assessment of fish welfare throughout production. The implementation of technologies and/or management procedures to improve their welfare poses a challenge as well.

To assess welfare of fish, welfare indicators are needed. These indicators are measures of fulfilment of the welfare needs for a given species and life stage under the production conditions concerned. Two types of welfare indicators exists, i.e. animal-based indicators (e.g. skin condition) and input-based indicators (e.g. stocking density). For both types of indicators standards are needed to determine whether welfare is e.g. good, acceptable or poor. Subsequently, welfare assessment schemes can be developed. Clearly, the use of a welfare assessment scheme only is not focused on preventive measures, nor control of the entire process. To achieve this, an approach based on 1) a thorough analysis of conditions used during production, considering the specific requirements of a fish species and its life stages; and 2) a review of the entire process, is needed. For this Quality Assurance appears to be a suitable approach, as it is process-oriented, efficient, focused on preventing hazards, it involves establishing critical steps and standards for these steps.

To implement technologies and/or management procedures to improve fish welfare, the following two-step approach is proposed: 1) proof of concept: establish specifications in a laboratory setting for a technology or for a management procedure by assessment thereof in a team; 2) evaluate the implementation of the results in practice.

In the view of the author, the combination of Quality Assurance and welfare assessment schemes is a generic approach to monitor and safeguard welfare of farmed fish. To control an implemented technology/management procedure, it is recommend to supplement the two-step approach by the use of a Quality Assurance system, as third step.

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Hans van de Vis PhD is senior researcher at Wageningen Livestock Research. He is project leader of interdisciplinary projects focused on fish welfare. His main research interests are in the fields of effects of stress throughout the production

Key publications

Boerrigter J,R Manuel, R Van den Bos, T Spanings, J Roques, G Flik and H van de Vis, H 2015. Recovery from transportation by road of farmed European eel (*Anguilla anguilla*). *Aquaculture Research* 46: 1248–1260

Manuel R, R Boerrigter, J Roques, J van der Heul, R van den Bos, G Flik and H van de Vis 2014. Stress in African catfish (*Clarias gariepinus*) following overland transportation. *Fish Physiology and Biochemistry* 40: 33 – 44

Roques, J, W Abbink, W Geurds, H van de Vis and G Flik 2010. Tailfin clipping, a painful procedure: studies on Nile tilapia and common carp. *Physiol. Behav*. 101: 533-540

Schram, E, JAC Roques, T van Kuijk, W Abbink, J van der Heul, P de Vries, S Bierman, H van de Vis and G Flik 2014. The impact of elevated water ammonia and nitrate concentrations on physiology, growth and feed intake of pikeperch (*Sander lucioperca*). *Aquaculture* 420–421, 95–104.

Veldhuizen LJL, PBM Berentsen, IJM de Boer, HW van de Vis and EAM Bokkers 2018. Fish welfare in capture fisheries: A review of injuries and mortality. *Fisheries Research:* 204, 41–48
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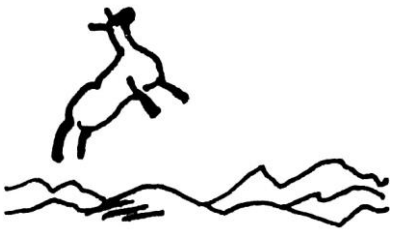

of farmed and captured fish.

Dr. Hans van de Vis has expertise on welfare of farmed and captured fish. In his research the focus is on assessment of stunning/killing methods of farmed fish and stress related to handling, transport and rearing. For wild fish he also studies how fishing gear affects welfare of fish.

He was involved in seven projects funded by the European Commission and various Norwegian and Dutch projects. In these projects research institutes collaborated with companies.

Hans acted as (co)-author of papers on: 1) the relationship between water quality and stress in African catfish, pike perch and European eel; 2) how transport affects stress physiology in European and African catfish;3) on assessment of pain in fish; 4) on welfare of captured fish; 5) and on assessment of stunning of farmed and captured fish.

He also acted as national expert for the AHAW Eel Welfare Working Group Meetings organised by the European Food Safety Authority in 2008 and 2009. He participated in AHAW Working Group Meetings focused on welfare of eel during husbandry and welfare aspects of stunning and killing of gilthead sea bream and sea bass.

He was a member of the management team of the finished Cost project Wellfish (Cost Action 867). The Wellfish project was focused on the provision of a secure foundation for the development of operational welfare indicators in order to monitor and safe guard the welfare of farmed fish in Europe. The book “Welfare of farmed fish in present and future production systems” was a major deliverable. Hans van de Vis acted as editor in chief during the preparation of this book.

Hans was involved as workpackage leader in DG Sante project (Specific Contract SANTE/2016/G2/SI2.736160) that was focused on an inventory of welfare aspect of transport and slaughter methods of farmed fish in Europe.

Current position
Hans van de Vis PhD is senior researcher At Wageningen Livestock Research. He is project leader of interdisciplinary projects focused on fish welfare. His main research interests are in the fields of effects of stress throughout the production of farmed and captured fish.

Van de Vis H, W Abbink, B Lambooij and M Bracke Stunning and killing of farmed fish: How to put it into Practice? (2014). In: *Carrick Devine & Michael Dikeman, editors-in-chief. Encyclopedia of Meat Sciences 2e*, Vol. 3, Oxford: Elsevier; 2014. pp. 421-426

Van de Vis, H, A Kiessling, G Flik and S Mackenzie (Eds) (2012) *Welfare of farmed fish in present and future production systems*. Springer, Heidelberg, Germany, 312 pp

Van de Vis, H and B Lambooij (2016): Fish stunning and killing. In: *Animal Welfare at Slaughter (eds. A. Velarde and M. Raj)*. 5M Publishing, Sheffield, UK, p. 152-176