Applications of NGS to inform disease management decisions for livestock

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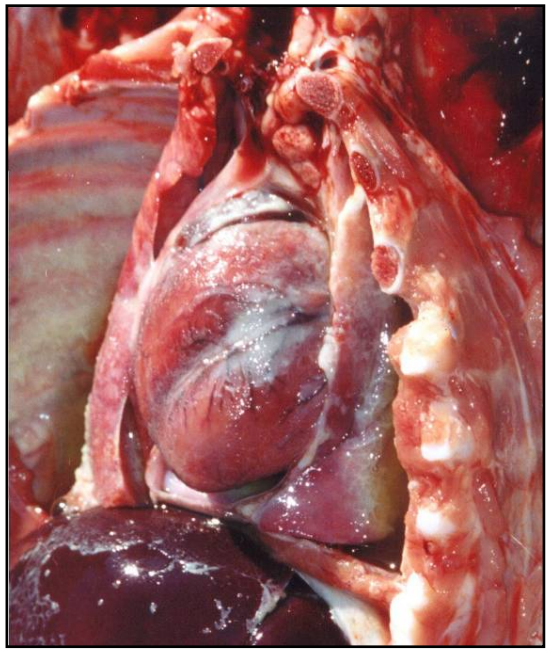
The need

- ✓ Significant impact on animal health, wellbeing, and productivity
- ✓ Degree of pathogenicity varies
- ✓ **Primary drivers for AMU**
- ✓ Absence of swine bacterial surveillance

