Transgenic Animals:
Where to from here?

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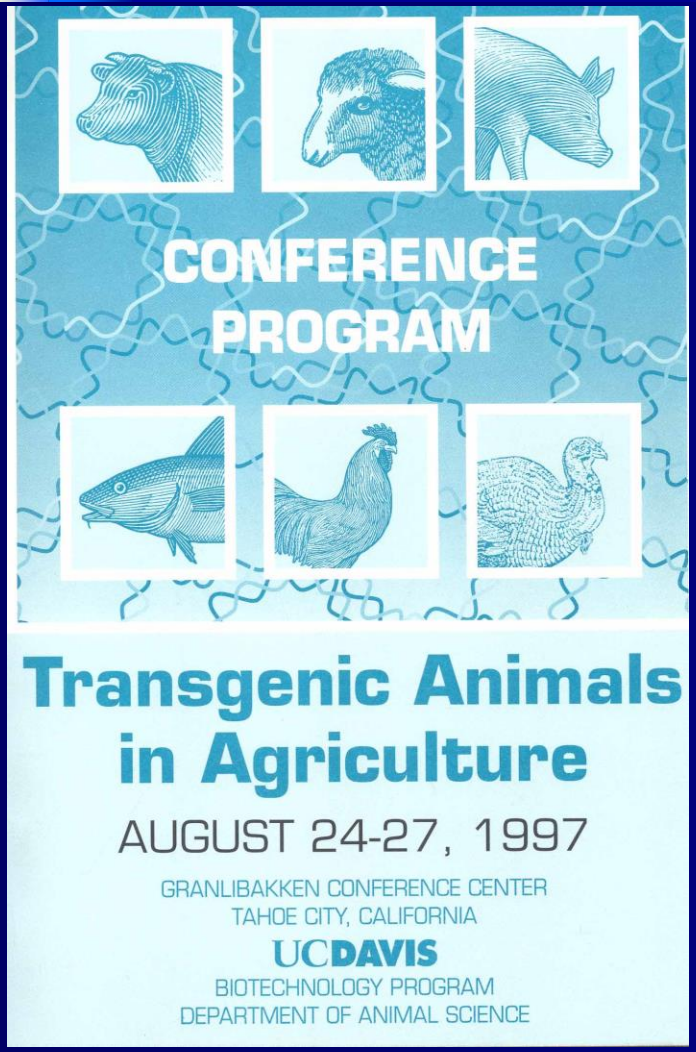
8/13/2007

Decade since first conference in 1997 "Transgenic Animals in Agriculture"



Selected Participants

- ABS Global
- Columbus Farming Corp.
- Food and Agriculture Organization of the UN
- NZ Ministry of Agriculture
- DeKalb Poultry Research
- Hy-Line International
- AgResearch (NZ)
- MetaMorphix
- National Institute of Animal Industry, Japan
- PIC Group
- Victorian Institute of Animal Science, Australia

"*Transgenic farm animals get off the ground*"

H. Niemann (1998) Transgenic Research 7:73

"For the next 10 years it is estimated that transgenic technology will be mainly directed towards increase in basic biological knowledge, particularly in the field of gene regulation and expression"

"This will increase the reliability and success of gene transfer methods and this should lead to transgenic farm animals in the field by the next 10-15 years."

- Production of human monoclonal antibody in eggs of chimeric chickens (2005)
- Germline transmission of genetically modified primordial germ cells (2006)
- Oviduct-specific expression of two therapeutic proteins in transgenic hens (2007)
- Transgenic avian-derived recombinant human interferon-alpha 2b (AVI-005) in healthy subjects: an open-label, single dose, controlled study (2007)

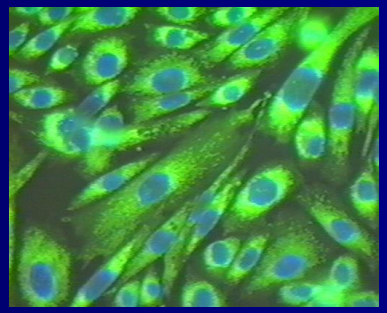
European panel now recommends GTC anti-clotting drug's surgical use

