

# GM animals - developments

3 May 2012, Esther Kok



# Bull Herman



*One of the first GM animals in Europe..*



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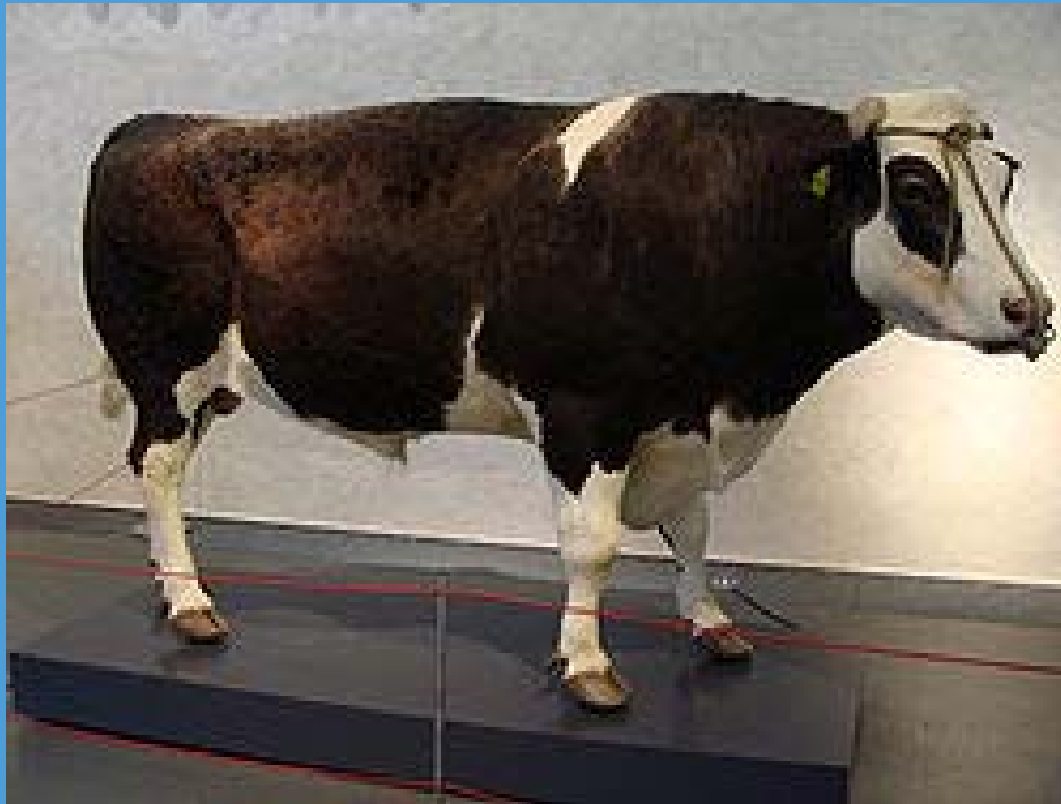
# Bull Herman



- Born in 1990 (Pharming)
- Lactoferrin gene
- 55 off-spring
- All females showed low lactoferrin production
- Died in 2004



# Bull Herman



Museum Naturalis, Leiden, The Netherlands



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# Glofish



# Current developments

## First International Workshop on the Food and Environmental Safety Assessment of Genetically Modified Animals

5-9 September, Buenos Aires City, Argentina

*EFSA:*

*dr. Yi Liu*

*EFSA GMO Panel:*

*dr. Gijs Kleter*

*WG Food/feed safety of GM animals:  
(financed by the Dutch Government)*

*dr. Esther Kok*



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# Current developments

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*No reports of GM animals on the market*



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# Current developments

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*No reports of GM animals on the market*

Which countries are most active?