S. suis

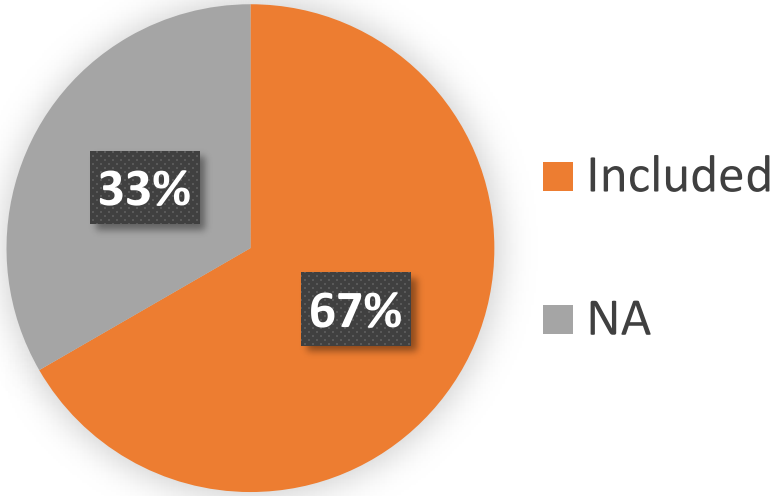
G. parasuis



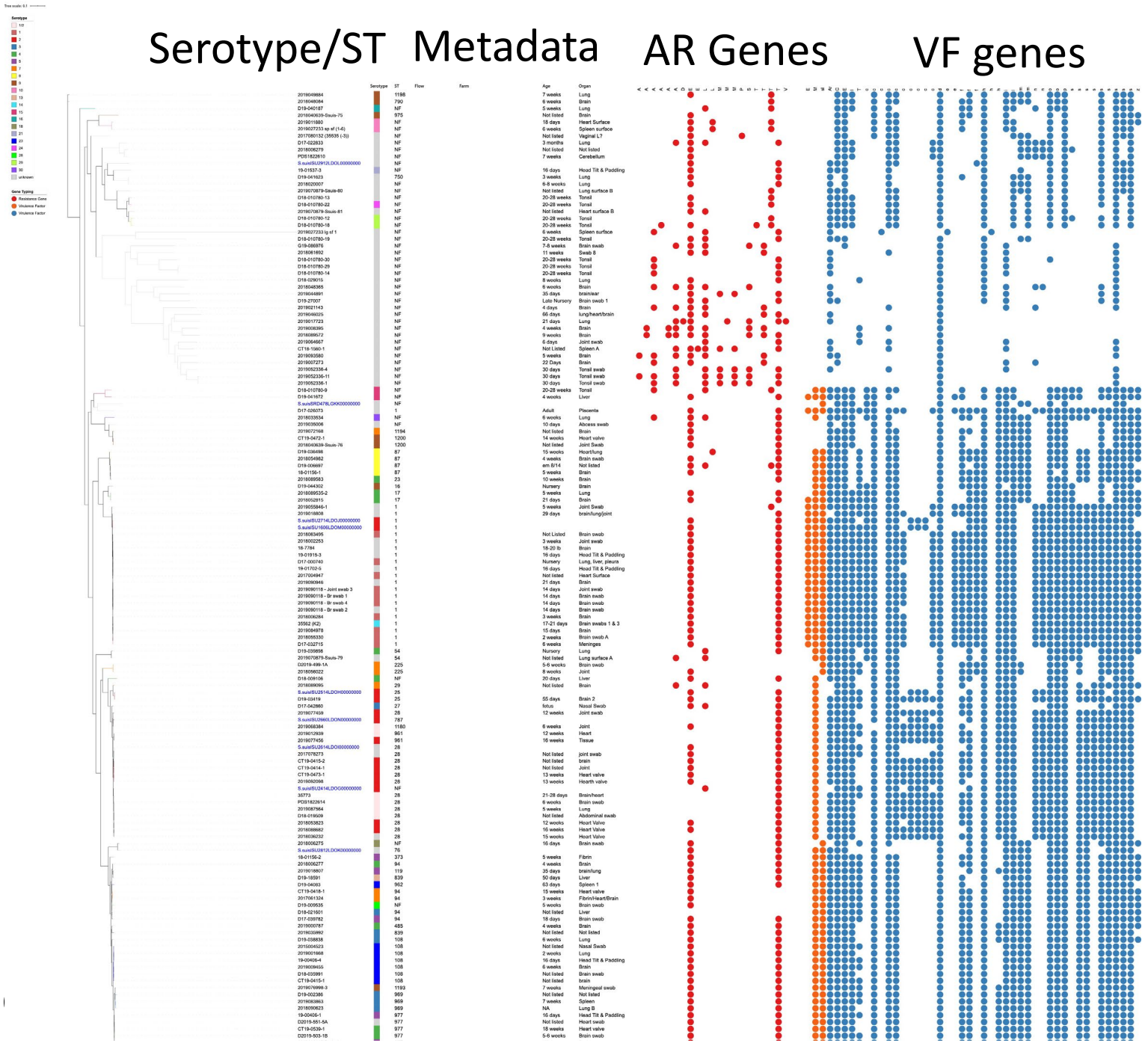
A. suis

M. hyosynoviae
M. hyorhinis

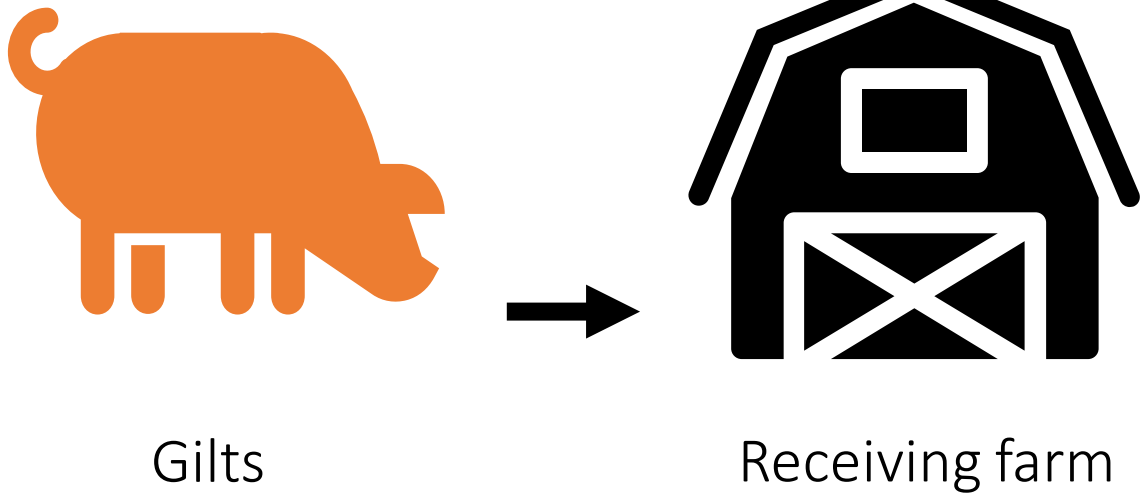