OCTOBER 15 2006
FRAMINGHAM — A European drug regulation committee reversed itself yesterday and recommended that a GTC Biotherapeutics Inc. anti-clotting drug (human antithrombin) drawn from the milk of genetically altered goats be approved for use in surgical patients

Cell culture-based manufacturing facility for a therapeutic protein can cost > $US500 mil.

$100,000 annual price for Avastin (a humanized monoclonal antibody produced in an engineered CHO cell line) to treat breast or lung cancer -

CHO Cells ☛

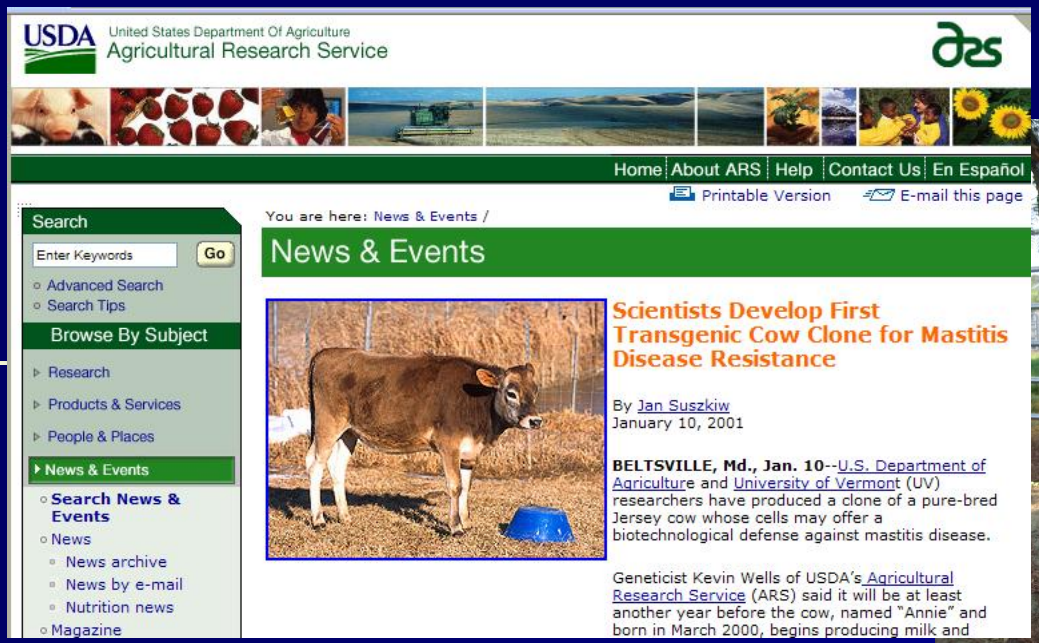


PharmAthene Awarded $213 Million Department of Defense Contract for Advanced Development of Protexia

September 25, 2006

PharmAthene, Inc., announced today that it has been awarded a multi-year contract valued at up to $213 million from the Department of Defense (DoD) U.S. Army Space and Missile Command, for advanced development of the Company's broad spectrum chemical nerve agent prophylaxis, Protexia(R).

Recombinant proteins in the milk of transgenic BELE® goats from which they are extracted.



- Genetically enhanced cows resist intramammary Staphylococcus aureus infection (2005)
- Production and processing of milk from transgenic goats expressing human lysozyme in the mammary gland. (2006)
- Production of cattle lacking prion protein (2007)

HEALTH & SCIENCE

Making Bacon That's Healthier for You

Listen by Joe Palca

Steve Morse/University of Missouri Extension and Agricultural Information

These pigs carry a gene that helps their bodies produce a healthier fat, known as omega-3 fatty acid.

