Towards a better understanding of the transmission of African Swine Fever

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All authors are involved in the European project ASFORCE dedicated at targeting research efforts on African Swine Fever

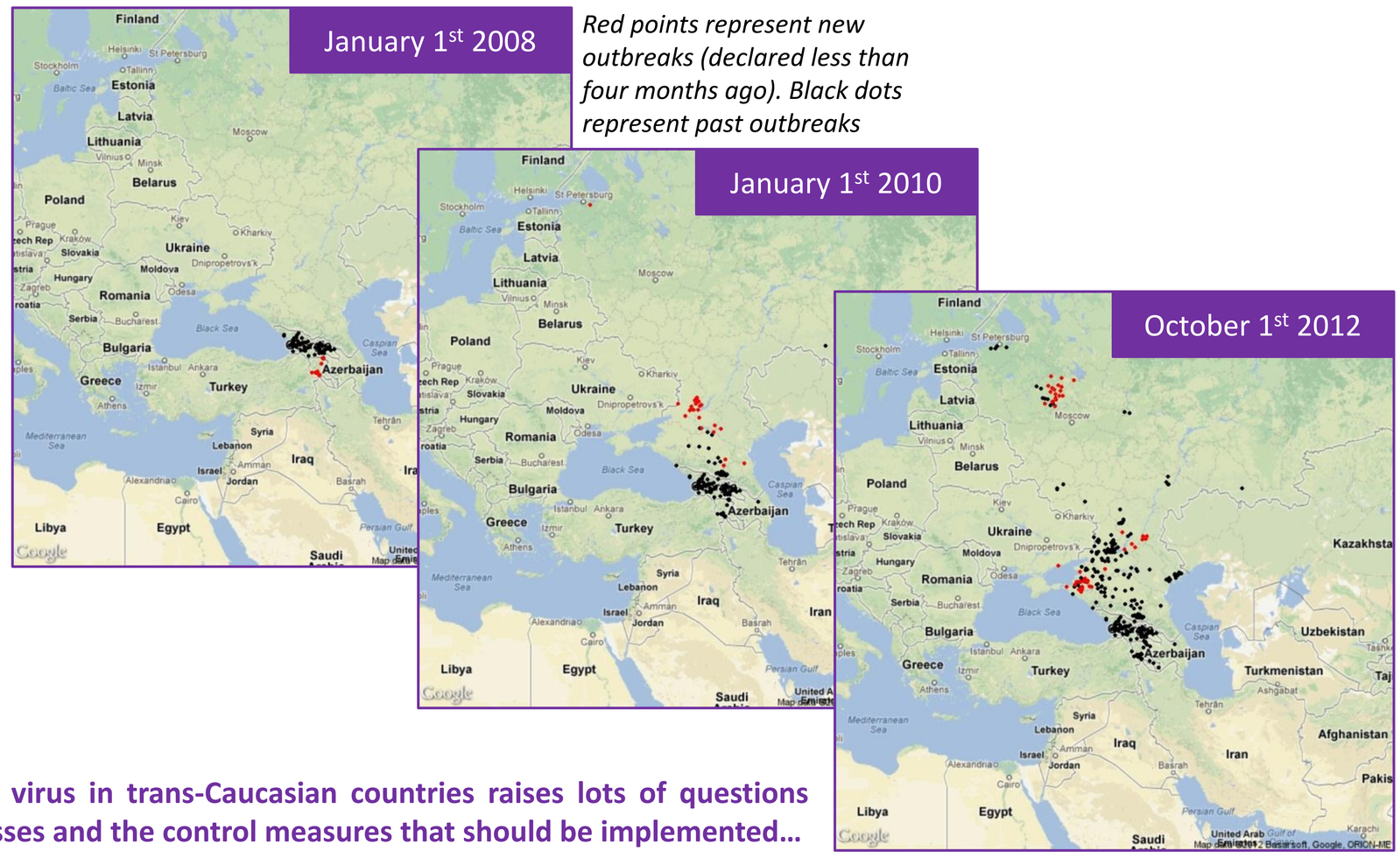
Background

African Swine Fever virus was introduced to Georgia in 2007 where it spread very quickly.

Then, in 2008, it crossed the Caucasus and was introduced to the Russian Federation.

Since then, the virus progressed Northward through different transmission routes that are not yet well understood

Please, have a look at these three maps describing the spread of the disease over the past 6 years…



Red points represent new outbreaks (declared less than four months ago). Black dots represent past outbreaks

The persistent circulation of the virus in trans-Caucasian countries raises lots of questions regarding the transmission processes and the control measures that should be implemented…

Research questions

How fast does the virus spread **within an infected farm**?

How long can it **survive in the environment**?

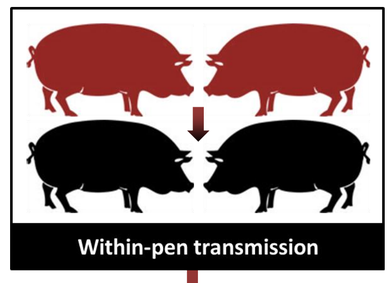
What are the **transmission parameters** of the epidemic in Russia and Georgia?

What are the **best control strategies** in Russia and in different settings in Europe, in case of an introduction?

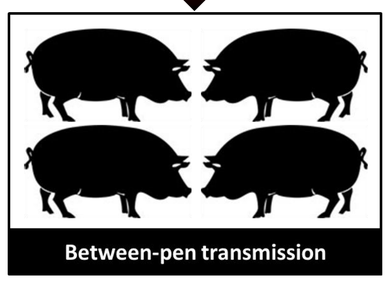
Can we **predict where and when** the virus will be introduced to the European Union?

