

Mortality Rate and Survival of Pigs Classified by Immune Response Phenotype Using the High Immune Response Technology™

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- ❖ Societal concern regarding food safety and animal health are increasing
 - The presence of antibiotic residues in meat, antimicrobial resistant organisms and the risk of zoonotic disease

- ❖ Effective economic alternatives, with the potential to improve productivity, animal health and robustness are essential

- ❖ Previous research has clearly demonstrated favorable outcomes by breeding pigs for immune response (IR)
 - Improved response to vaccination and disease challenge
 - Increased rate of gain

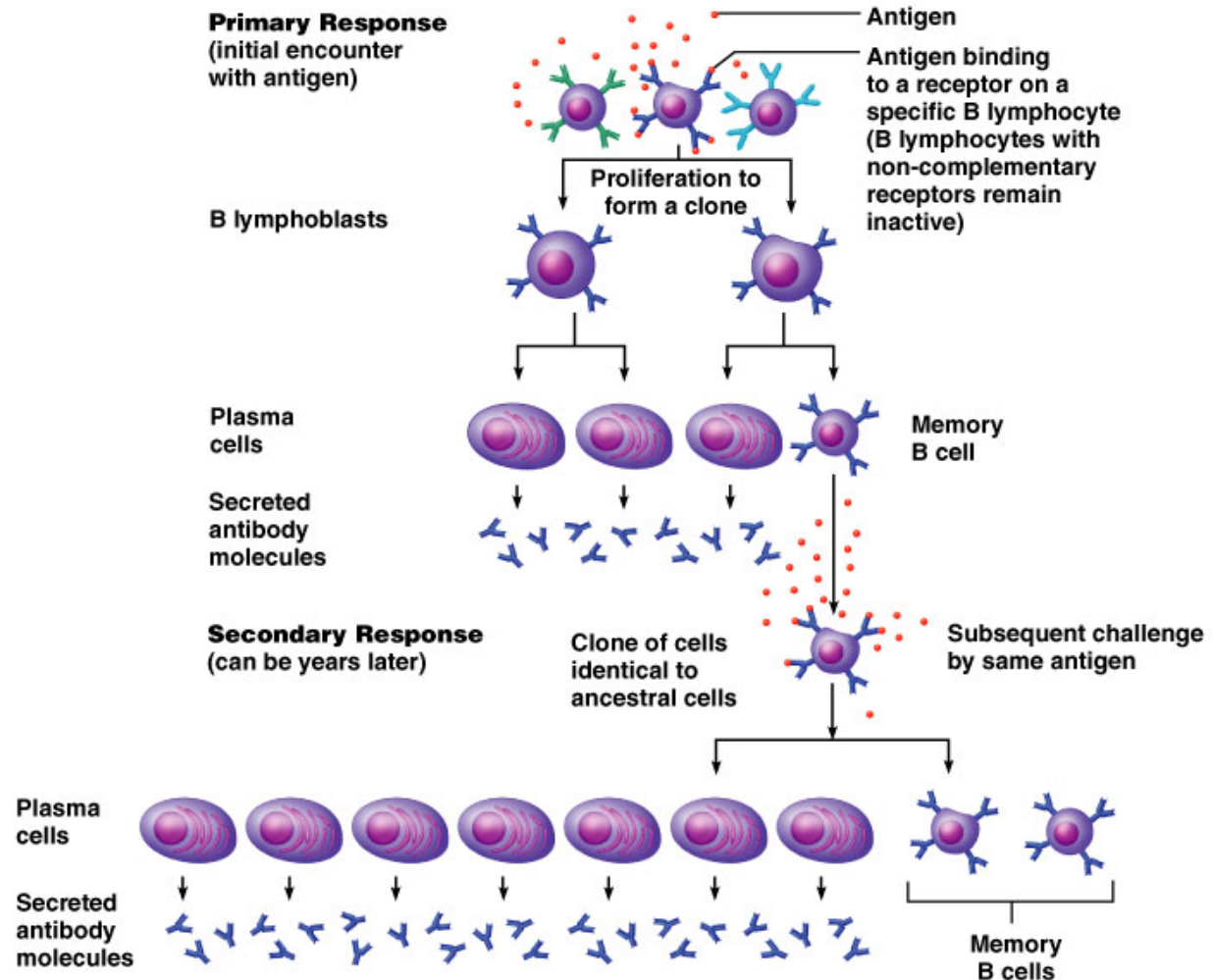
Wilkie and Mallard. 1999. Adv. Vet. Med. 41:39