NPR.org, March 26, 2006 · If you think scientists never do anything useful, consider this: A team of researchers may have found a way to make bacon that's good for your heart. This stunning achievement comes from a mixture of molecular genetics, cloning, and good old American know-how.

The key to this delicious prospect? A modified gene that changes some of the omega-6 fatty acids -- which pigs normally create -- into omega-3 fatty acids.

Omega 3 is the healthy fat you get in oily fish and flax seed. It's generally thought that a diet high in omega-3 fatty acids helps prevent heart disease.

The first animals to get this

- Generation of cloned transgenic pigs rich in omega-3 fatty acids (2006)

Clop,A., et al. 2003. **Detection of QTL affecting fatty acid composition in the pig.** *Mammalian Genome* **14**, 650-656

Nii,M., et al. 2006. **Quantitative trait loci mapping for fatty acid composition traits in perirenal and back fat using a Japanese wild boar x Large White intercross**. *Animal Genetics* **37**, 342-347.

Skim milk straight from the cow

Liz Williams
Cosmos Online

Monday, 28 May 2007

SYDNEY: A new breed of cow that produces skim milk naturally – straight from the teat – has been discovered by New Zealand scientists.

The cow's milk is low in saturated fat but high in protein, according to the researchers. It is also high in omega-3 oils, which have been linked to improved brain power and mental wellbeing, as well as decreased incidence of cardiovascular disease.

Mutant Marge

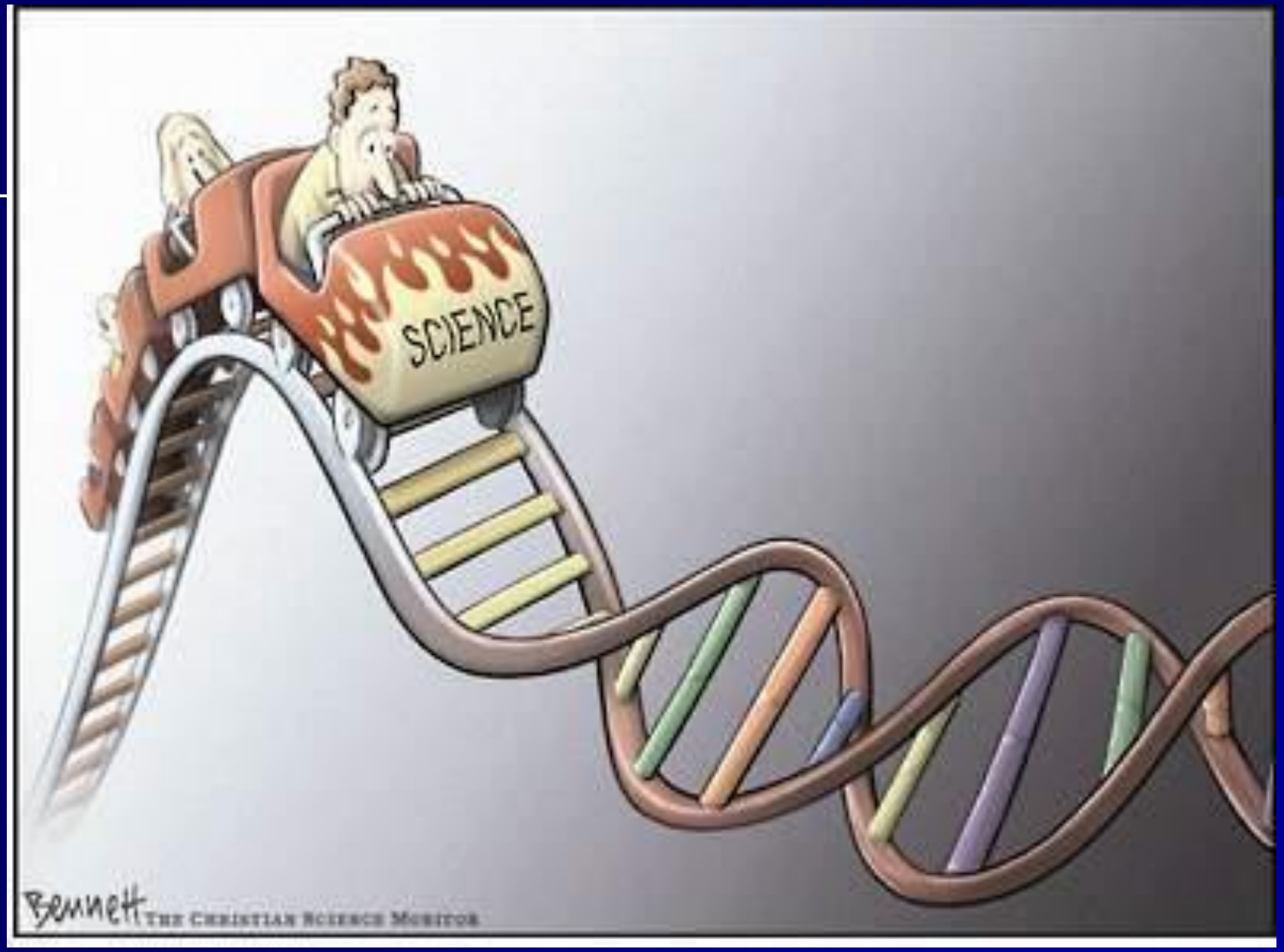
A Friesian cow called Marge is at the centre of the breakthrough. Discovered in 2001 by New Zealand-based biotech company ViaLactia, Marge has a random genetic mutation that enables her to produce milk containing significantly less fat than regular milk.