Swine bacterial database



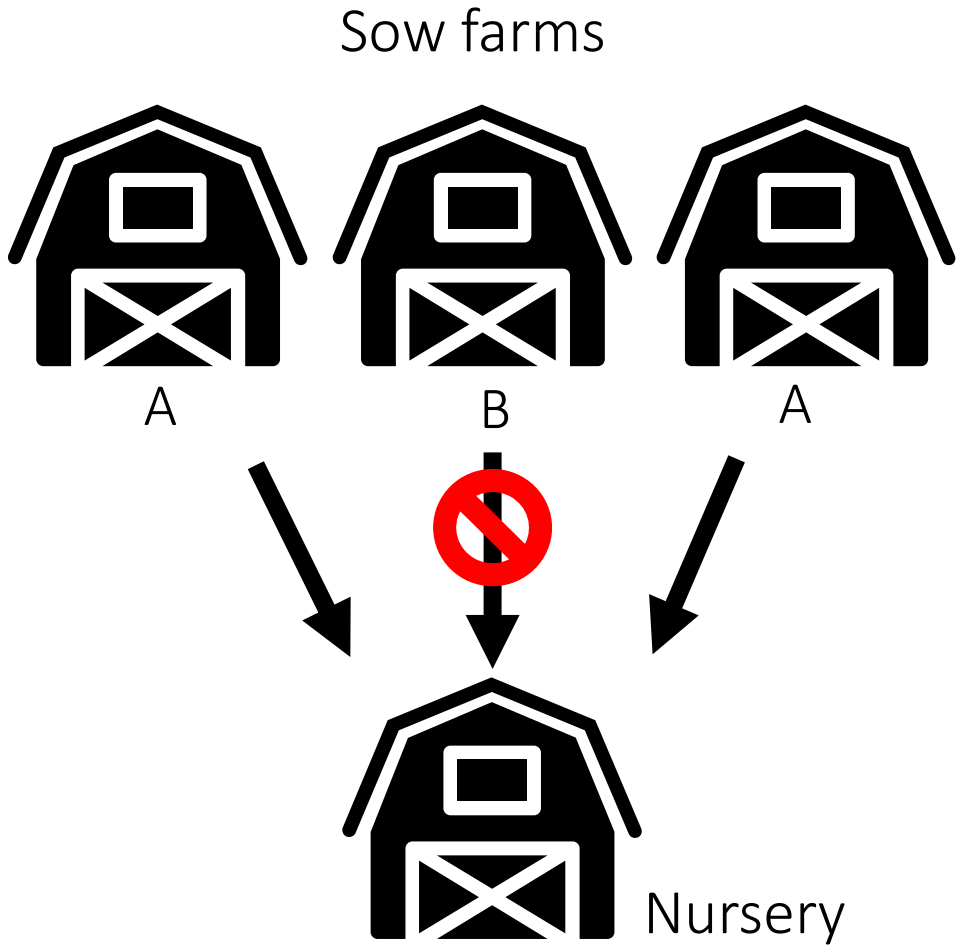
- 32 swine systems from top producing states
- 6 bacterial species
  - Clinical and epidemiological



