

PIC[®]

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

✓ <u>Primary drivers for AMU</u>

✓ Absence of swine bacterial surveillance

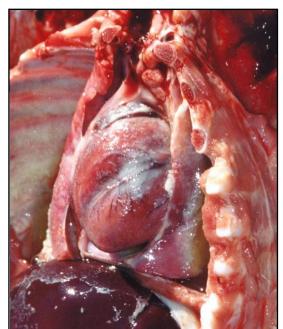
S. suis



A. suis

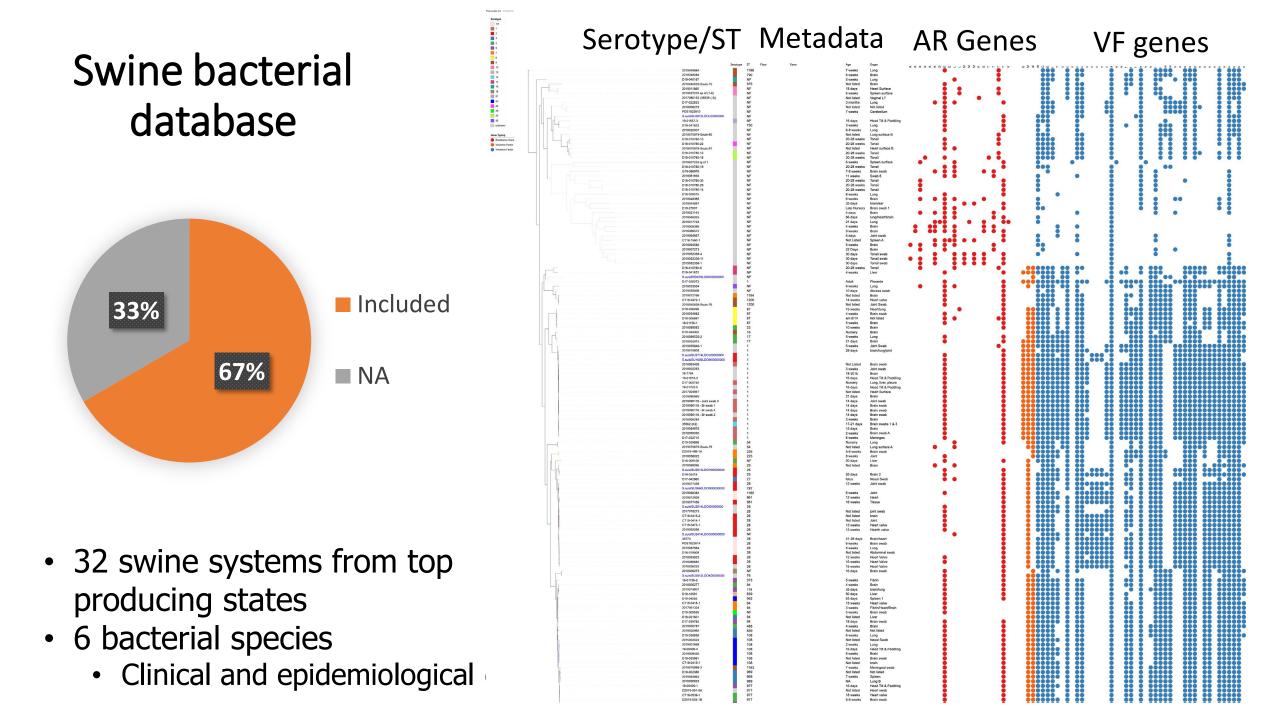


G. parasuis

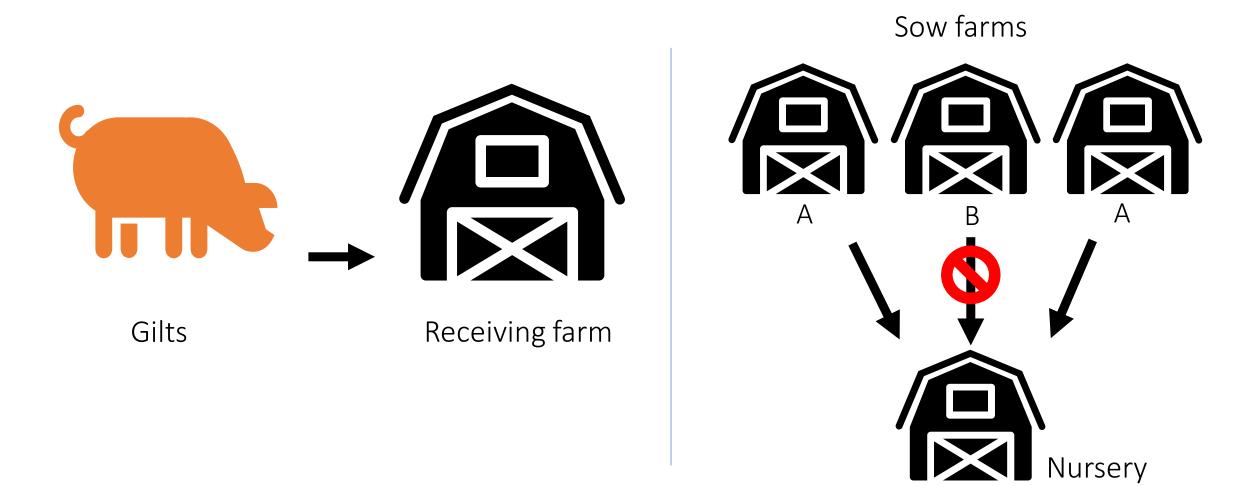


M. hyosynoviae M. hyorhinis





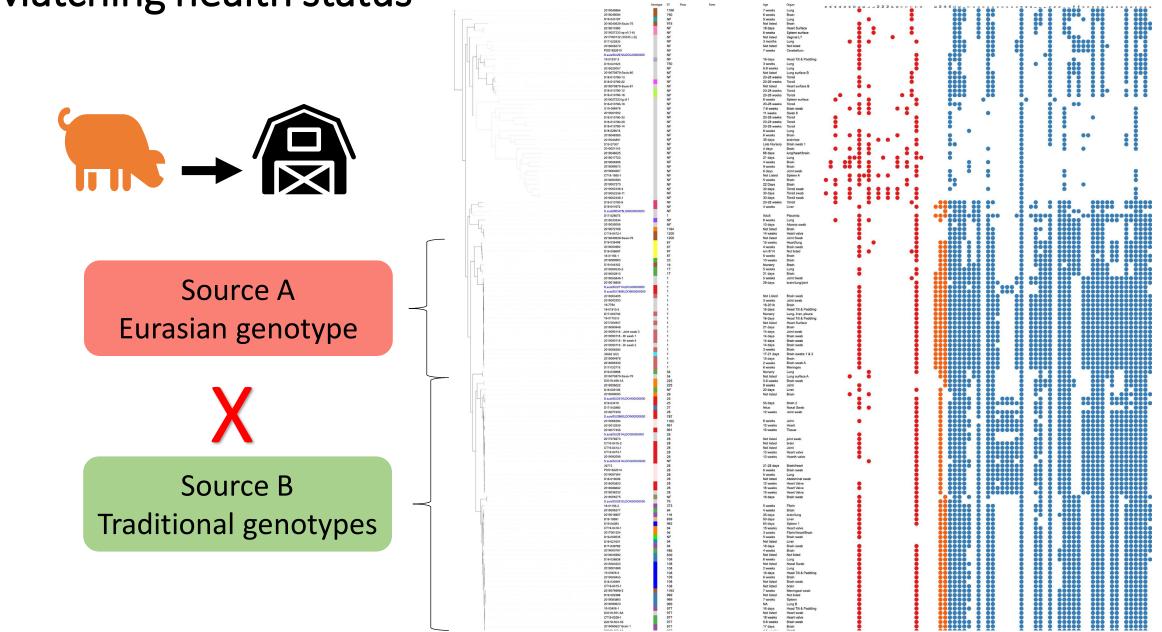
Improving how populations of pigs are mixed