More importantly, Marge's milk also has substantially lower levels of saturated fat – a leading cause of obesity and cardiovascular disease in humans.

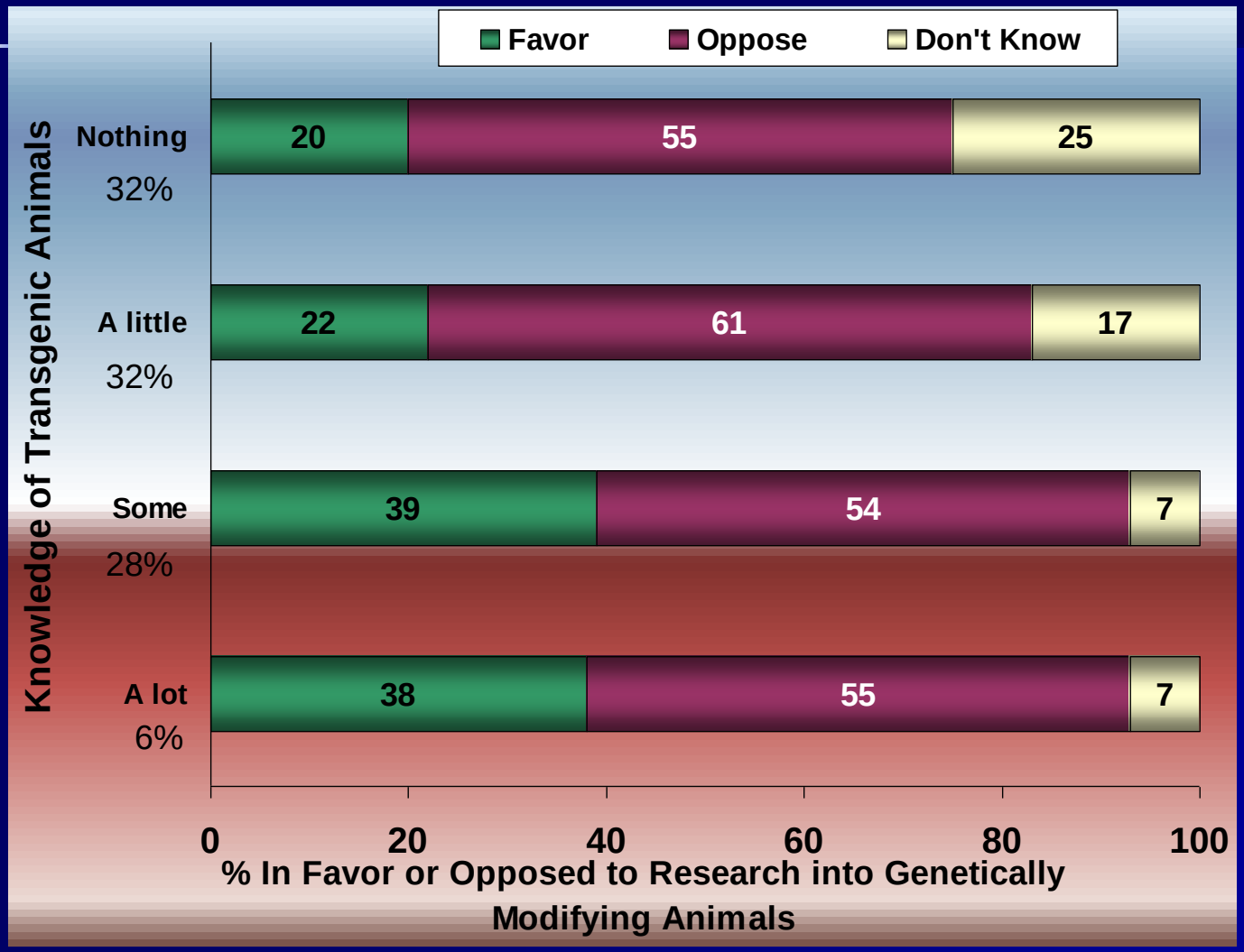
The researchers identified the low-fat milk in a random screening of millions of New Zealand cattle in 2001. They bought her for NZ$300 (AU$265) from