Reddy, J. et al. 2000. Infection and Immunity 68(3):1150

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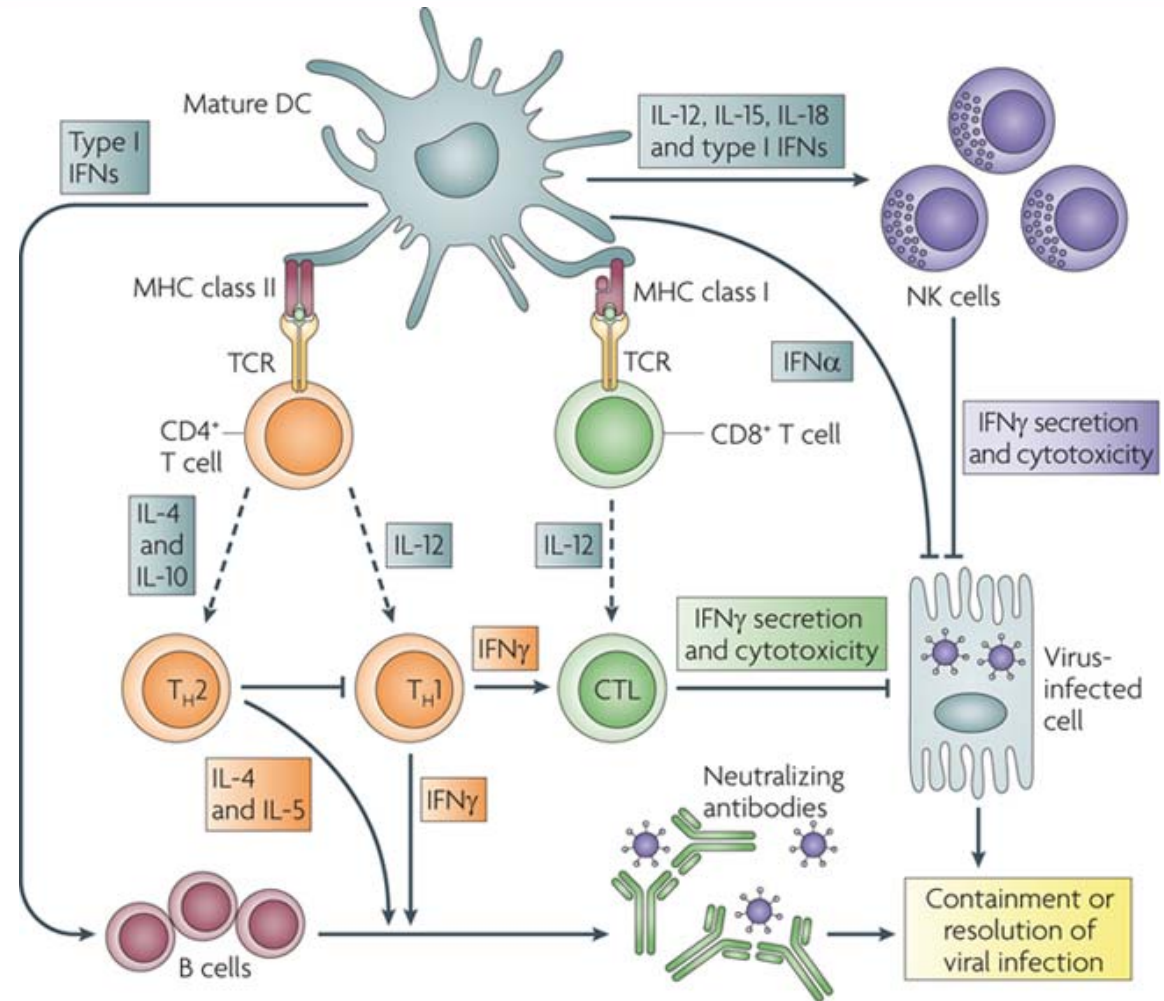
Antibody-mediated

- Extracellular pathogens (Bacteria, Fungi)
- Mediated by B-cells and CD4+ T-cells
 - T-helper 2 cells (IL4, IL5, IL13)
- Antigen-specific antibodies eliminate pathogens



