



UNDERSTANDING GENETIC RESISTANCE TO E. COLI F18



WHAT IS F18?

- Disease = Enteric colibacillosis
- Nursing and newly weaned pigs
- Colonization of the small intestine by enterotoxigenic strains of *Escherichia coli* (E. coli)
- Severe, watery diarrhea and dehydration
- Two strains...F4 and F18, cause most disease in U.S.
- These strains have 'Fimbriae' present on their surface which bind a specific receptor on the gut wall
- Some pigs lack the receptor and are therefore 'genetically' resistant



UNDERSTANDING F18 RESISTANCE IN OUR LINES

- DNA Lines are genetically resistant to E. coli F4
 - Desired to understand resistance to F18 and implement selection
1. Validation of the genetic marker
 2. Understand the frequency of resistance in our populations
 3. How to leverage the resistant animals for customer benefit
 4. Develop selection strategy to increase resistance over time



VALIDATION TRIAL

Objective: To evaluate the ability of specific E. coli. genotypes to confer resistance to E. coli. F18 in nursery pigs.

Selection of Pigs:

- Pigs from 30 AB genotype sows were tagged & sampled at birth
- At weaning, pigs with a known E. coli. genotype were identified and moved to the CISS-VRF and placed in pens according to genotype in a blinded study

**180 + 10 extra
animals**

AA	AB	BB
60 + 5	60 + 5	60 + 5



VALIDATION TRIAL

- 15 pens with ~12 pigs per pen, all of the same genotype
- Feed intake and fecal scoring were recorded for each pen
- Molecular results for bacterial count and quantity
- Pigs were inoculated on day 3 of the trial.
- Trial lasted 5 wks.



RESULTS

Treatment Code	Genotype	Expected Outcome
A	AB	SUSCEPTIBLE
B	BB	SUSCEPTIBLE
C	AA	RESISTANT

Cumulative Mortality			
Treatment	A	B	C
Pigs started, n	60	60	58
Pigs that died, n	16	11	0
Mortality, %	26.7	18.3	0



RESULTS

Genotype	A	B	C	SEM	P-VALUE
Start Weight	13.15	13.12	12.13	0.5	0.29
-3 to 3 DPI					
Weight	14	13.96	14.22	0.66	0.95
ADG	0.14a	0.15a	0.35b	0.04	<0.01
ADFI	0.42	0.38	0.45	0.03	0.30
FCR	3.17a	2.29ab	1.28b	0.37	0.01
3-7 DPI					
Weight	14.54	14.48	16.12	0.89	0.37
ADG	-0.05a	0.01a	0.50b	0.07	<0.01
7-14 DPI					
Weight	20.86	20.80	21.21	1.43	0.98
ADG	0.67	0.82	0.73	0.10	0.56