Improving how populations of pigs are mixed

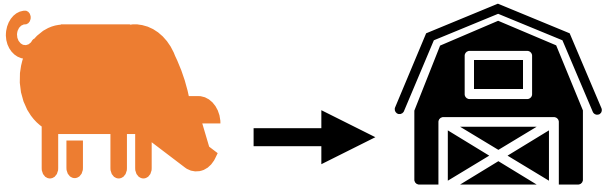


Farm stocking



Strategic commingling

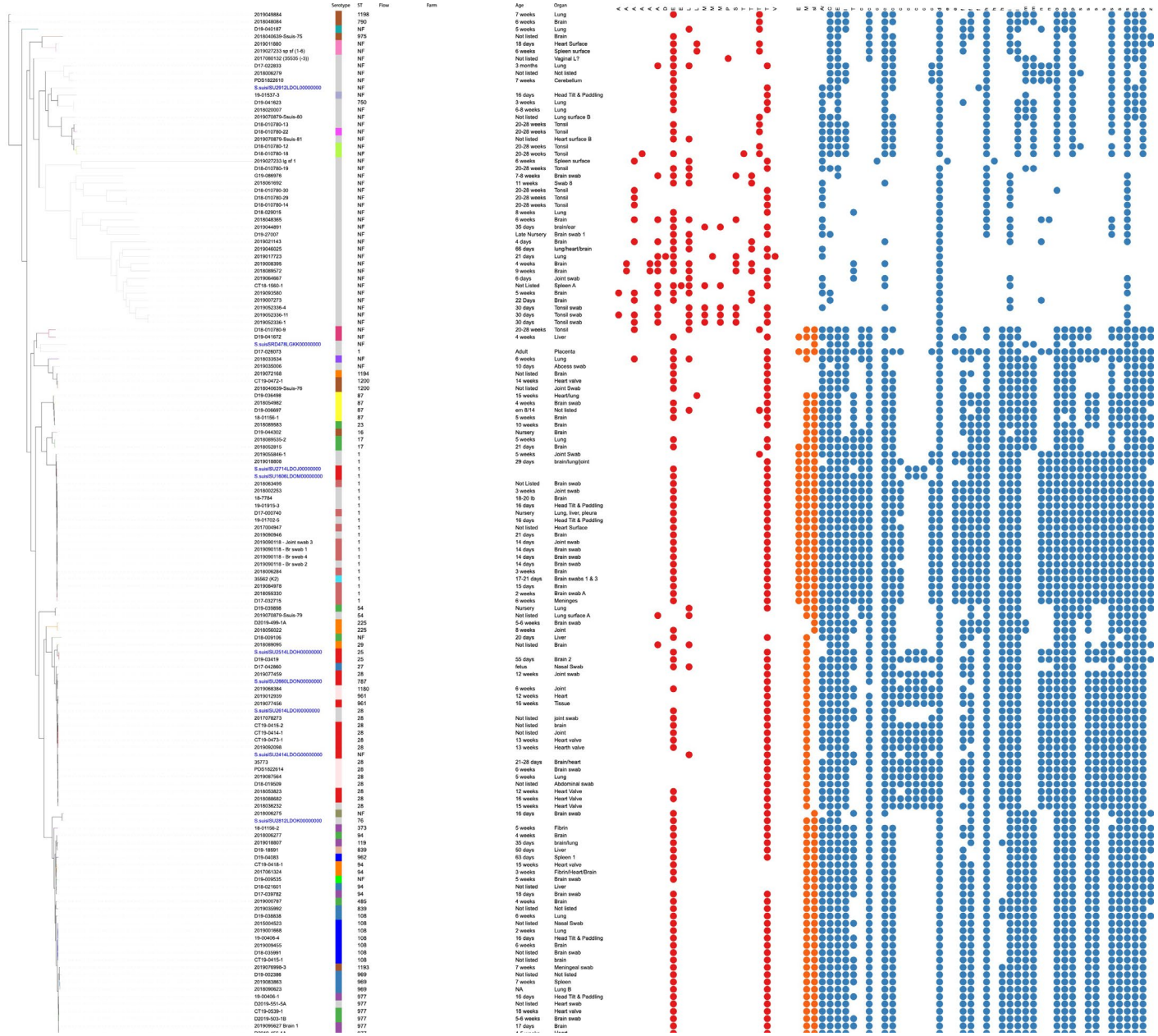
Matching health status



Source A
Eurasian genotype

X

Source B
Traditional genotypes

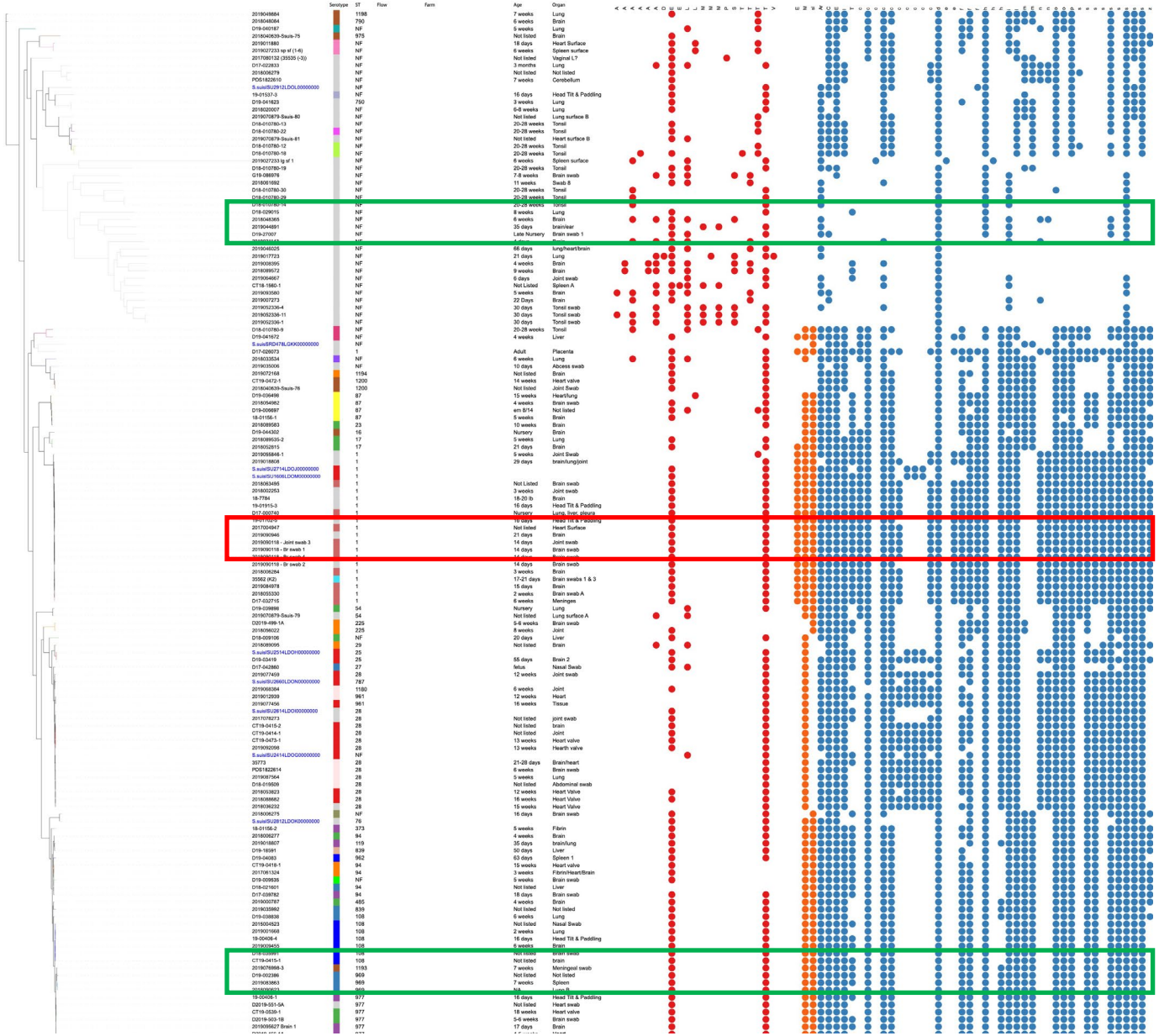


Refining selection of vaccin

Vaccine strain (Commensal)