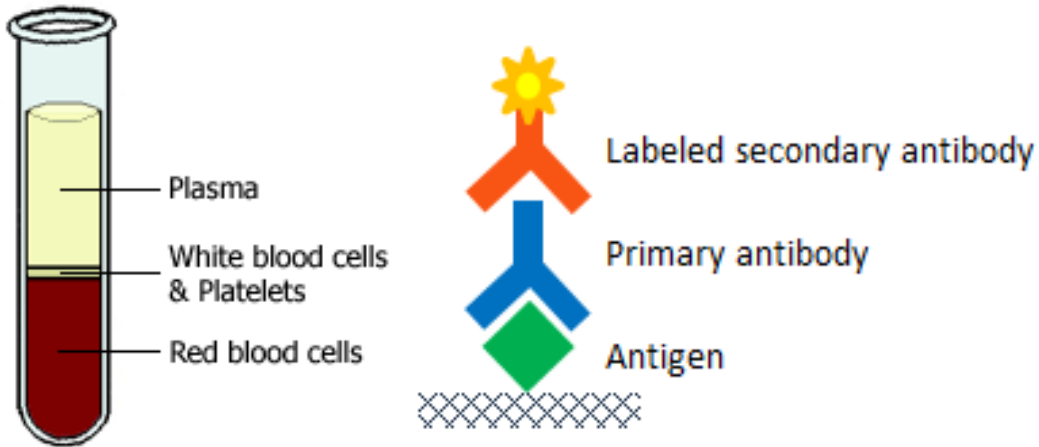
Cell-mediated

- Intracellular pathogens (Viruses)
- CD4+ and CD8+ T-cells
- Cells including Cytotoxic T-cells and Natural Killer cells destroy virus infected cells

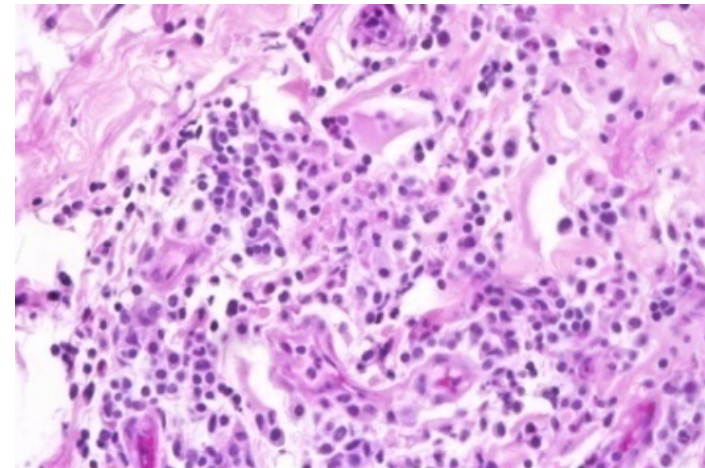


ANTIBODY- MEDIATED IMMUNE RESPONSE (AMIR)

- Antigen-specific Antibody Activity



CELL-MEDIATED IMMUNE RESPONSE (CMIR)



❖ Research facilities located in Deschambault, Québec

- **“Clean” nursery facility (HIR testing)**
- Disease Challenge Barn: nursery – finisher



❖ Continuous Flow of animals through each facility

- New piglets (21 – 25 days old) enter every three weeks
- Piglets sourced from 1 of 7 different breeding companies comprising PigGen Canada
- Piglets are evaluated for numerous parameters from weaning until slaughter



