



THE UNIVERSITY  
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# ESTIMATION OF DIRECT AND MATERNAL GENETIC RESPONSES BASED ON A PIGLET POST-NATAL SURVIVAL SELECTION

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# Piglet survival

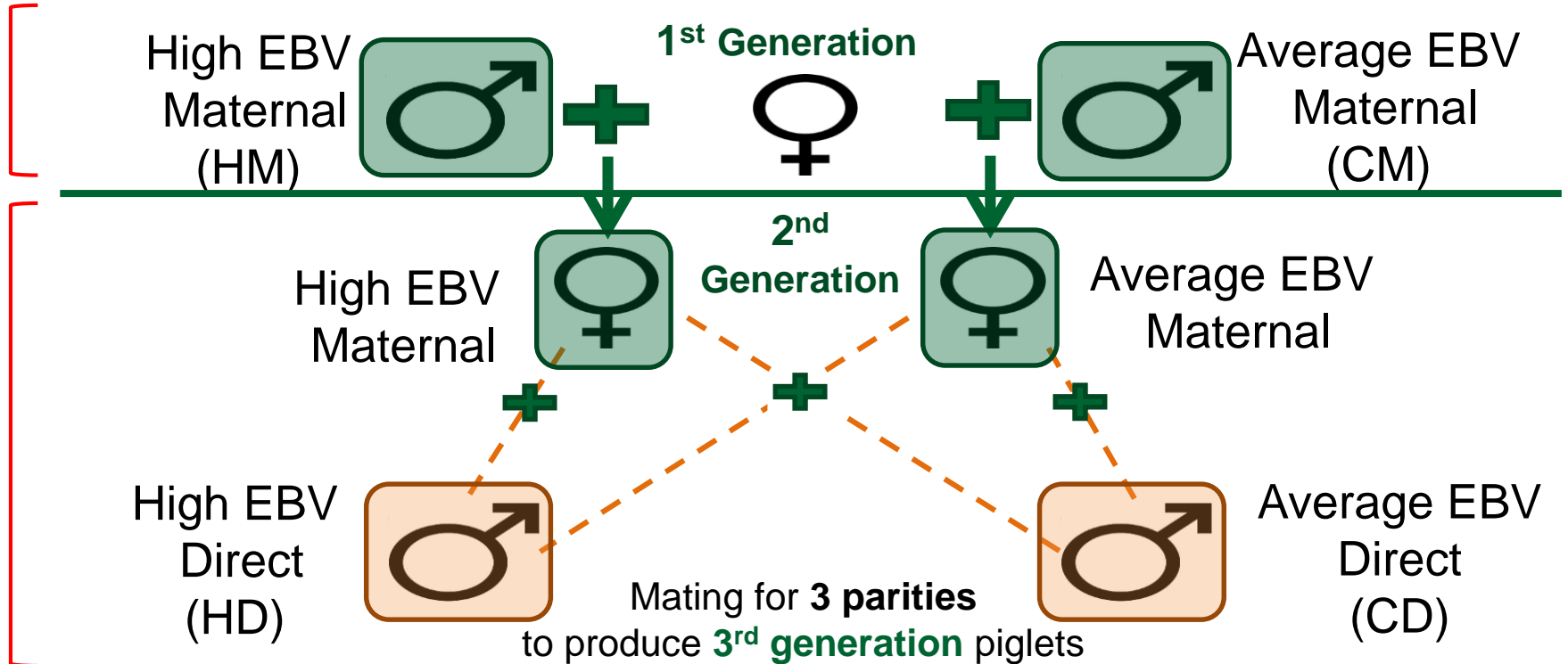
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- Important trait
  - Welfare and Ethical
  - Economic
- Selection response
  - Direct genetic effect and maternal genetic effect
  - Low heritability
- Aim: To estimate selection response on piglet survival after two generations of selection.









# Material

- ❖ Piglet survival: 2 generations of selection



# Traits used for analysis

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- At piglet level:
  - » SVB Survival at birth 
  - » SVNP Survival within nursing period 
  - » IBW Individual birth weight 
- At sow level
  - » NB Total number piglets born
  - » ABW Average piglet birth weight within litter 
  - » SDBW Standard deviation of piglet birth weight within litter
  - » SVBL Percentage of survival at birth per litter 
  - » SVNPL Percentage of survival within nursing period per litter 

# Bayesian model


## At piglet level

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- Model

$$y = Xb + Z_1d + Z_2m + Z_3l + e,$$

- » y SVB, SVNP, IBW
  - » b Fixed effects 
  - » d Direct genetic effects
  - » m Maternal genetic effects
  - » l Litter effects
  - » e Residuals
- H.y.s 23 classes
  - gestation 09 classes
  - sex 02 classes
  - fostering 02 classes













