



**HAL**  
open science

## Exploring modelling approaches to address the dynamic nature of animal health

Pauline Martin, Foucras G., Rafael Muñoz-Tamayo, Nicolas N.C. Friggens

### ► To cite this version:

Pauline Martin, Foucras G., Rafael Muñoz-Tamayo, Nicolas N.C. Friggens. Exploring modelling approaches to address the dynamic nature of animal health. 75. Annual Meeting of the European Federation of Animal Science (EAAP 2024), European Federation of Animal Science (EAAP), Sep 2024, Florence, Italy. pp.805. <hal-04777992>

**HAL Id: hal-04777992**

**<https://hal.inrae.fr/hal-04777992v1>**

Submitted on 22 Nov 2025

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



HAL Authorization

## Exploring modelling approaches to address the dynamic nature of animal health

*P. Martin<sup>a</sup>, G. Foucras<sup>b</sup>, R. Muñoz-Tamayo<sup>c</sup>, N.C. Friggens<sup>d</sup>*

<sup>a</sup> *Université Paris-Saclay, INRAE, AgroParisTech, GABI, 78350, Jouy-en-Josas, France*

<sup>b</sup> *Université de Toulouse, INRAE, ENVT, UMR IHAP, 31076, Toulouse, France*

<sup>c</sup> *Université Paris-Saclay, INRAE, AgroParisTech, UMR Modélisation Systémique Appliquée aux Ruminants, 91120, Palaiseau, France*

<sup>d</sup> *UMR PEGASE, INRAE, Institut Agro Rennes, 35590, Saint-Gilles, France*

Health is usually considered in a binary manner: the animal is healthy or not, for a given disease or disorder, at a given time. However, health is a multifactorial status and evolves through time. The development of precision livestock farming and high-frequency phenotyping provides trajectories of performances or traits that can be used as indicators of the health status, and allow its dynamic nature to be taken into account. In this study, we explored conceptual approaches to model the evolution of the health status of an animal facing a disturbance. The animal's observable reaction through time (or degree of health) was considered as a function combining the intensity of the environmental disturbance and the biological ability of the animal to cope with the perturbation, the latter being a function as well, depending on individual factors such as genetics, current physiological state or life course, for example. Using a sigmoid relation between the degree of health and the intensity of disturbance seems a promising option. It implies that low levels of intensity do not affect health, and that there is a maximum degradation of health for high levels of intensity. We expect that having dynamic trajectories of a high number of animals subjected to the same environmental disturbance intensity would enable the characterization of individual resilience, as well as estimating the unmeasured dynamic trajectory of the environment intensity. This is currently being tested on real data.