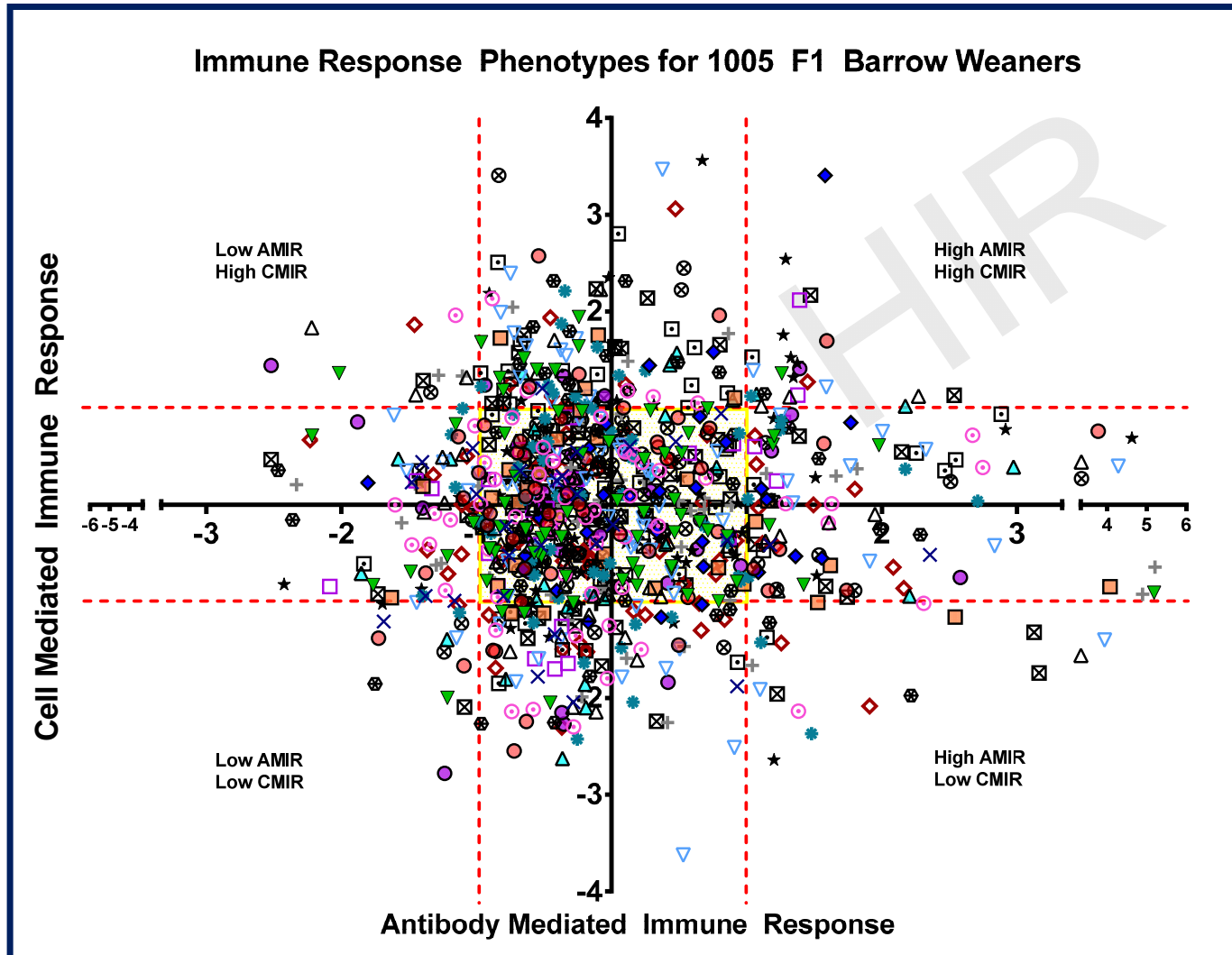
❖ 'Natural' Challenge Model

- Specific pathogens were introduced via '**seeder**' pigs from disease positive commercial sources
- Major intended and confirmed targets:
 - *Mycoplasma hyopneumoniae*
 - *Actinobacillus pleuropneumoniae*
 - Influenza A virus
 - Porcine Circovirus
 - Porcine Reproductive and Respiratory Disease virus

❖ Objective:

- Find early immune predictors of resilience that can be used in nucleus herds to supply multipliers with healthier animals

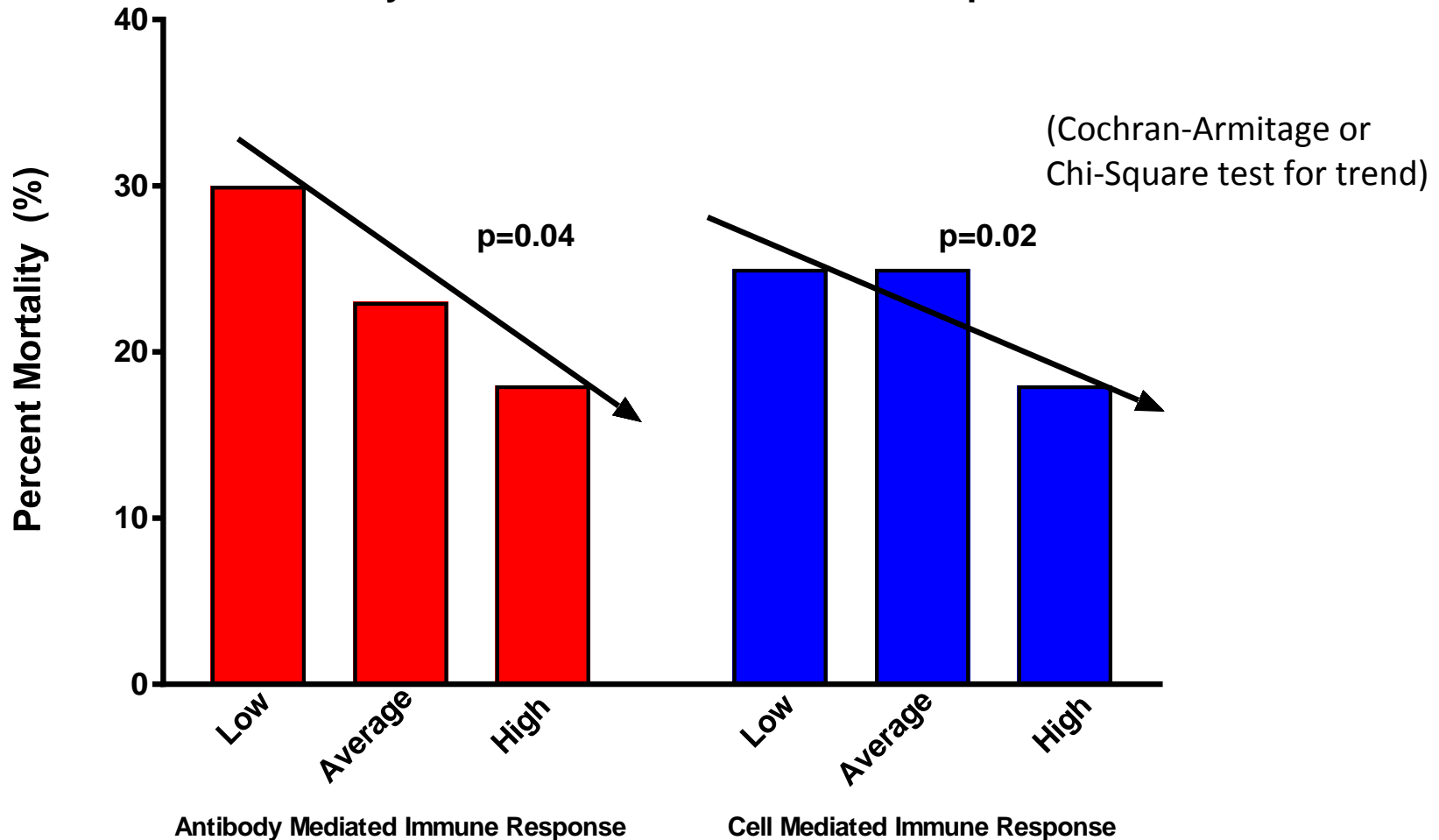
Immune Response Phenotype Rankings for 1005 F1 Barrow Weaners (Standardized Residual)