Disease Associated (Field strain)

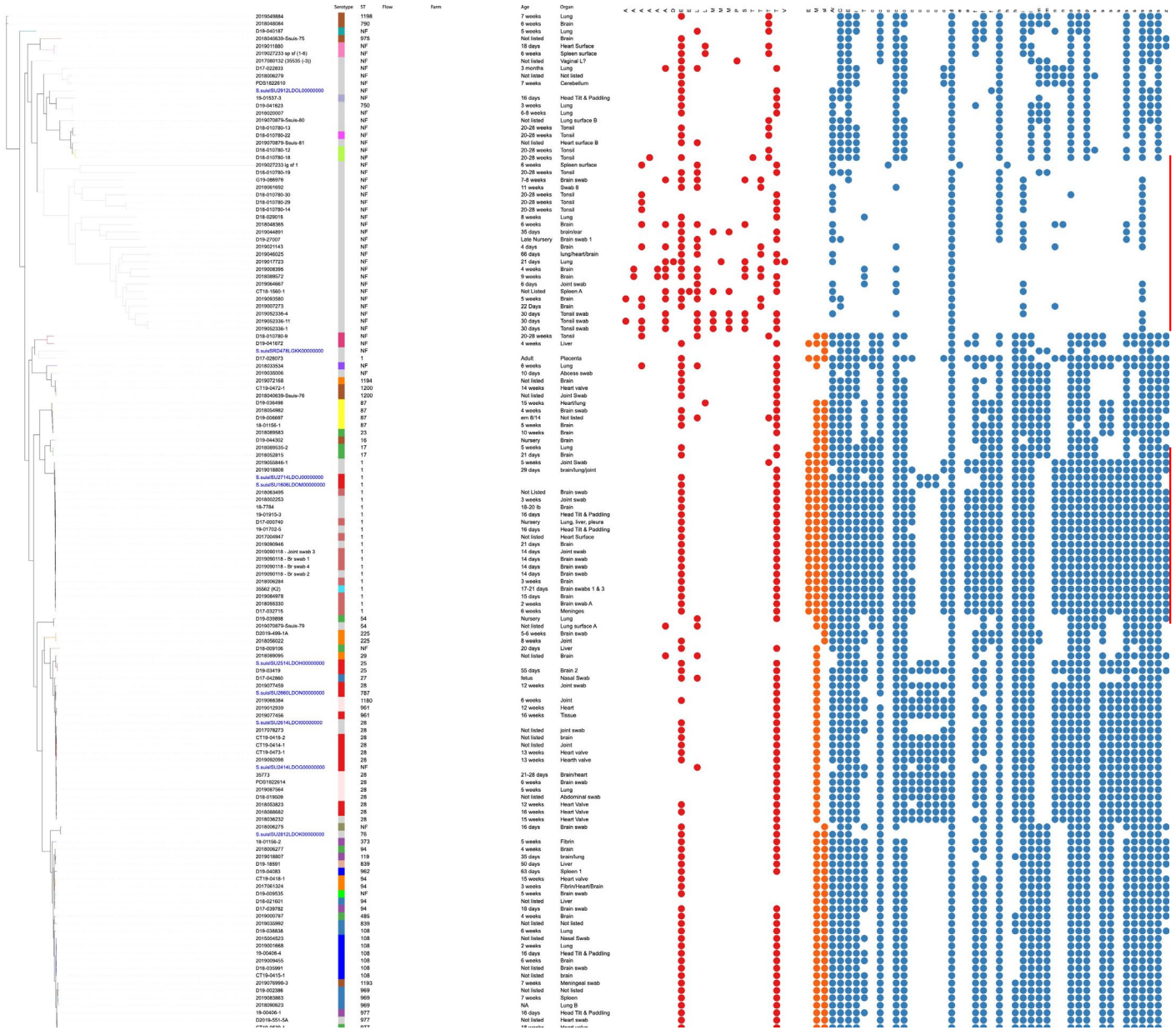
Vaccine strain (Opportunistic)