A Friesian cow that produces low-fat milk from the teat has been discovered by New Zealand scientists

Image: iStockphoto


SCIENCE
Bennett
THE CHRISTIAN SCIENCE MONITOR

The majority of Americans oppose scientific research into genetic modifications of animals - irrespective of self-assessed knowledge level



10/2005

http://pewagbiotech.org/research/2005update/2005summary.pdf

It may be difficult to know what the public has heard about animal biotechnologies….

Supercow and pigs that glow at night - an average day on the GM farm

Last updated at 10:11am on 3rd November 2006

Channel 4 is to unveil a shocking menagerie of genetically modified animals in a new show revealing the frightening leaps technology has taken.

See also:

- Swan falls in love with paddle boat
- VIDEO: Fuelish driver - woman loses control of car at petrol station
- The best viral emails doing the rounds

Among the bizarre engineered creatures from around the world is a giant cow, three times the size of ordinary cattle, reared without fat to produce gallons of milk.

But the so-called Belgian Blue - pictured

Appliance of science: the Belgian Blue is bred to produce gallons of milk

Animal cloning and genetic modification. A prospective study Joint Research Center Institute for Prospective Technological Studies. European Commission, Seville. *In preparation*

- Number of published papers on animal GM/GE increased over the period 1985 – 1998 and then leveled off, with most coming from the EU, followed by the USA.
- Number published papers on cloning increased from 1990 – 2000 but this has since leveled off. Most of the work was done in the USA with Europe coming third (after the Far East). The work concentrated on technical aspects and was mostly publicly funded.

Cloning opens door to 'farmyard freaks'

By SEAN POULTER - More by this author »
Last updated at 08:35am on 11th January 2007

Comments (38)

Moves to clone and genetically modify farm livestock have opened the door to the creation of "Farmyard Freaks", experts have warned.

News that the daughter of a US clone cow has been born on a British farm has moved the issue from science fiction to consumer reality.

A former government adviser has painted a nightmarish picture of "zombie" and fast-growing supersize animals.