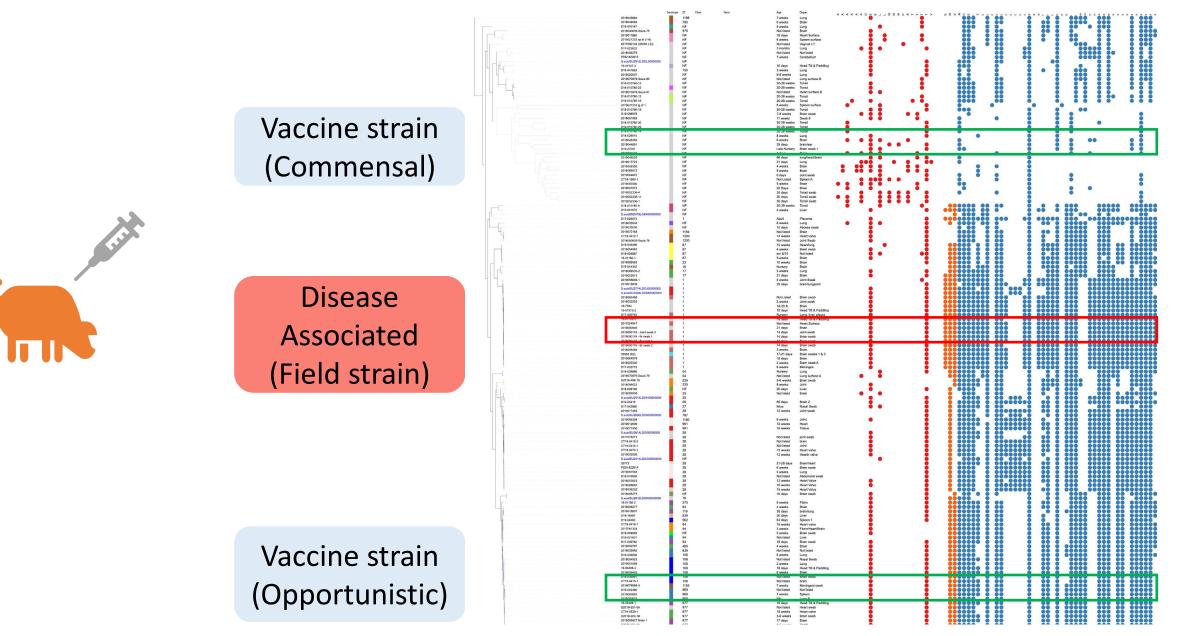
Farm stocking

Strategic commingling

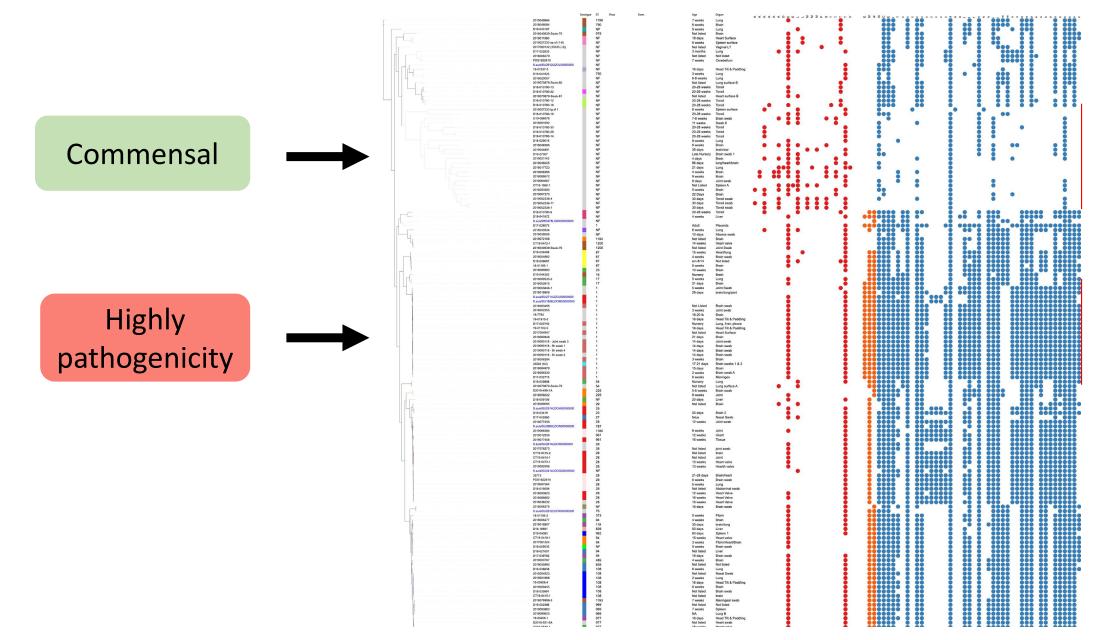
Matching health status



Refining selection of vaccin



Monitoring genetic antimi

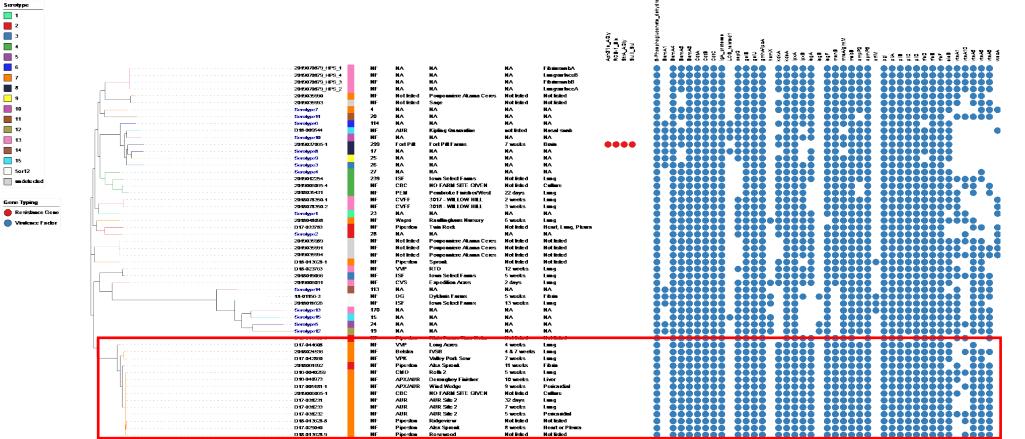


Track spread of pathotypes and identify global markers for virulence

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Identify sources of outbreaks

Time scale: 0.1



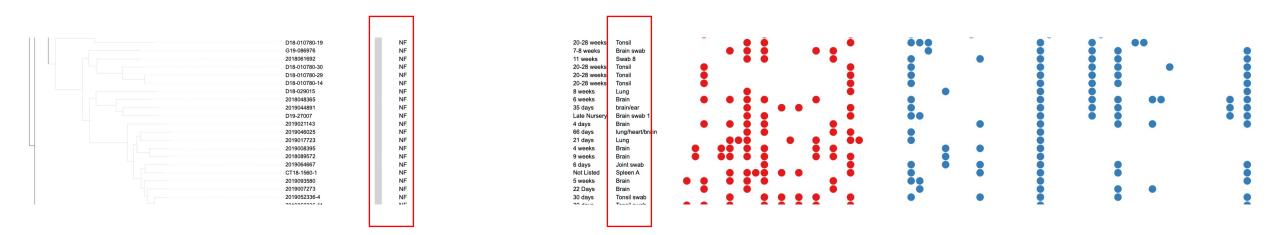
Leads to improvement in biosecurity



G. parasuis



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

Disease BioPortal - Bacteria project							Add Component 🗢 🗅 🗁 🕲 🗘 🖽 🖽 🖯 Ξ
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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 annually¹. The disease syndrome was first recognized in the United States in 1987 and described in 1989 (ref. 2). The causative

disease syndrome and porcine circovirusassociated disease, and can establish a lifelong subclinical infection⁶. In 2006, a more severe form of the disease, called highly pathogenic PRRS, decimated pig populations throughout China7. Although genetic selection for natural resistance is an option, success to date has been limited, possibly due to the genetic diversity of the virus⁸

