

➤ Farm animal health and welfare at the heart of agroecological livestock system priorities: proposed research questions to contribute to this objective

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➤ Some background information...



Animal board invited review: Improving animal health and welfare in the transition of livestock farming systems: Towards social acceptability and sustainability



- The present communication is based on a **recently published position paper** authored by a community of french scientists from various disciplines
- **A collective and interdisciplinary vision** of the advances in knowledge needed, at different scales, to contribute to the transformation of livestock systems that jointly improve health and welfare of animals, together with the other components of sustainability.
- The conceptual framework of an **INRAE scientific programming tool** designed to boost systemic and interdisciplinary research on major scientific issues and societal concerns
(**'metaprogram'** SANBA, launched in 2019)

➤ The various points to be covered

- **proposed definitions** of health and welfare and the challenges raised to evaluate them on farm
- **interactions** between animal health and welfare
- how the transformation of livestock farming activities towards health and welfare **scales up to research questions** at the animal and farm levels, at the industry and territory levels, and ultimately on the society's view of livestock farming and its evolution.
 - **some examples of supported research actions**

➤ Animal health and welfare definitions

- **Animal Health** : definitions...

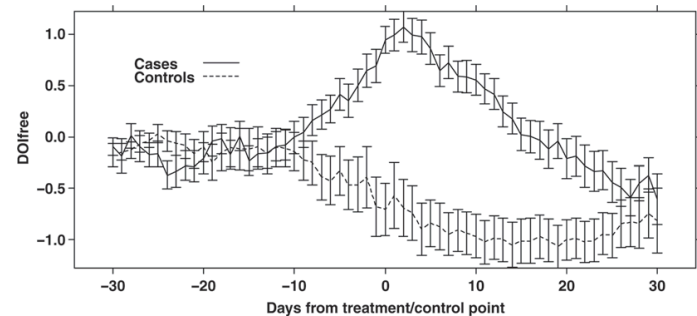
WHO (1946) definition : *"Health is a state of complete physical, mental and social welfare, and does not consist only of the absence of disease or infirmity"*.

An integrated conception of health that takes into account both dimensions of the physical component of health :

- exposure to external, microbiological and toxic agents, which are the main causes of transmissible infectious and parasitic diseases
We include zoonotic agents that may involve wildlife (ex ASF, avian influenza) and produce an asymptomatic carriage on animals (ex salmonella)
- physiological imbalances linked to breeding conditions and intensification, with high morbidity, drops in performance, often linked to non-specific aggressors (ex diarrhea in piglets, mortality in chicks, mastitis in dairy cows, bronchopneumonia in young cattle).

➤ Animal health and welfare definitions

- **Animal Health** : scientific and methodological challenges associated to its evaluation on farm
 - moving beyond the focus on the presence or absence of specific diseases ; considering health as a whole and varying along a continuum
 - choosing and combining parameters for the different animal species and for different periods of their life
 - exploring the potential of on-farm monitoring technologies to provide high-frequency measures allowing quantification on a continuous scale



Hojsgaard & Friggens (2010)

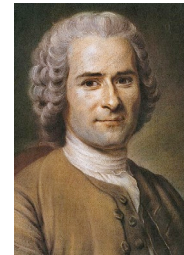
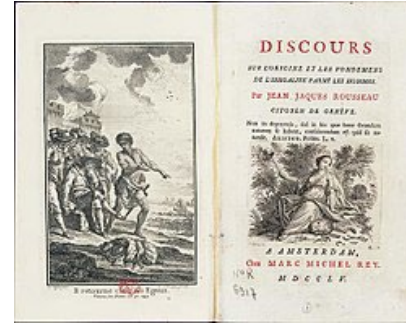
➤ Animal health and welfare definitions

- **Animal welfare** : a concept that introduced different dimensions over time..