Professor Ben Mepham, of Nottingham University, said the impact of bio-engineering, creating GM and cloned animals, is huge.

Factory farming techniques, most commonly used with pigs and chicken, often involve keeping animals confined in cramped conditions.

For pigs, who are highly intelligent, these conditions can lead to stress and aggression.

However, GM scientists are actively investigating ways to remove the stress and aggression gene from animals, effectively turning them into complacent zombies.

The professor said it might become

The cloned cow Dundee Paradise

ENLARGE

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Coleen's fashion gaffes exposed
When Coleen McLoughlin announced she was writing a style manual, cynics questioned whether she was ideally placed to dispense advice. Now the Wag has been exposed as ignoring her own advice

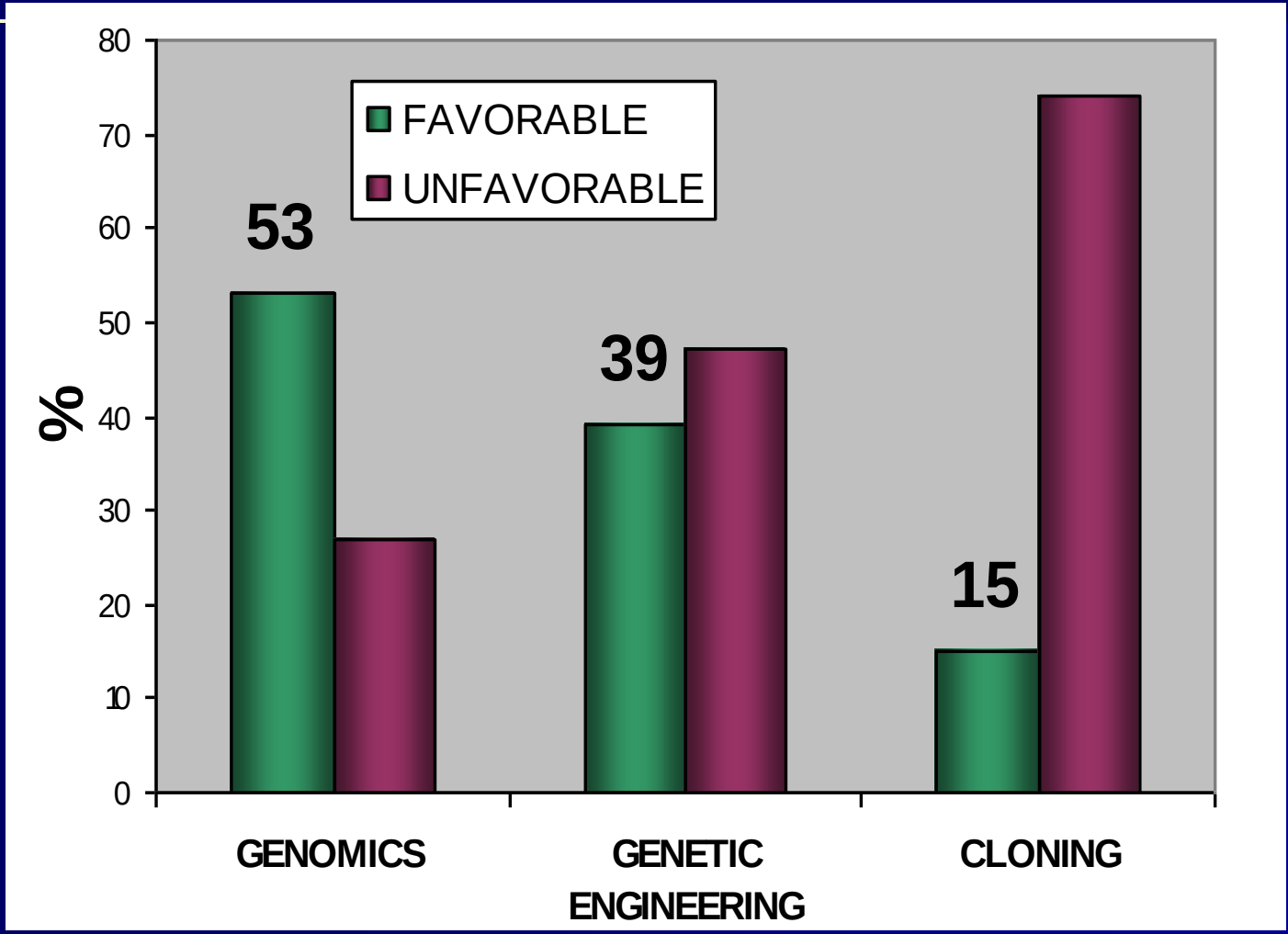
Women messy? What rubbish!