$Y = B_i + T_j + e_{ij}$. Where
Y = Immune Response
Phenotype, B = Batch (i)
and T = Technician (j)

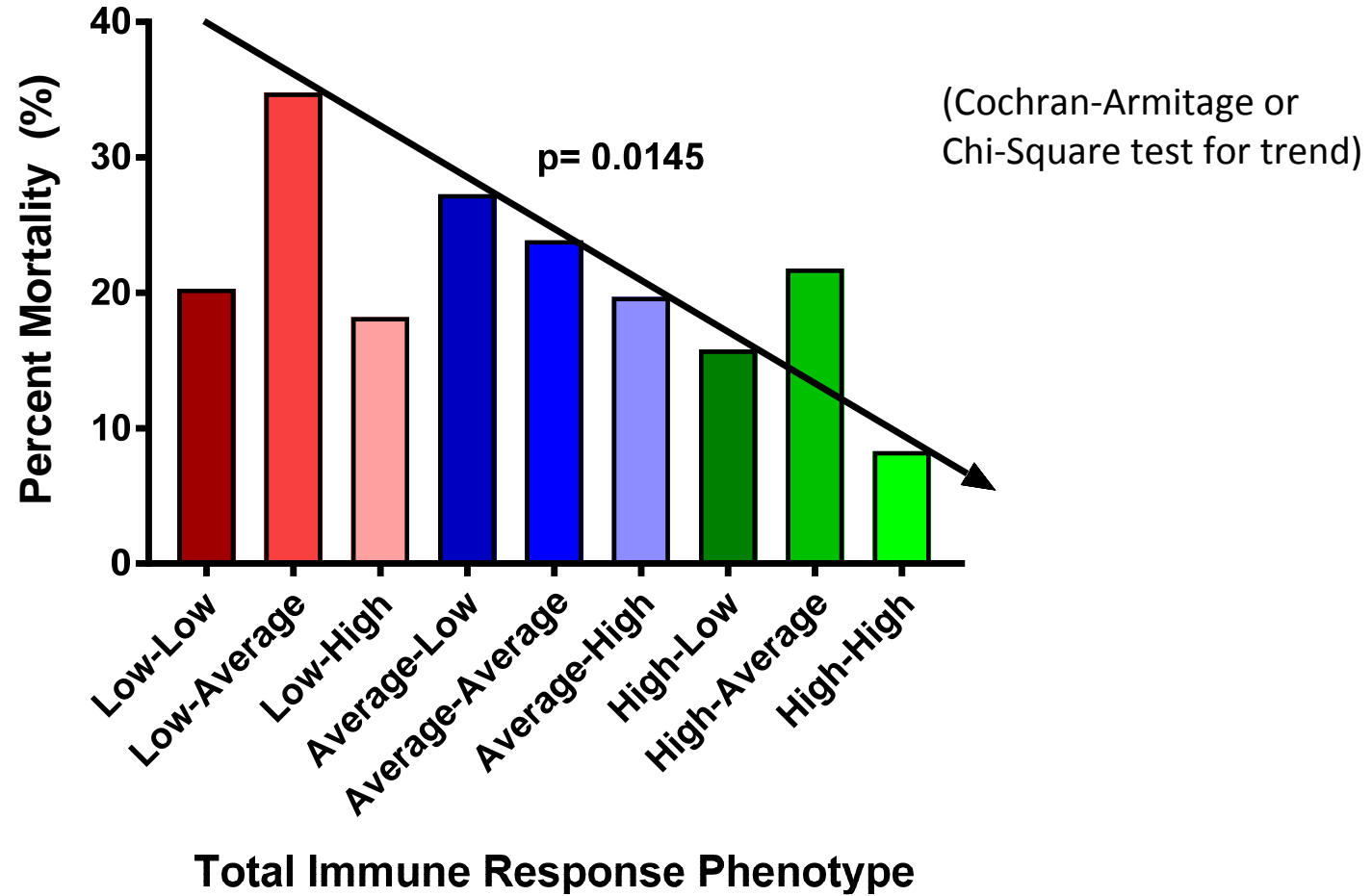
Disease Associated Mortality Rate: AMIR and CMIR Individual Phenotypes