*China*  
*(focus on pigs, cattle and sheep)*

*Argentina*  
*Brazil*  
*Canada/US*





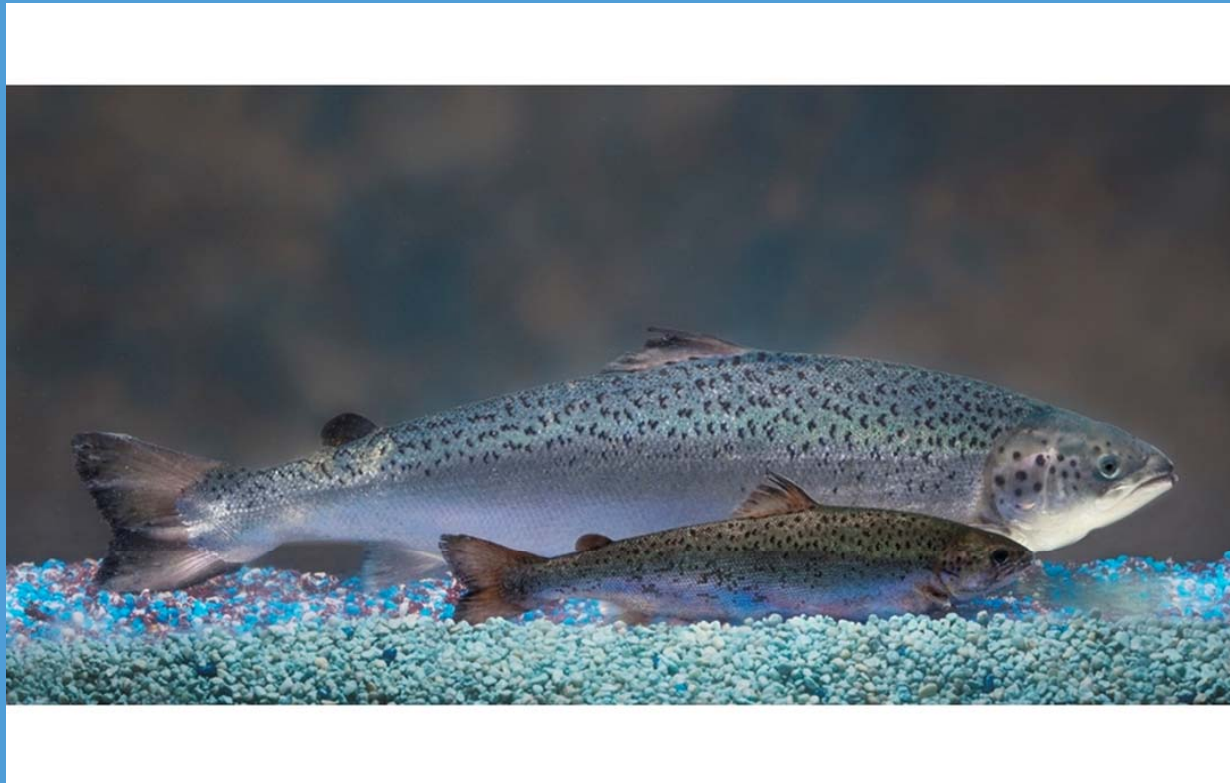
# Traits

- Production of pharmaceutical compounds, a.o:
  - Lactoferrin
  - Lysozym
  - Insulin
  - Human growth hormone
  - Erythropoetine
  - Albumin
  - Interferon-alpha
  - Monoclonal antibodies
  - Fucosyltransferase
  - Lactoperoxidase