I. Infection studies in a controlled environment

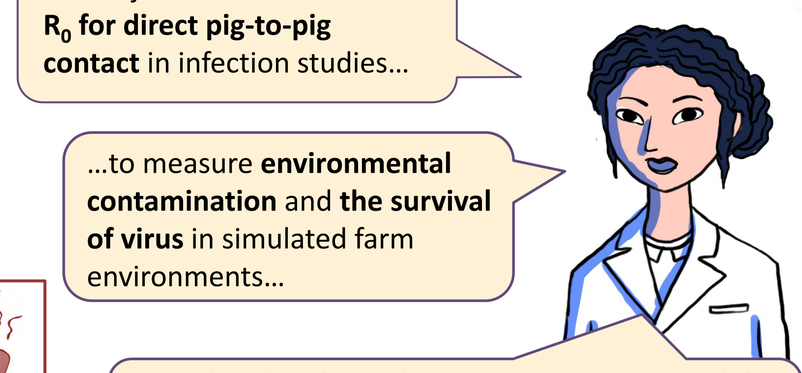
Our objectives are to estimate **R_0 for direct pig-to-pig contact** in infection studies…



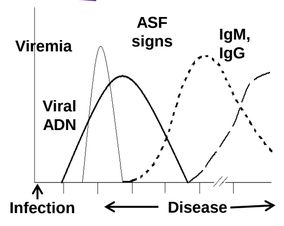
f(infectiousness for direct and indirect contacts)



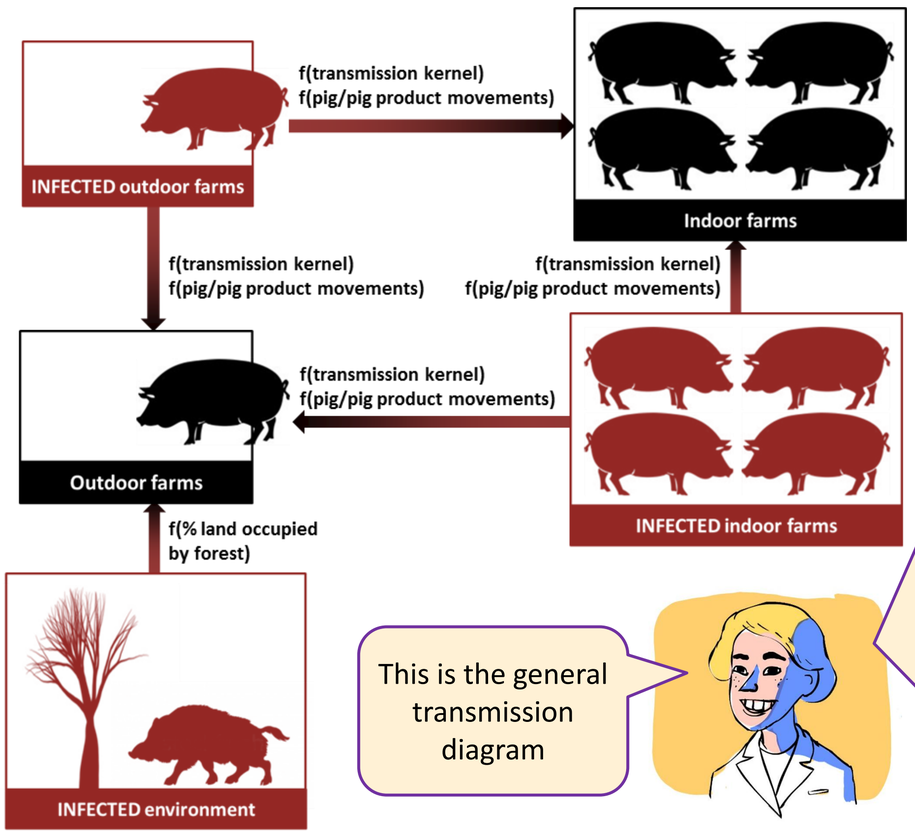
…to measure **environmental contamination** and **the survival of virus** in simulated farm environments…



…and to **develop a disease transmission model** that **allows predictions in different farm settings** using the parameters identified.



II. Modelling the spread of the virus in Trans-Caucasian Countries



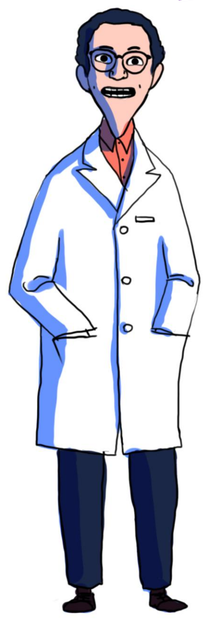
This is the general transmission diagram

We will develop a **stochastic farm-level dynamic model** based on long-distance **pig/pig product movements** and a **transmission kernel** that we will parameterize based on analyses of the surveillance data from Russia.

Note: a transmission kernel describes how the probability of contact between farms varies with distance. It is supposed to capture all forms of short distance transmission between farms (direct contact, fomites…)

Anticipated outcomes

Based on the **experimental transmissions**, we will estimate the **basic reproductive numbers** (within-pen and between-pen) that will be used in the farm-level dynamic model.



Based on the Russian **farm-level dynamic model**, we will estimate the **parameters of the transmission kernel** and assess the importance of **transmission via the environment.**
We will also identify the most cost-effictive **control strategies** that could be used in Russia for mitigating the disease.

Finally by running additional simulations with the fitted farm-level dynamic model, we will attempt to **predict where and when the virus is most likely to be introduced into the European Union** …

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