Monitoring genetic antimi

Commensal

Highly pathogenicity



Track spread of pathotypes and identify global markers for virulence

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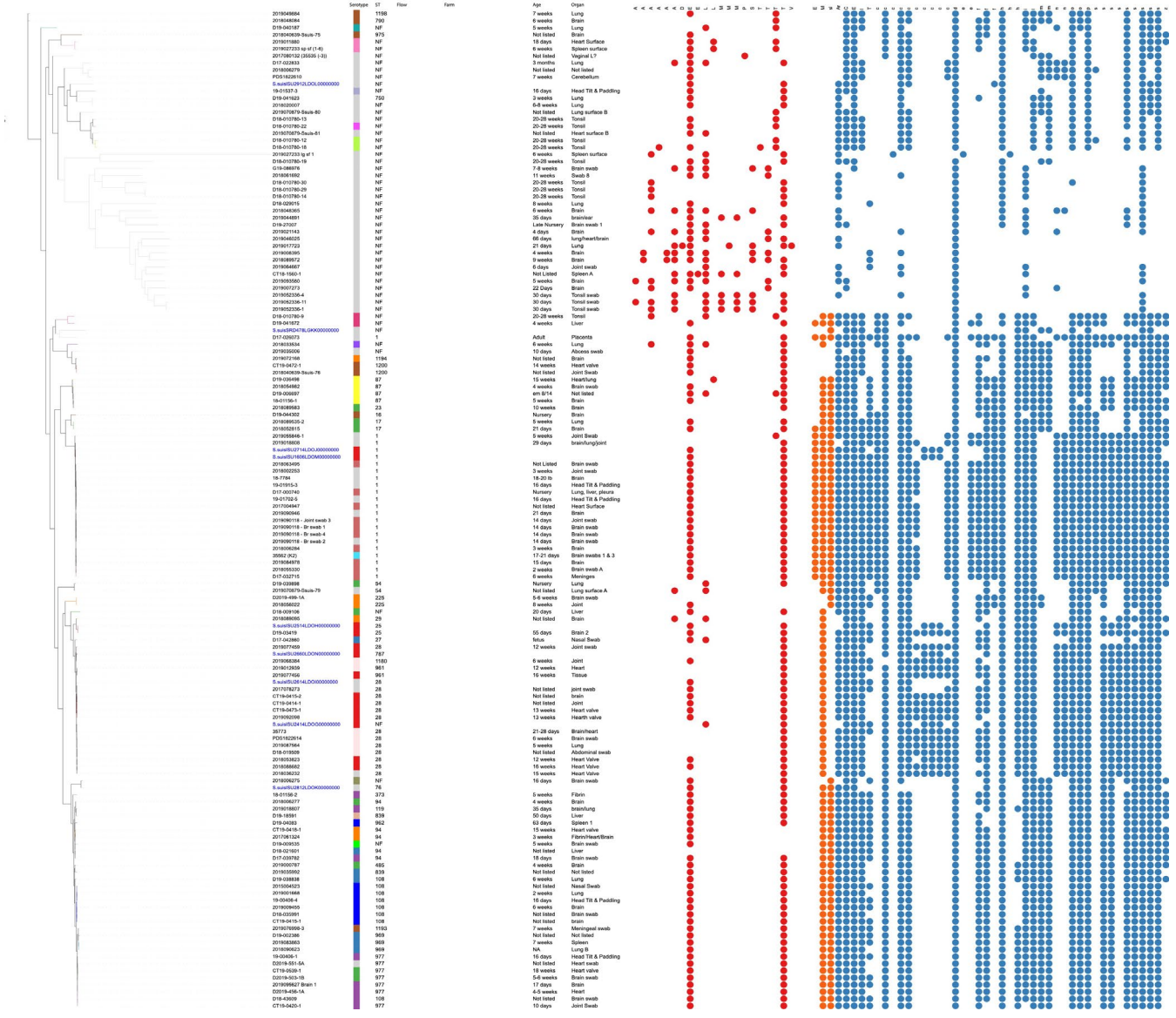
Université de Montréal

