Preface of the African swine fever modelling challenge special issue

Pauline Ezanno, Sébastien Picault, Timothée Vergne

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Editorial

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Epidemiological modelling provides vital support to policy and decision making in public and animal health. It renders it possible both to better understand and forecast epidemics, and to better assess surveillance and control strategies. However, in any given situation, it can be very difficult to determine which model would best support decision making, and once an epidemic has begun, several different approaches are sometimes required. When an epidemic is emerging (i.e., when the availability of data is limited), it is also difficult to develop new models, analyse their behaviour, and compare their advantages and drawbacks. Using models to support policy in real time therefore requires their development before epidemics emerge.

Short competitions known as modelling challenges have been organized frequently in the field of human health, focussing for example on influenza (Reich et al., 2019; Viboud and Vespignani, 2019), dengue (Johansson et al., 2019) and Ebola (Viboud et al., 2018). Such challenges offer a unique and stimulating environment to improve the ability of modellers to advise policy makers in a timely manner. Prior to the *ASF Challenge*, no such event had been organised in the animal health epidemiology community.

African swine fever (ASF) was chosen for this first modelling challenge in animal epidemiology because it is a devastating emerging animal disease whose epidemiological cycles involve transmission between wildlife and livestock (EFSA et al., 2020). Due to its very high mortality rate and the lack of vaccine or treatment (Dixon et al., 2020), ASF is considered as one of the biggest threats to swine production, agricultural economies, international trade and biodiversity (Luskin et al., 2021). The international spread of the disease has been facilitated by human and animal mobility, making ASF a risk for most countries with a swine industry (Vergne et al., 2017).

As the organisers of the *ASF Challenge*, we developed a totally hypothetical environment, Merry Island, in which ASF has emerged and started to spread among domestic pig farms and wild boar populations. We introduced into the story veterinary services that seek support from modelling teams to make evidence-based decisions. To simulate ASF spread, we developed an original spatio-temporal model of ASF virus circulation at the interface between wild boar communities and pig farms that could integrate different scenarios of control measures. The resulting model was used to generate synthetic data, similar to what might be available during a real ASF epidemic. The *ASF Challenge* was launched on 28 August 2020 with six international teams that had volunteered to participate. Epidemic data were progressively made available to the teams to mimic the progression of the outbreak. At three different time points, the teams were asked to use the synthetic data available at that moment to predict the development of the epidemic and to answer management questions related to the most effective control strategies to implement and the probability of a second wave.

This special issue is composed of six articles. Picault et al. (2023) describe the model used to generate the synthetic data and provide a synthesis of the assumptions underlying the model and the selected epidemic. The participating teams each submitted papers describing the modelling approaches they used, the major results they obtained, and their reflections on the main difficulties they faced while participating in the *ASF Challenge* (Beaunée et al., 2023; Dankwa et al., 2022; Han & Vignes, 2023; Muñoz et al., 2022). In the closing paper of the special issue, Ezanno et al. (2022) compare these models to assess their ability to predict the (known) spatio-temporal distribution of ASF epidemics and to identify levers that would enable modellers to be more reactive in the event of a real crisis.

The *ASF Challenge*, as the first modelling challenge in animal health, has provided an inspiring platform for the exchange of knowledge and expertise on animal health modelling. This special issue should contribute substantially to the body of literature on ASF modelling, which has suffered dramatically from a scarcity of ASF models at the livestock-wildlife interface (Hayes et al., 2021). And most importantly, the *ASF Challenge* has allowed the community of animal health modelling epidemiologists to improve our collective ability to respond to an emergency crisis situation while having fun!

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Pauline Ezanno[a,*], Sebastien Picault[a], Timothée Vergne[b]
[a] *INRAE, Oniris, BIOEPAR, 44300 Nantes, France*
[b] *IHAP, Université de Toulouse, INRAE, ENVT, Toulouse, France*

[*] Corresponding author.
E-mail addresses: pauline.ezanno@inrae.fr (P. Ezanno), sebastien.picault@inrae.fr (S. Picault), timothee.vergne@envt.fr (T. Vergne).