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Oxytocin candidate genes and maternal behaviour of sows

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Maternal ability

sows' ability to raise a large litter of fast growing piglets

Sows' behaviour matters for

- production results piglet survival, piglet growth
- piglet welfare crushed, starved
- sow welfare fear
- caretaker welfare aggression

There is genetic variation between sows
in maternal behaviour

Behavioural traits are difficult to record

If we could use **genetic markers** for important genes...

1. blood samples from young gilts
2. DNA analysis reveals genotype
3. gilts with favourable alleles are selected
4. genetic progress

Which genes are important for maternal behaviour?

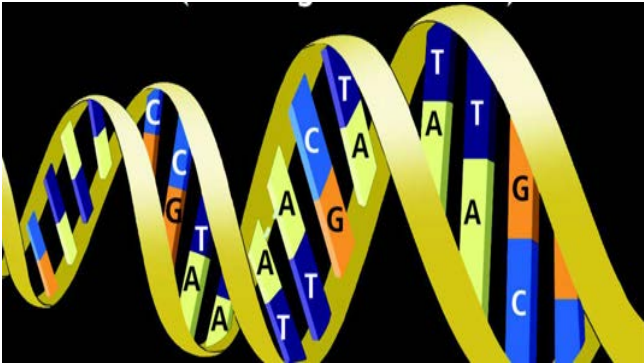
One candidate gene is oxytocin

Oxytocin - a mediator of well-being

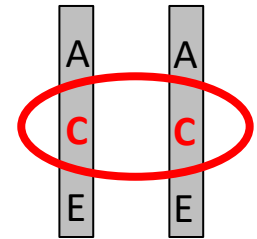
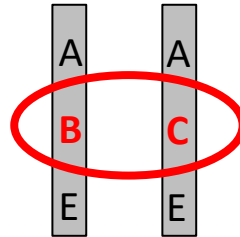
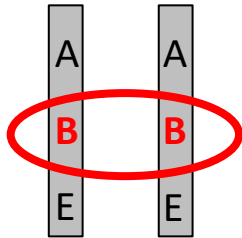
- calmness and stress response
- sow nest building
- uterus contraction during farrowing
- grunting and behaviour during nursing
- milk release
- social behaviour
- ...

Oxytocin level in blood is difficult to measure

Gene governing oxytocin synthesis on chromosome 17



This gene is 850 base pairs long. Base pairs where sows differ can be used as markers



9 chosen candidate genes

OXT oxytocin synthesis

OXTR oxytocin receptor

AVP vasopressin, social behaviour

FOSB ability to nurse

MEST maternal behaviour

Grb10 social behaviour

PRKCG behavioural impulsivity

Peg3 milk ejection, abnormal behaviour

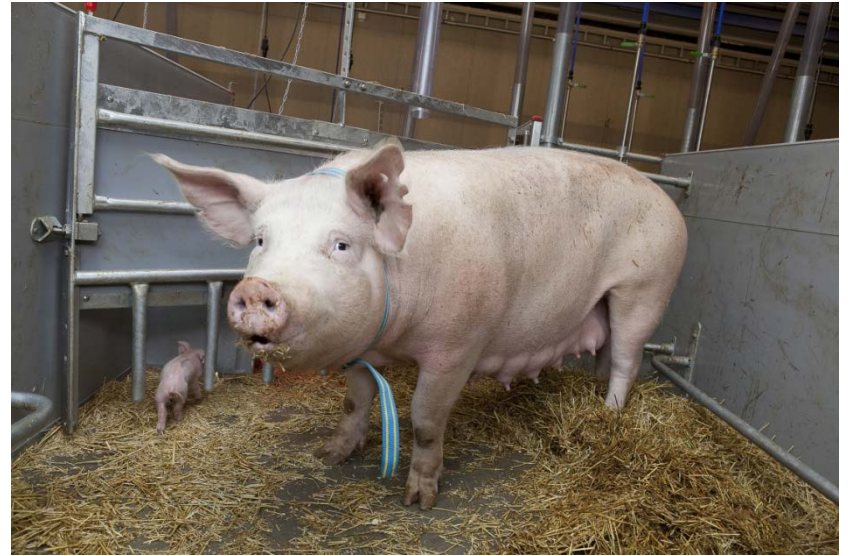
CD38 social behaviour

Peg3 and CD38 also in oxytocin regulation path

96 Swedish Yorkshire sows

- litter size, piglet weight d1, d21, d35, mortality
- colostrum in udder before farrowing
- sow behaviour, questions to caretaker d1, d21
- sow reaction when handling piglets d5
- medical treatment: synthetic oxytocin after farrowing

Video recording, before farrowing to d21



Sow behaviour, results

Large variation in nest building activity

Very few sows aggressive towards piglets

Few sows aggressive towards caretaker

Few sows show fearfulness

Aggression and fear repeated d1 - d21

30% no colostrum in udder the day before farrowing

31% treated with synthetic oxytocin after farrowing

No phenotypic correlation between
sow behaviour and piglet growth or survival

Candidate genes, results

1-5 useful markers for all 9 candidate genes

Some association between candidate gene and maternal ability and or behaviour found for 8 genes

<i>Gene</i>	<i>associated with</i>
Oxytocin	Nest building, Number born, Aggressive-caretaker
Vasopressin	Mortality, Growth, Fearful
Oxy receptor	Number born
Peg3	Mortality, Oxy-treatment Reaction-handling piglets
CD38	-
FOSB	Colostrum, Birth weight, Mortality
Grb10	Mortality, Fearful

Next step: **Video recordings**
from before farrowing to d 21

96 sows x 23 days ...

Focus on sows with interesting alleles

Conclusions

There is genetic variation in the 2 oxytocin genes and the 7 other candidate genes

No significant phenotypic correlations between behaviour and piglet growth or survival

Some significant associations between candidate genes and piglet growth and survival

Some significant associations between candidate genes and sow behaviour

Complex traits with complex genetic background...
but probably a good base for genomic selection

Your comments are welcome

- additional candidate genes
- video, which traits?
- use of oxytocin treatment (31%)

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