homologous recombination and somatic cell nuclear transfer) were infected with PRRSV and compared with infected wildtype pigs, no difference in virus replication was found⁹. 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

A PRRSV VR-2385

10¹²

10¹¹ 10¹⁰

<u>ഴ</u> 10⁹

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trom vRNA 10⁶. 10⁵. 10⁴. Calculated TCID

104

10³

104

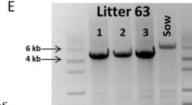
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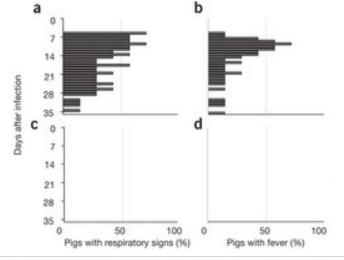
6 12 18 24 30 36 42 48 54

Time post inoculation (h)











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

Christine Burkard¹, Simon G. Lillico¹, Elizabeth Reid², Ben Jackson², Alan J. Mileham³, Tahar Ait-Ali¹, C. Bruce A. Whitelaw¹, Alan L. Archibald¹

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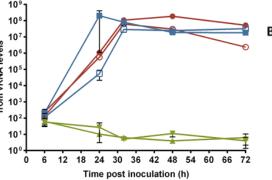


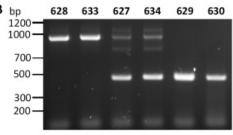
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ICID

PRRSV MN184







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