RESULTS

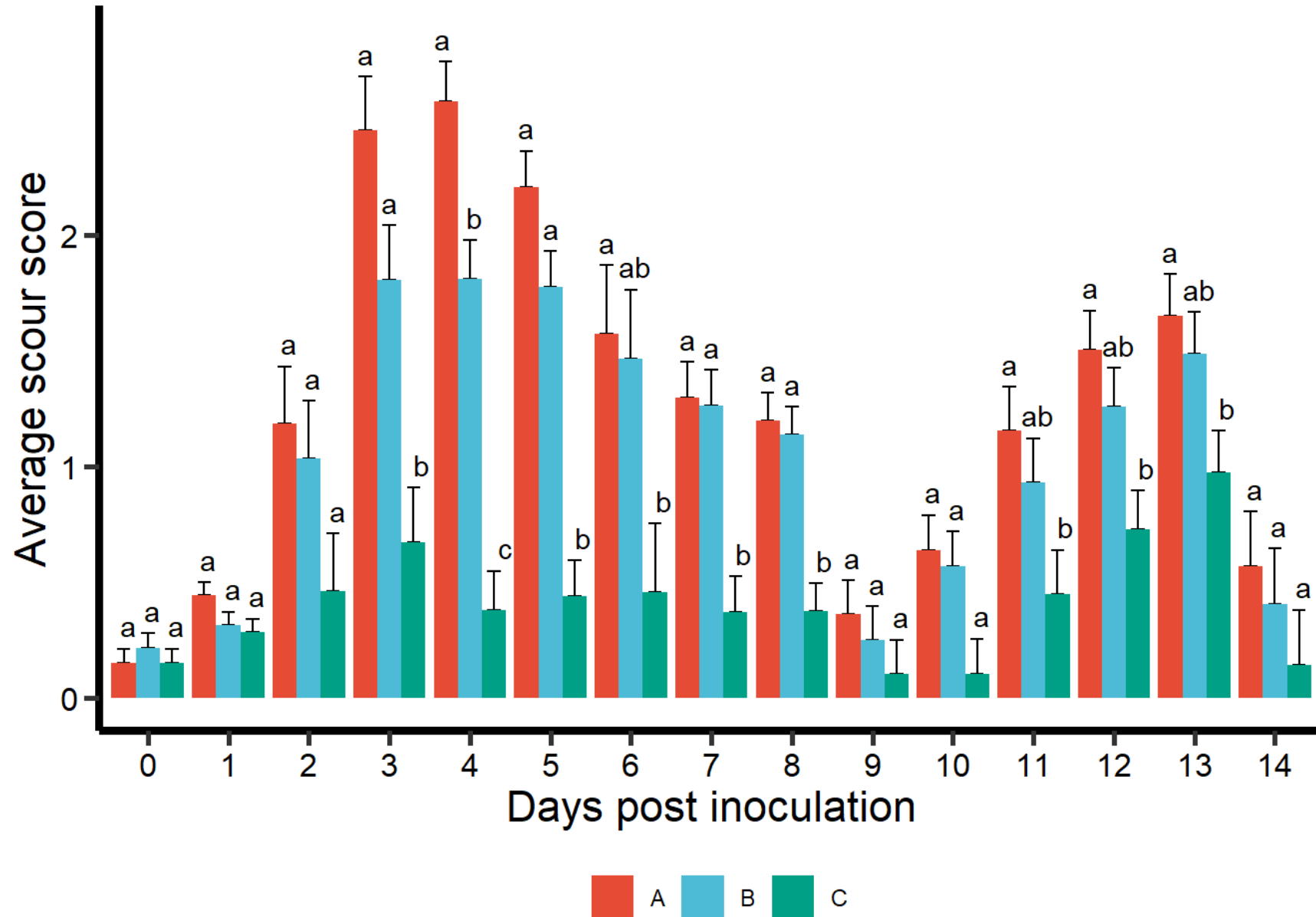
Genotype	A	B	C	SEM	P-VALUE
17-31 DPI					
Weight	39.98	38.62	41.23	2.28	0.73
ADG	1.19	1.07	1.17	0.07	0.46
ADFI	1.76	1.60	1.73	0.14	0.68
FCR	1.47	1.50	1.48	0.10	0.99
CUMULATIVE					
ADG	0.62a	0.66ab	0.84b	0.06	0.03
ADFI	1.03	1.01	1.14	0.09	0.53
FCR	1.67a	1.54ab	1.36b	0.05	<0.01



RESULTS

Genotype	A	B	C	SEM	P-VALUE
MOLECULAR RESULTS					
F18 E. coli, Ct*	22.65a	23.89a	30.07b	1.79	<0.01
Total E. coli (gad ab), Ct	21.57a	21.87a	27.01b	1.33	<0.01
Total bacteria (rrs), Ct	19.89a	20.33a	24.47b	1.22	0.01