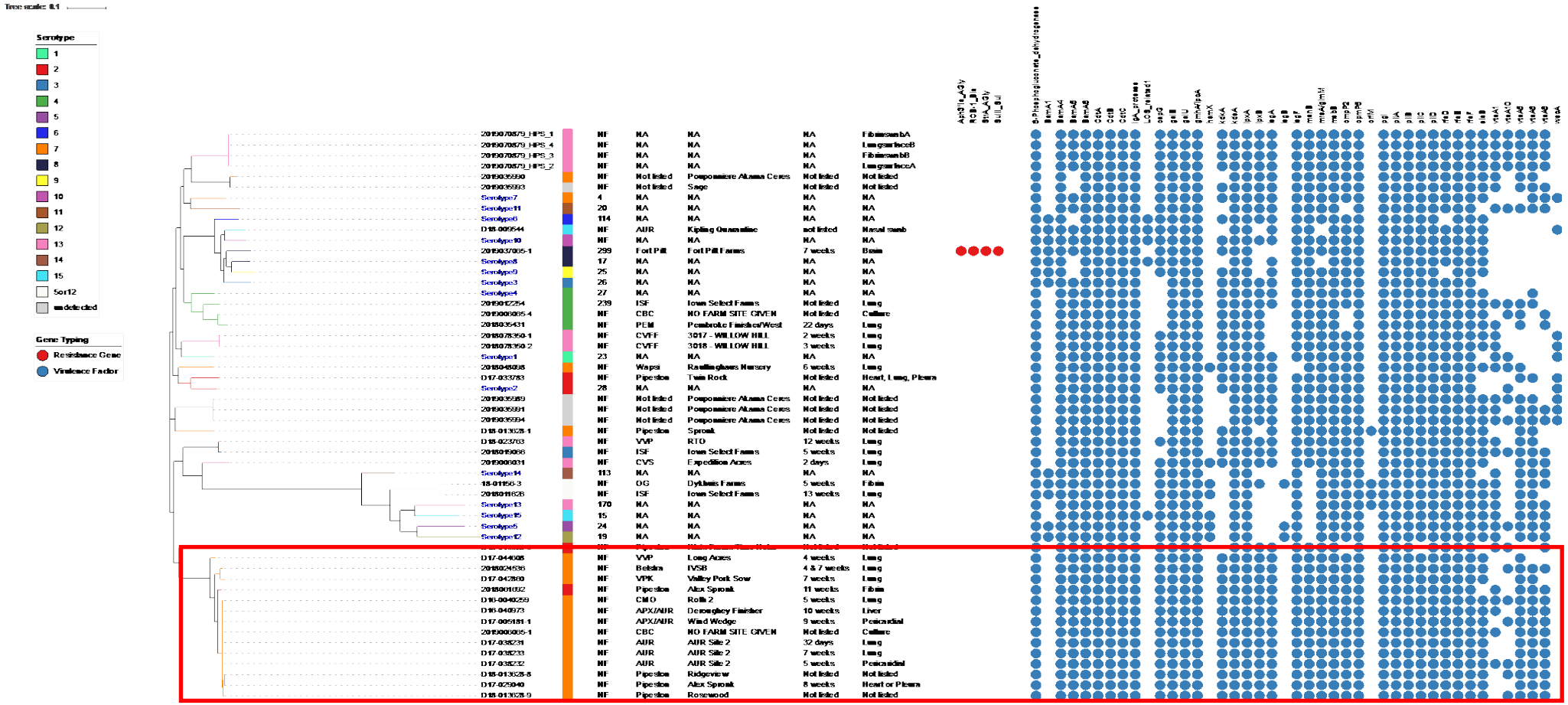


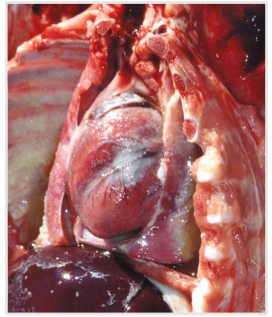
Commensal

Associated with high mortality

Associated with sporadic disease

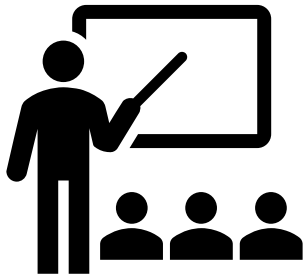
Identify sources of outbreaks





G. parasuis

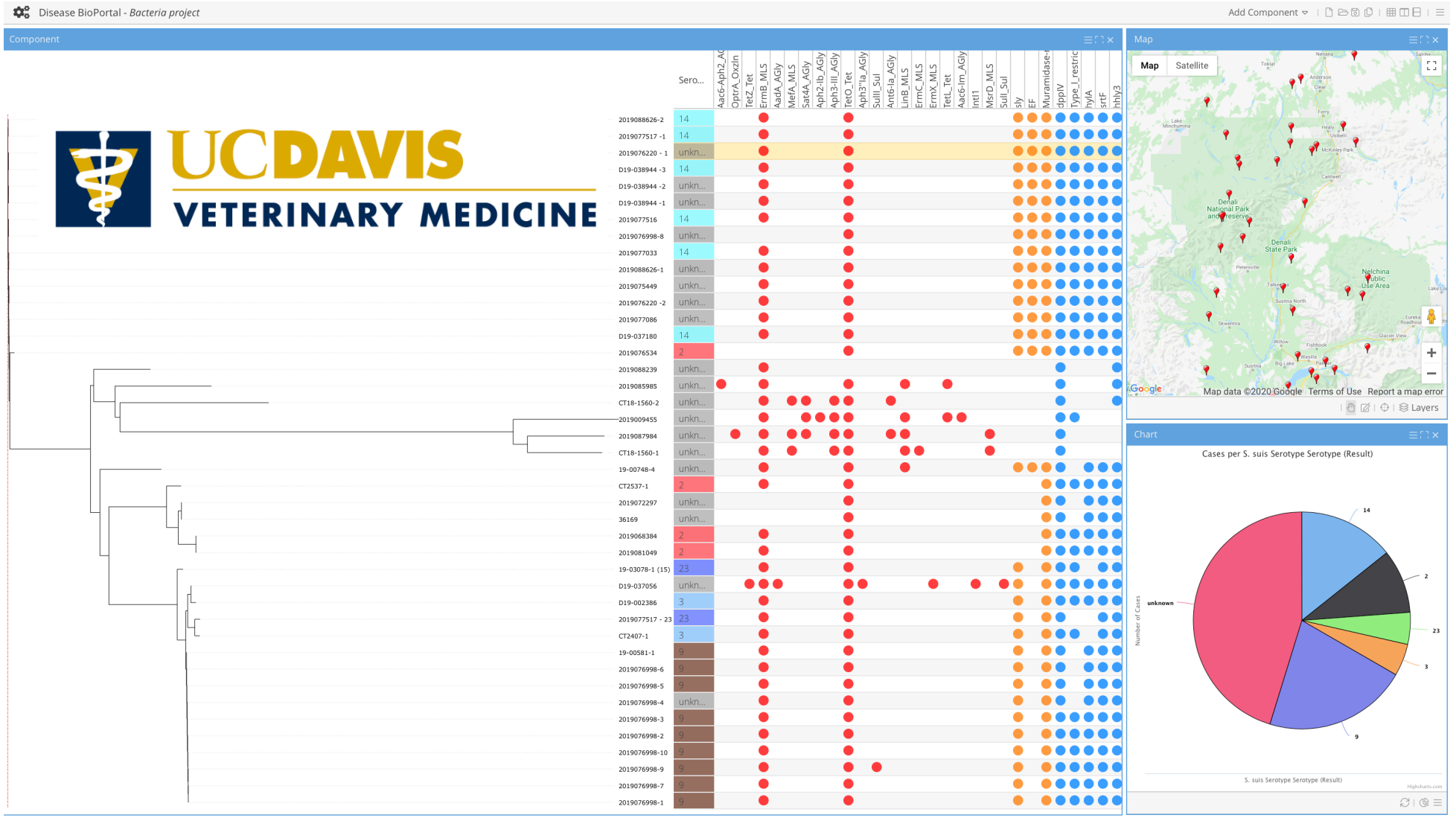
Leads to improvement in biosecurity



Are we getting the wrong strains?

- ✓ ***Creation of educational material***
- ✓ ***Improved sample collection and handling***

Disease Bioportal - online swine bacterial visualization, analysis and sharing platform




FARM ANIMALS
GET SICK,
SOMETIMES WITH
DISEASES WITH
NO EFFECTIVE CURE
OR VACCINE

PRRSV FALLOUT





THE ANIMAL

Suffering from secondary Infections

Higher mortality rates

THE FARMER

Loss of animals

Economic loss

Chooses to treat sick animals and use more antibiotics

THE CONSUMER

Concerns about animal suffering

Wants less antibiotics

Safest food system possible

Affordable choices

THE FOOD COMPANY

Concerns about sustainability impact

Looking to eliminate waste

Looking to reduce antibiotic use when possible

THE ENVIRONMENT

More waste

More chance for disease and resistance to spread to other geographies

EDITED ANIMALS ARE RESISTANT TO PRRS VIRUS

nature biotechnology

University of Missouri

Gene-edited pigs are protected from porcine reproductive and respiratory syndrome virus

To the Editor:

Porcine reproductive and respiratory syndrome (PRRS) is the most economically important disease of swine in North America, Europe and Asia, costing producers in North America more than $600 million annually[1]. The disease syndrome was first recognized in the United States in 1987 and described in 1989 (ref. 2). The causative disease syndrome and porcine circovirus–associated disease, and can establish a lifelong subclinical infection[6]. In 2006, a more severe form of the disease, called highly pathogenic PRRS, decimated pig populations throughout China[7]. Although genetic selection for natural resistance is an option, success to date has been limited, possibly due to the genetic diversity of the virus[8] homologous recombination and somatic cell nuclear transfer) were infected with PRRSV and compared with infected wild-type pigs, no difference in virus replication was found[9]. To test the role of CD163 in infection, we previously created 45 live-born piglets with insertions ranging from 1 bp to 2 kb, deletions from 11 bp to 1.7 kb, as well as a partial domain swap in *CD163* using

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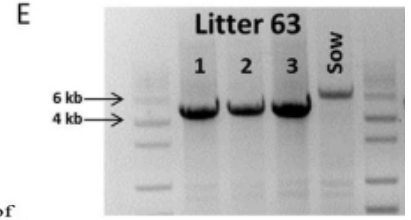

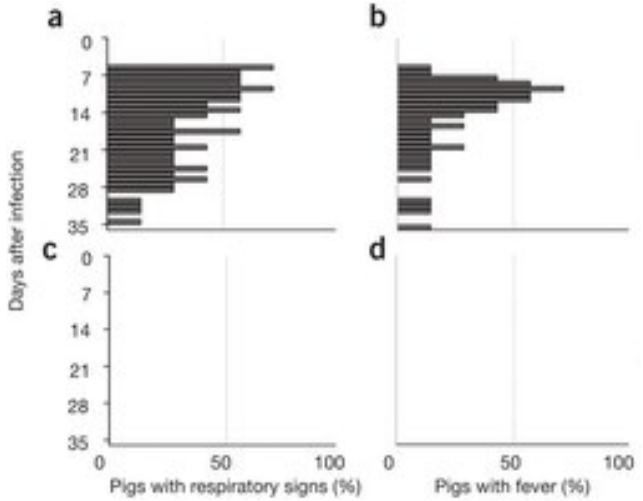

PLOS PATHOGENS

ROSLIN

RESEARCH ARTICLE

Precision engineering for PRRSV resistance in pigs: Macrophages from genome edited pigs lacking CD163 SRCR5 domain are fully resistant to both PRRSV genotypes while maintaining biological function

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