The animal is a **sensitive being** which refers to:

- a *sensory dimension* (animals experience sensations) but also...
- a dimension related to its *psychic content* and its capacity to feel emotions

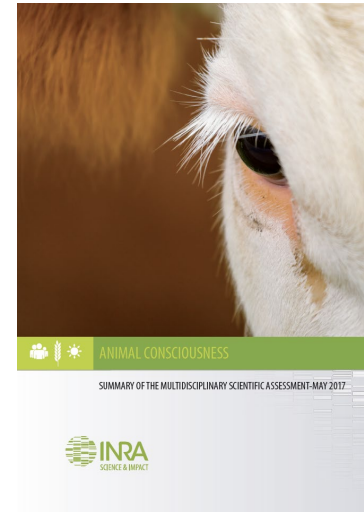
The animal has a **consciousness**, mobilized to locate itself in its world, generate its emotional experiences, preferences and expectations, and therefore its interests and well-being.



Jean-Jacques Rousseau
(1755) :

« ... a sentient being;
quality which being
common to the beast
and to the man, must at
least give one the right
not to be unnecessarily
mistreated by the
other... »

INRA collective scientific
expertise (2017)



➤ Animal health and welfare definitions

- **Animal welfare** : a concept introducing different dimensions over time..

These different dimensions have brought to a new definition of animal welfare

*"The welfare of an animal is the positive mental and physical state linked to the satisfaction of its physiological and behavioral needs, as well as its expectations » (Anses, 2018)**

Good health, good level of production and absence of stress are not enough to guarantee animal welfare.

A need to consider the different components of welfare contained in the definition proposed by ANSES

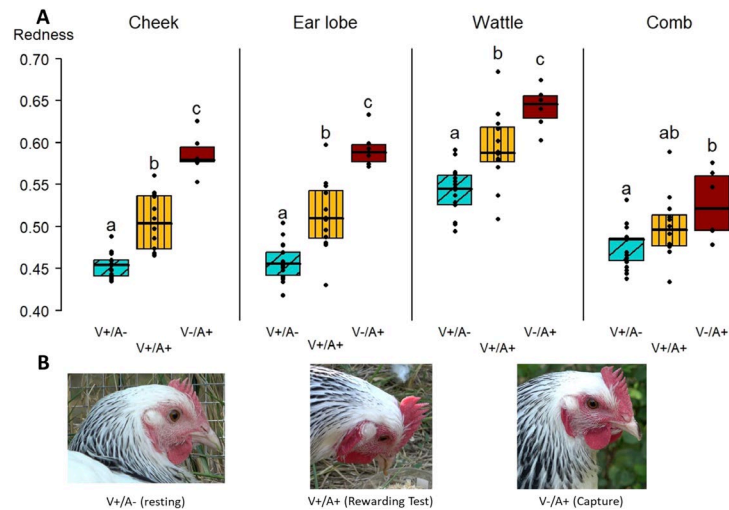
- Going beyond the criteria of well-treatment and obligation of means (the 5 fundamental freedoms) by using indicators of negative and positive emotions.
- A great scientific and methodological challenge : **identifying and qualifying animal emotions**

> Assessing animal emotion - an example of research action supported by the 'metaprogram' SANBA



Skin blushing as new emotional biomarker in hens (Soulet et al., 2024, *Appl. Anim. Behav. Sci.*, 274)

- facial skin redness depended on the valence of the situation (positive vs negative) and on the level of arousal (high vs low)
- changes in facial skin redness reflect variations in affective states and can be used as a marker for assessing the quality of the human-hen relationship.



➤ Interactions between animal health and welfare

In most cases, animal health and welfare are closely connected...

- A causal link firstly described : the adverse effects of altered animal welfare on disease susceptibility, in particular via a deterioration in immune function (Broom and Kirkden, 2004)
- Diseases linked to physiological imbalances, with or without an infectious component, are dependent on husbandry practices and are thus possibly in strong connection with animal welfare.
- Less data are available on the effects of improved welfare on disease resistance.

"Research is urgently needed into the relationship between animal welfare, immunity, gut microbiota and disease and we are not yet in a position to claim that improving welfare will improve resistance to disease. 'Boosting' the immune system is not straightforward and an interdisciplinary approach is needed".

(Dawkins, 2019)

➤ Interactions between animal health and welfare

But in other cases, « tensions » may exist between animal welfare and health ...