# At sow level







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- Model

$$y = Xb + Z_1a + Z_2pe + e,$$

- »  $y$  NB, ABW, SDBW, SVBL, SVNPL
- »  $b$  Fixed effects
- »  $a$  Direct genetic effects of the sows
- »  $pe$  Permanent environmental effects
- »  $e$  Residuals

Effect and trait	Direct			Maternal			
	SVB 	SVNP 	IBW 	SVB 	SVNP 	IBW 	
Direct	SVB 	<b>0.18*</b> (0.13 0.23)	<b>0.23*</b> (0.01 0.44)	<b>0.23*</b> (0.11 0.35)	-0.04 (-0.26 0.17)	0.14 (-0.05 0.34)	0.12 (-0.00 0.24)
	SVNP 		<b>0.18*</b> (0.13 0.24)	<b>0.25*</b> (0.13 0.37)	0.16 (-0.04 0.37)	-0.15 (-0.33 0.03)	<b>0.14*</b> (0.01 0.26)
	IBW 			<b>0.36*</b> (0.32 0.40)	<b>0.16*</b> (0.04 0.29)	<b>0.15*</b> (0.03 0.27)	-0.05 (-0.14 0.05)
Maternal	SVB 			<b>0.14*</b> (0.12 0.17)	<b>0.23*</b> (0.07 0.40)	<b>0.17*</b> (0.06 0.29)	
	SVNP 	<b>Heritability on diagonal</b>			<b>0.12*</b> (0.09 0.14)	<b>0.28*</b> (0.18 0.38)	
	IBW 	<b>Genetic correlation above diagonal</b>				<b>0.29*</b> (0.26 0.32)	
<b>At piglet level</b>							

Trait	NB	ABW 	SDBW	SVBL 	SVNPL 
NB	<b>0.22*</b> (0.16 0.30)	<b>-0.39*</b> (-0.59 -0.17)	<b>0.38*</b> (0.12 0.65)	-0.37 (-0.84 0.05)	<b>-0.36*</b> (-0.68 -0.05)
ABW 		<b>0.22 *</b> (0.13 0.32)	<b>0.68</b> (0.48 0.85)	-0.17 (-0.64 0.29)	0.31 (-0.04 0.65)
SDBW			<b>0.11*</b> (0.06 0.17)	-0.43 (-0.86 0.04)	-0.02 (-0.41 0.35)
SVBL 	<b>Heritability on diagonal</b>			<b>0.06*</b> (0.02 0.12)	0.18 (-0.31 0.68)
SVNPL 	<b>Genetic correlation above diagonal</b>				<b>0.13*</b> (0.06 0.19)
	<b>At sow level</b>				



# Selection response

## At piglet level

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- Maternal selection response

$$R_{mEBV} = \mu_{mHM} - \mu_{mCM}$$

- Direct selection response

$$R_{dEBV} = \mu_{dHD} - \mu_{dCD}$$

# Selection response

## At sow level




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- Second generation sows (selected for maternal genetic effects vs control)
- Selection response




$$R = \mu_{HM} - \mu_{CM}$$

# Maternal selection response




Trait	High	Control	R	Pvalue
mSVB 	96.31%	96.27%	0.04%	0.36
mSVNP 	88.74%	88.42%	0.32%*	<0.001
mIBW 	-0.0146	-0.0127	-0.0019	0.73

1.28%

# Direct selection response

Trait	High	Control	R	Pvalue
dSVB 	96.21%	95.47%	0.74% *	<0.0001
dSVNP 	88.36%	87.81%	0.55%*	<0.0001
dIBW 	0.03 kg	0.01 kg	0.02 kg*	<0.0001

# Selection response at sow level

Trait	High	Control	R	Pvalue
NB	0.116	0.458	-0.342*	<0.0001
ABW (kg) 	-0.023	-0.025	0.002	0.73
SDBW (kg)	-0.003	0.001	-0.004*	0.0007
SVBL (%) 	0.000	-0.001	0.001	0.0872
SVNPL (%) 	0.003	-0.010	0.013*	<0.0001

# Conclusions

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- The heritabilities of all traits analysed in this study were significantly different from zero
  - » Opportunity for genetic improvement of all reproduction traits

# Conclusions (cont.)

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- Selection for survival at weaning led to
  - » Reduction in litter size
  - » Slightly higher birthweight
  - » Reduction in birthweight variation
  - » **Improve piglet survival**
    - » **(Direct and maternal simultaneously)**

# THANK YOU!



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