This week the Mail's Martin Newland berated women for their untidiness. Now his wife Benedicte gets her revenge in a stinging rebuke

Kate admits she, too, has gone to drastic measures to lose weight

She has boasted of being proud of her curves and scorned faddish diets. But now Oscar hopeful Kate Winslet

Public Attitudes Towards Specific "Animal Biotechnologies" (IFIC, 2005)



http://ific.org/research/upload/2005BiotechSurvey.pdf

The FDA continues to call for a voluntary prohibition of the marketing of milk or meat from adult SCNT clones and their offspring

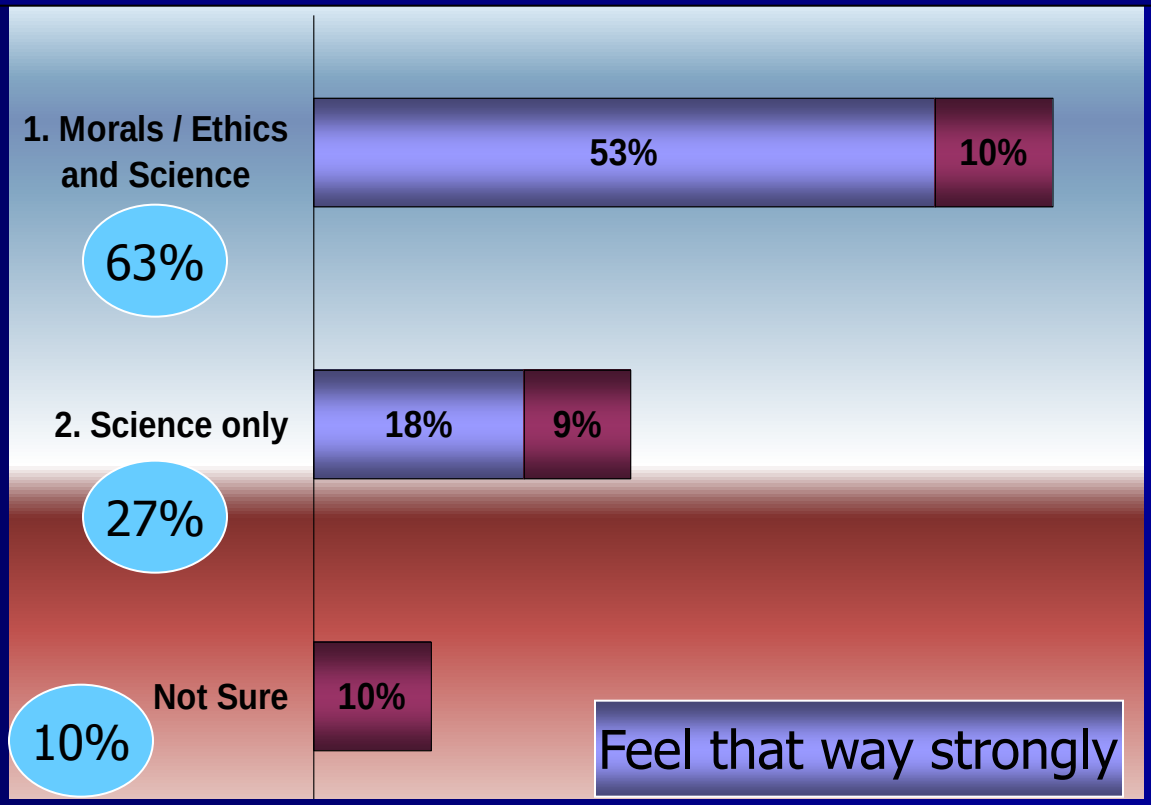
What clones will be banned or labeled (in the US case)?