Practices aimed at promoting animal welfare can also have detrimental effects on health, via increased exposure to pathogens (parasites, pathogens outside the farm), risks of injury from predators, from flock mates,

Delsart et al., 2021 for alternative pig production ; Holt, 2021, for organic chicken

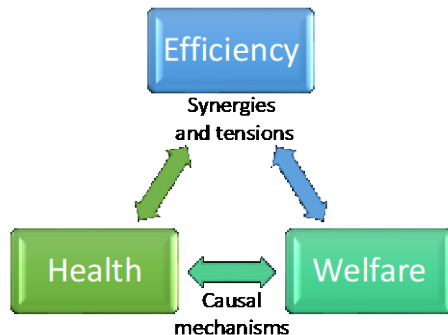
Profound changes in breeding practices may bring out the question of possible tensions between health and expected improvement in welfare

The relationships between health and welfare should be studied at the different scales, from the animal to the livestock farming system in his territory, raising research questions to different disciplines and levels of approach.

→ A research agenda proposal / Examples of supported projects



Research questions at the animal level



Bergerie de la Loire 1985 / Ducrot C

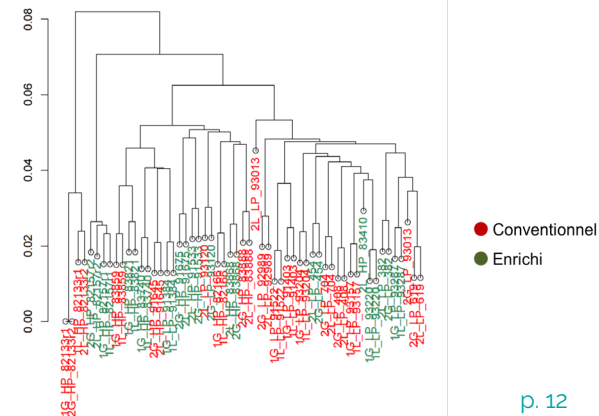
- Does improving the state of animal welfare, in particular by facilitating the induction of prolonged or repeated positive emotions, impact their health (a focus on the role of the microbiota through the gut-brain axis ?) ?
- What are the tensions/synergies between robustness traits (health, immunity, welfare) and the traits that govern efficiency (of feed, production, reproduction, adaptation, etc.)?
- How to evaluate the complementarity of biotechnical levers for action (genetic, nutrition, microbiota function) and environmental factors and their interactions, at the scales of the animal and the group, in order to obtain robust animals that are resilient to infections and disease throughout their lives?

➤ An example of research project at the animal level

Pig welfare and immune programming: identification and exploration of metabolic and epigenetic mechanisms



- Can the transcriptome of blood immune cells be used to assess chronic states of well-being or malaise in sows?
 - What biological functions are involved (inflammation, energy metabolism, other)?
 - Are these alterations associated with epigenetic modifications in these cells?
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Research questions at the herd/farm level

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- How do **interactions between individuals, and between individuals and their environment**, impact the health and welfare of animals (communication of positive emotions, microbiome flows, exchanges of pathogenic agents between animals and their environment)?
- What are the **tradeoffs that need to be arbitrated between health and welfare** while minimising the impact of these changes to practices on other types of performance?
- What are **the farmers obstacles and drivers for changing to practices that favour animal health and welfare**? What are their impacts in terms of farmer well-being and organisation of working patterns. What are the conditions for their economic viability?



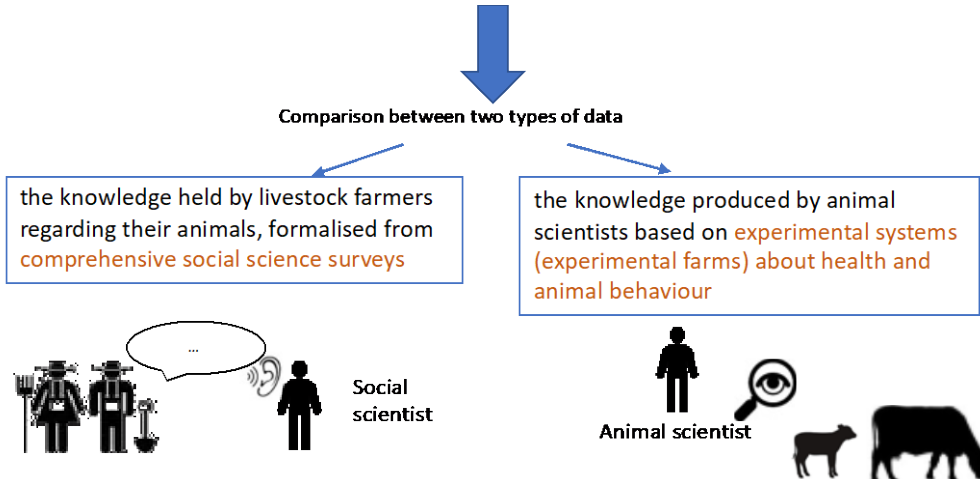
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➤ An example of research project at the herd/farm level