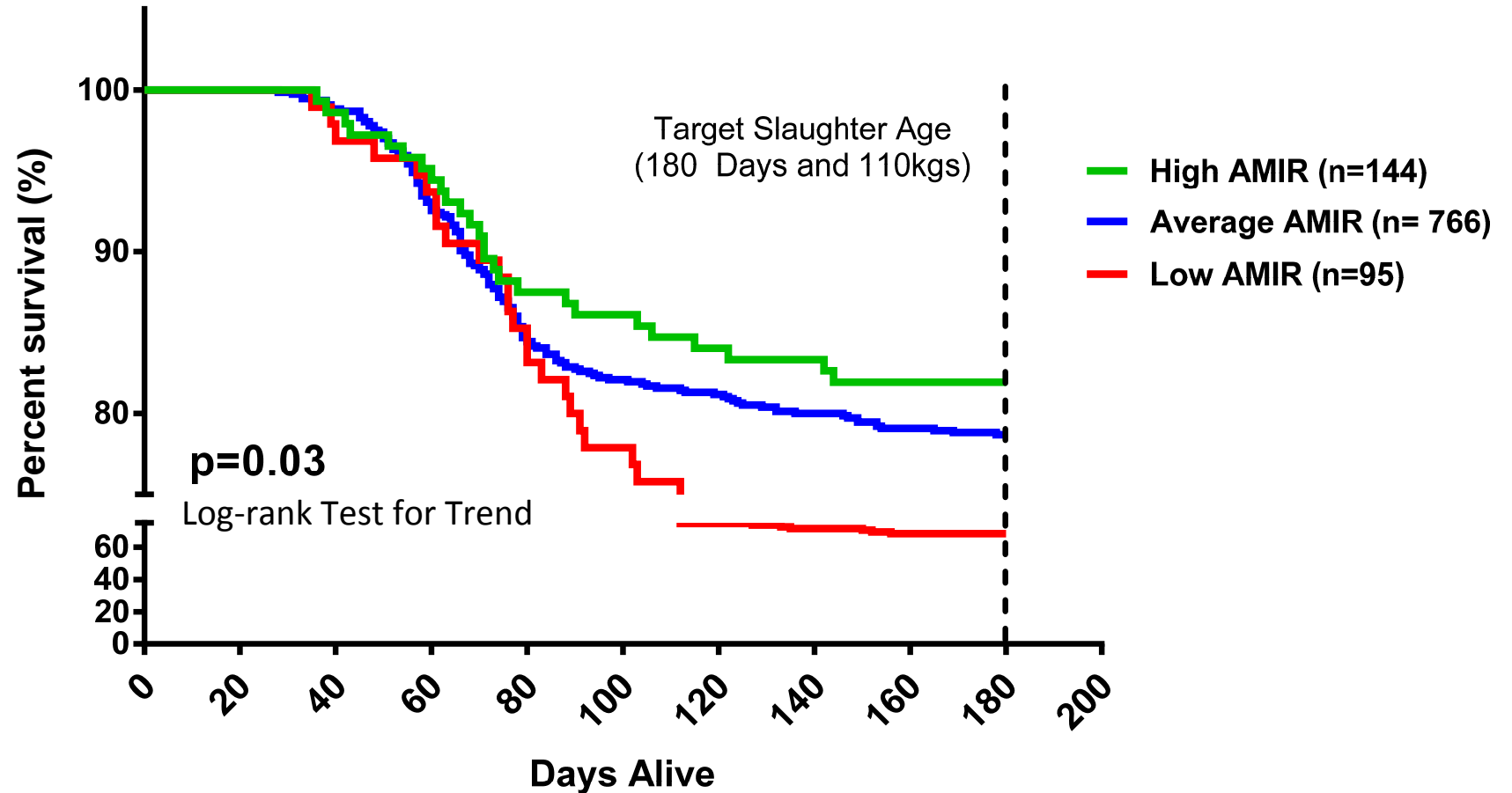
Mortality Rate of 1005 Immune Response Phenotyped F1 Barrows:
Antibody and Cell Mediated Immune Response