*Lower Ct values indicate higher pathogen present





CONCLUSIONS

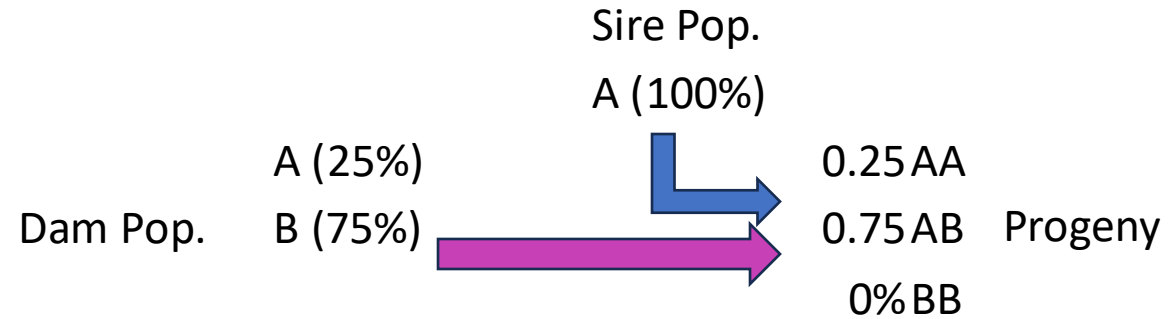
- All animals with AA genotypes (resistant alleles) survived the E.coli infection (100% survival)
- Resistant animals had better performance on feed and growth traits
- AB and BB animals (susceptible) are **not** significantly different



THE IMPORTANCE OF THE SOW

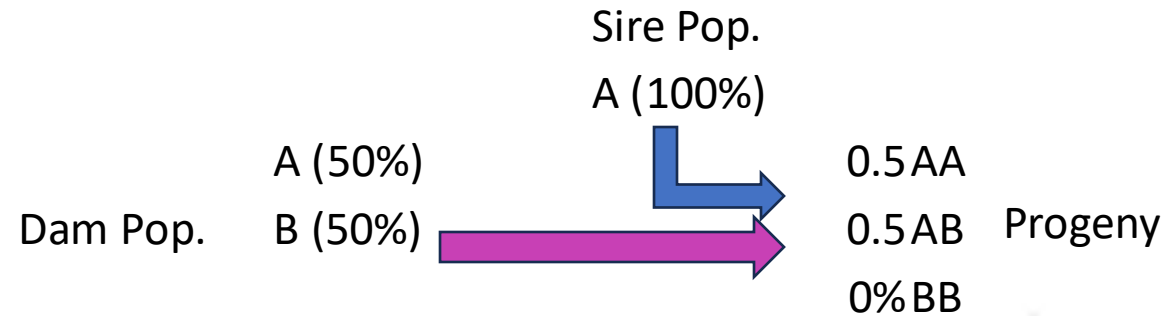
1)

**Dam with
25% resistant**



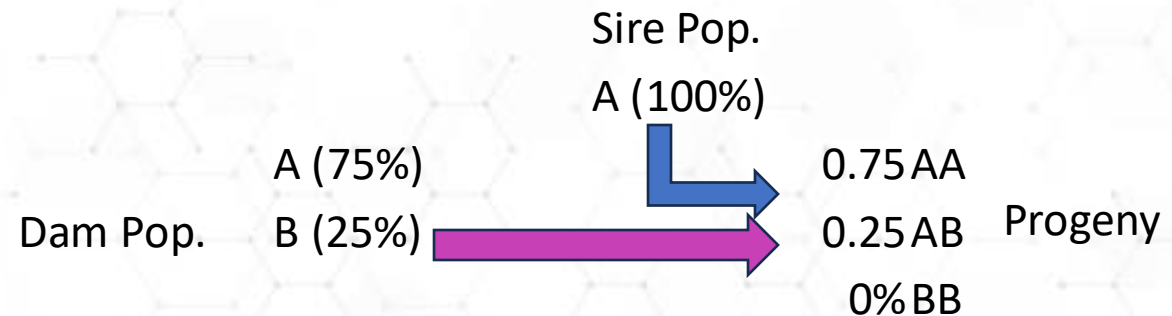
2)

**Dam with
50% resistant**



3)

**Dam with
75% resistant**





NEXT STEPS

- E. coli. F18 resistance contributes to overall survival, a key objective of our program:
 - Develop genotyping pipeline for individual E.coli. genotypes, all animals in all breeds – DONE
 - Understand the relationship between resistance alleles and other traits in our objective – DONE
 - Increase the frequency of resistance in all of our populations via selection - ONGOING