January 2007 Reacting to reports that a cloned cow from the United States has birthed a calf on a British farm, virtually all major British grocery chains have pledged to boycott meat from clones or their offspring.

Tesco, Wal-Mart's Asda chain, Morrisons and Marks & Spencer were among the chains participating in the boycott, which would include meat, milk or "anything else from clones or their offspring," according to an Asda spokesperson.

1. Government regulators ***should include ethical and moral considerations***, in addition to scientific evaluation of risks and benefits, when making regulatory decisions about cloning or genetically modifying animals.

2. Though ethical and moral considerations are important, government regulators ***should consider only scientific evaluation of risks and benefits*** when making regulatory decisions about cloning and genetically modifying animals.



http://pewagbiotech.org/research/2005update/2005summary.pdf

How to incorporate social and ethical issues into regulatory decisions ?

- American consumers (75%) and scientists (70%) agree that cloning and genetic engineering of animals raise some moral and ethical issues
- However public is much less likely to approve (21-25%) of these technologies than scientists (60-68%)
- How to reach a societal consensus on ***which set of values*** will ultimately be applied to decide the acceptable uses of animal biotechnology ?

Keystone Research Center (2004) – Biotechnology and ethics: a national survey of consumers and scientists. Report to the Biotechnology Industry Organization. KRC Research, Washington DC, 29pp.

Animal cloning regulations in Denmark and Norway prohibit cloning for food and agricultural purposes.

"Alicia"

An International Star

Winner at the prestigious International Dairy Show in Madison, WI and at the Royal Winter Fair in Canada, Shoremar S Alicia was cloned in 2001. The clone calf, born in winter of 2002, was one of the favorites when she was at Cyagra. Using the merchandising options that cloning creates, Alicia's owners sold Alicia's Clone before it was born for $100,000 in October of 2002.

Shoremar S Alicia 3E-97
6-10 2x 365d 35,760 4.3 1541 3.2 1147
All-American Age Cow 2003
All-American & All-Canadian 5-Year Old 2000
All-American People's Choice Winner 2000
Holstien International Cow of the Year 2000
All-Canadian 4-Year Old 1999
All-Canadian Jr. 2 Year Old 1997
Nominated for QII – Queen of the Breed 2004

January 2007: The European Food Standards Agency is seeking urgent legal advice after farmers announced the <u>birth of a calf whose genetic mother is the clone</u> of an American prizewinning dairy cow.

H. Niemann (1998)"*Transgenic farm animals get off the ground*" Transgenic Research 7:73

"An important factor that should not be underestimated is the considerable resistance of public opinion in several countries, particularly Europe, against this technology. This could affect private and public funding in these countries and thereby slow down further progress. Given the broad range of serious problems that mankind is facing in the years ahead, one can hope that rational approaches will be taken to ensure that the huge benefits of transgenic farm animals will not be an unexploited resource."

Why silence is not an option
Nature Biotechnology 24:1177 (2006)

"Silence, nonengagement and navel gazing will not reestablish the facts about GM products in the public's consciousness. There is a basic truth that bears repetition: and that is that basic truths bear repetition."


B
Red
Orange
Yellow
Green
Wild Type


GMO'S
TREATOR
TRICK?


HUMAN GROWTH HORMONE GENE
MT
PROMOTER
pBR