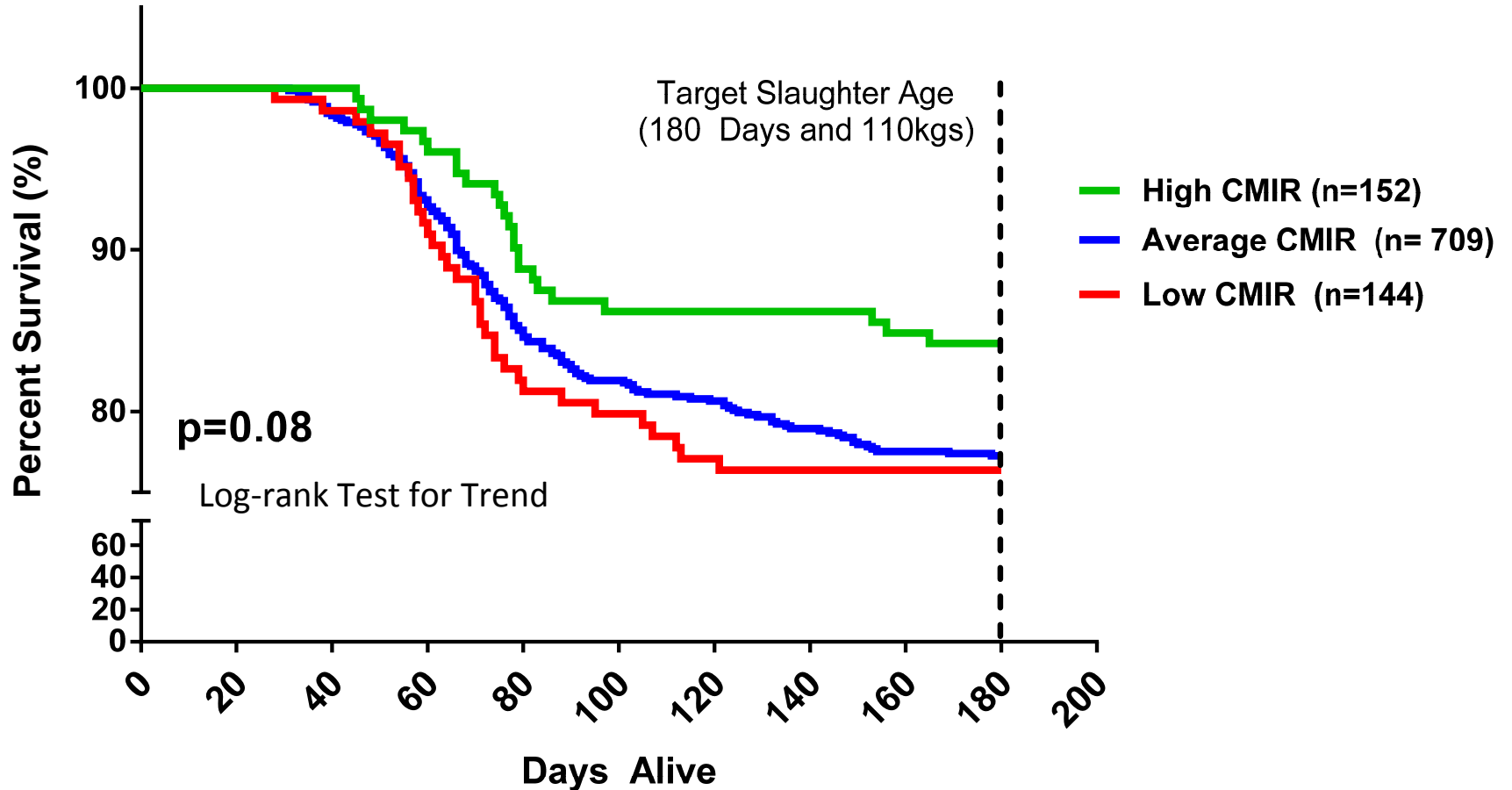


Disease Associated Mortality Rate: Combined Immune Response Phenotype

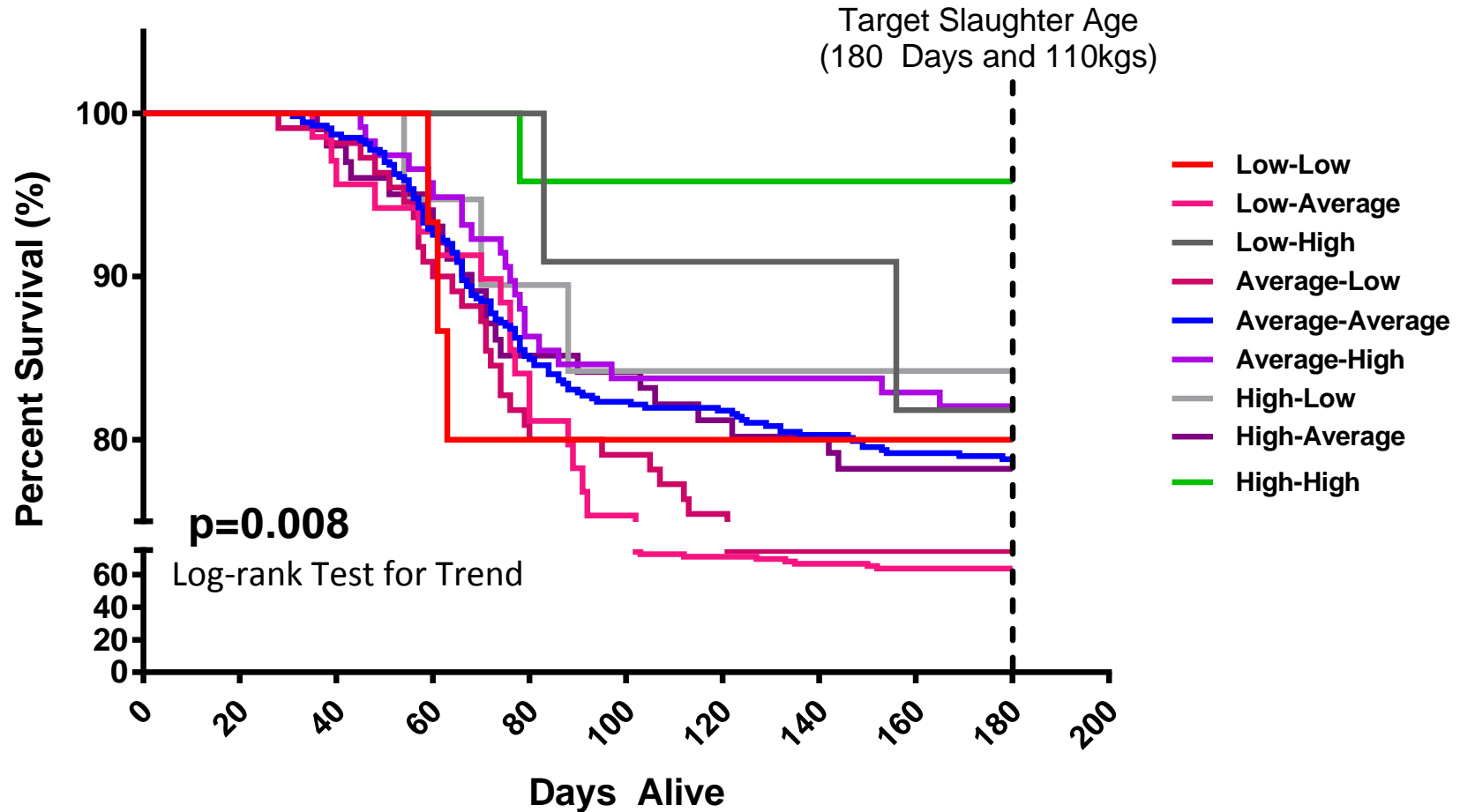
Mortality Rate of 1005 Immune Response Phenotyped
F1 Barrows: Total Immune Response



Survival of 1005 Immune Response Phenotyped Pigs
by Antibody Mediated IR Category

Survival of 1005 Immune Response Phenotyped Pigs
by Cell Mediated IR Category

Survival of 1005 Immune Response Phenotyped Pigs: Total Immune Response



- ❖ Immune Response phenotyping of pigs identifies animals with the potential to withstand pathogen-challenge by making strong and appropriate IRs.
- ❖ These animals may also display production related advantages, as observed in previous experiments.
- ❖ Therefore, the implementation and integration of the HIR™ technology into commercial pig breeding programs could yield both health and production benefits similar to that seen in dairy.

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GenomeCanada

GLOBAL CHALLENGES + GENOMIC SOLUTIONS



Ontario Genomics



GenomeAlberta



GenomePrairie



Ontario

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Heritability AMIR = 0.25 - 0.3

- ❖ In line with previous estimates in pigs bred for immune response
- ❖ In line with current dairy cattle data
- ❖ Relatively un-affected by “human element” due to nature of test (ELISA)

Heritability CMIR = 0 – 0.09

- ❖ Previously estimated to be between .2 and .25 in pigs bred for immune response
- ❖ Subject to human variation due to nature of test