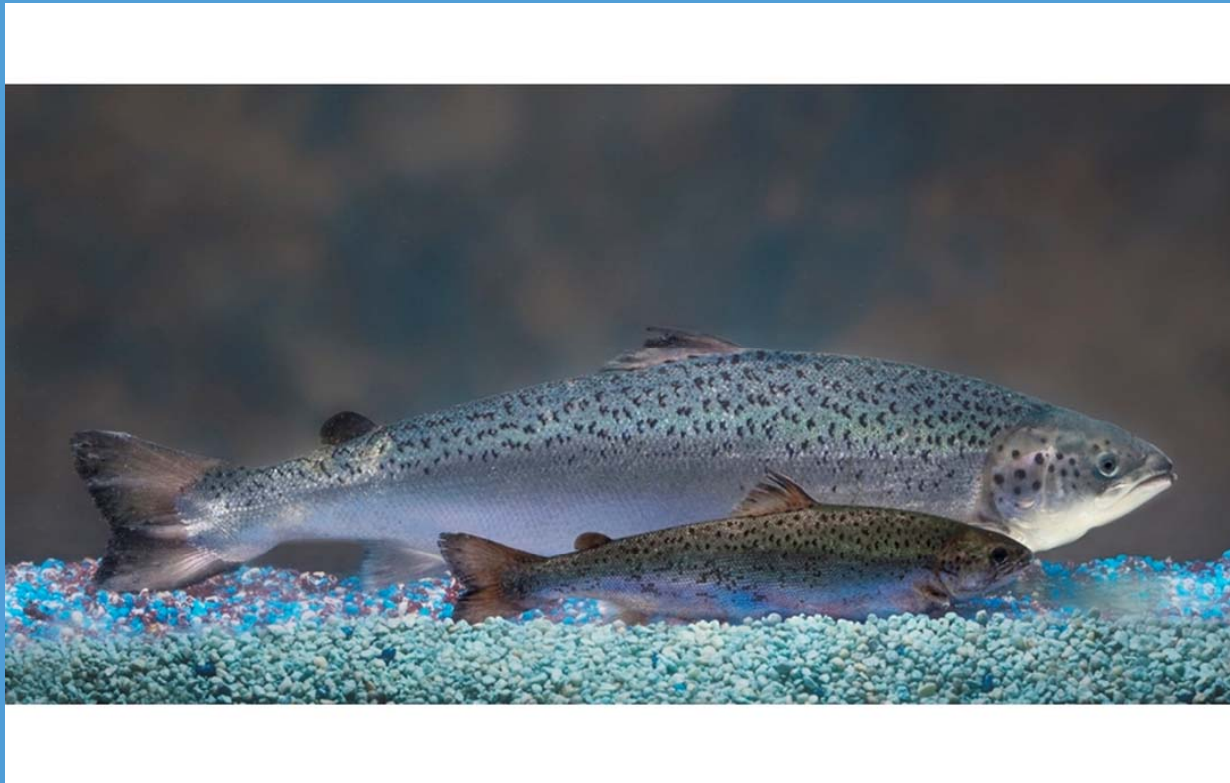


# Traits

- Increased production characteristics:
  - Growth hormone, continuous expression



# Traits



**OpAFP-GHc2: regulatory sequences from an ocean pout AFP gene and protein-coding sequence from a chinook salmon growth hormone (GH) gene**



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# Traits

- Increased production characteristics:
  - Growth hormone, continuous expression



CSIRO, Australia

- Reduction of myostatin (trout)
- Cutinase in salivary glands of sheep (to improve feed intake)



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# Traits

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- Improved nutritional characteristics of animal products:
  - High lysin milk of GM cows
  - Meat from pigs and cows with high omega-3-levels
  
- Improved fertility in pigs



# Traits

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- Improved disease resistance:
  - Disease-resistant chicken
  - Mastitis-resistant cows
  - BSE-resistant cows (similar in pigs)
  - Virus-resistant pigs



# Traits

- Reduced environmental effects of animal production:

*Enviropig*

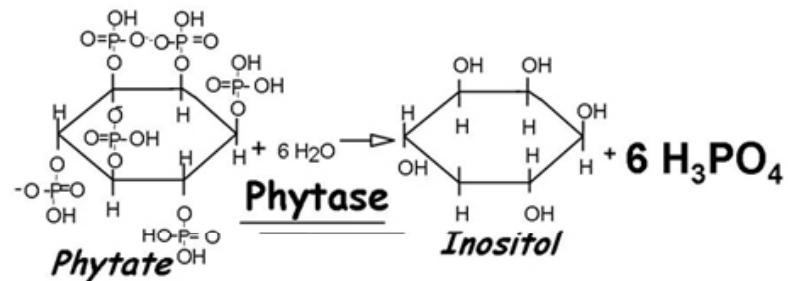


Yorkshire pigs that can digest phosphorous more efficiently than traditional Yorkshires



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Enviropig produces phytase in the salivary glands (parotid, submaxillary and sublingual), and thus secretes the enzyme in the saliva



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# Traits

- Reduction of vectors for human disease
  - GM mosquitoes with lethal genes to keep the number of female mosquitoes low, to reduce the incidence of Dengue Fever

## Open field trials:

- Grand Cayman ('09/'10)
- Malaysia ('10)
- Brazil (''11)



# Traits

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- Production of new substances:
  - Goats producing spider silk
  - Sheep producing fine/Cashmere wool



# Traits

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- Production of animal models to study human disease
- Production of animal models for xenotransplantation
- Production of GM animals for ornamental purposes



# Regulations safety assessment

- As with GM plants: all countries apply similar strategies, in line with
  - the Codex guideline for the food/feed safety assessment of products derived from GM animals
  - Cartagena Protocol on the risk assessment of LMOs (environmental assessment)
- No guidelines yet for GM animals with non-heritable traits



# Conclusions 1

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- The production of GM animals is in its second phase and is likely to stay
- The number of animals and traits is still relatively limited, but will probably increase in the years to come
- Regulations are to a large extent harmonised



## Conclusions 2

- Genetic modification is very closely linked to cloning, especially in the larger husbandry animals
  - it allows selection of nuclei that have taken up the genetic construct, and
  - to more rapidly increase the number of GM animals for breeding
- As a result of the different techniques (GM and cloning) currently GM animals are often mosaic



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Thank you for  
your attention!

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