Combining breeder and scientific knowledge to promote well-being and health on dairy farms: innovative calf rearing using nurse cows

Objectives : To bring together scientific and farmers' knowledge, by focusing on :

- relationships between farmers and their animals (calves and nurse cows), and professional know-how required for farmers.
- welfare of the calves and cows, determined by linking health and animal behaviour.



➤ Research questions at the territory and/or production chain levels

- What are the technical and organizational innovations and coordination mechanisms that need to be implemented within animal production sectors and territories to ensure that they evolve towards better consideration of health and welfare throughout the lives of animals ?
- What are the social, legal, economic and institutional processes involved in the aim of placing health and welfare in the heart of priorities of production sectors and territories.
- What differentiation of products in their marketing ?
- What is the impact of these changes to practices and organisation on all the pillars of sustainability (including ecosystem services, regional land use and development, employment)?



Porc plein air Corse 2007 / Ducrot C

➤ An example of project at the territory level

Towards **the crossover institutionalisation** of Animal Health and Welfare?

The future of livestock activities is closely linked to a multiplication of norms and standards (both formal and informal) related to **animal health and welfare** that are tightly linked but rarely addressed together



➤ *Is health a brake and/or a lever for the institutionalisation of welfare, and vice versa?*

The project has **two main objectives**:

- to produce an **inventory and mapping of norms and instruments** with particular focus on the dynamics underlying their construction.
- to analyse the **effects of these norms and instruments on actors** in livestock farming (breeders, advisors, veterinarians, etc.) and research scientists working in animal sciences.



Research on the link between farming activities and society

- A need for a **combined consideration** for societal concerns on health (antimicrobial use, zoonoses) and welfare of animals, two concepts that stay separated in society, science and political debates...
- ... animal health and welfare challenges are too complex to be tackled by a single discipline or a small group of players. **A transdisciplinary approach is needed**, involving collaboration between scientists, experts and citizens, to imagine solutions that take account of different perspectives and aim for the common good.

➤ An example of project with a transdisciplinary approach

Implementation of a process enabling the inclusion of citizens in the design of production systems – A case study of mid-mountain dairy farming systems in the “Massif Central”



Question addressed : Does the participation of citizens in a livestock system design process with researchers and agricultural professionals enable the exploration of innovative solutions?

Adaptation of the innovative DKCP (Diagnostic-Knowledge-Concept-Project) design method, initially developed for the industrial context, with the aim of exploring new avenues of innovation based on interactions between stakeholders.

Diversity of ideas and the development of **innovative projects** at different levels (dairy, veal, marketing and consumption). The relevance and feasibility of these proposals have yet to be assessed.

➤ Conclusions and perspectives

- It is crucial to consider animal **health and welfare as central elements** of farming systems, rather than as secondary aspects.
- It is important to define **what constitutes good animal health and welfare**, and to find practical and objective ways of assessing these criteria, taking into account the interactions between them.
- Animal health and welfare raises **questions about the design of farming systems**, their economic profitability, the welfare of farmers, and the adaptation of farming sectors to integrate these innovations.
- Improving animal health and welfare needs to be seen in a broader perspective of sustainability by considering the full range of services offered by livestock production system, and in collaboration with citizens and consumers to co-construct a shared vision of livestock farming.
- Responding to these challenges requires **an interdisciplinary approach**, involving human and economic sciences in collaboration with animal and veterinary sciences, and **transdisciplinary research** adapted to regional / territorial contexts.

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Thank you for
your attention