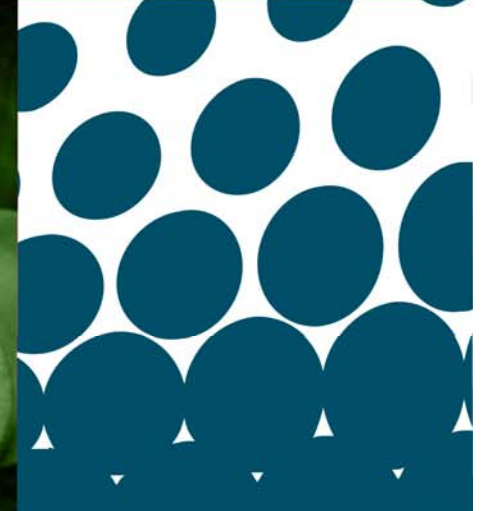
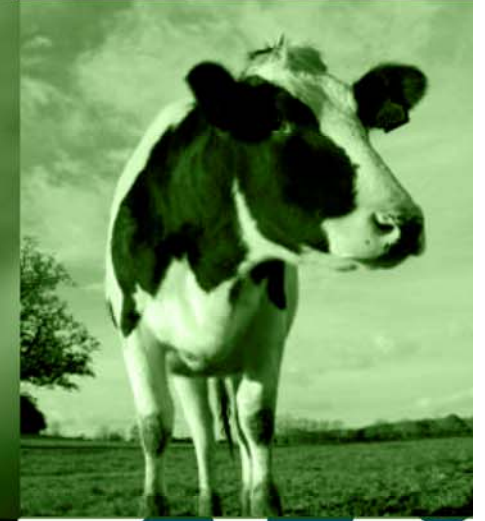


Cloning Technology Challenges and Opportunities

Leah Wilkinson, Director
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21st Century Problems

- **Increasing Population**
 - 9 billion by 2050
 - At present, 852 million malnourished
- **Improved Nutrition in China and India**
 - Double food needs
- **Water Shortage**
 - Aquifers being depleted
- **Global meat demand is projected to grow 57 percent by 2020**



Today's Livestock Industry

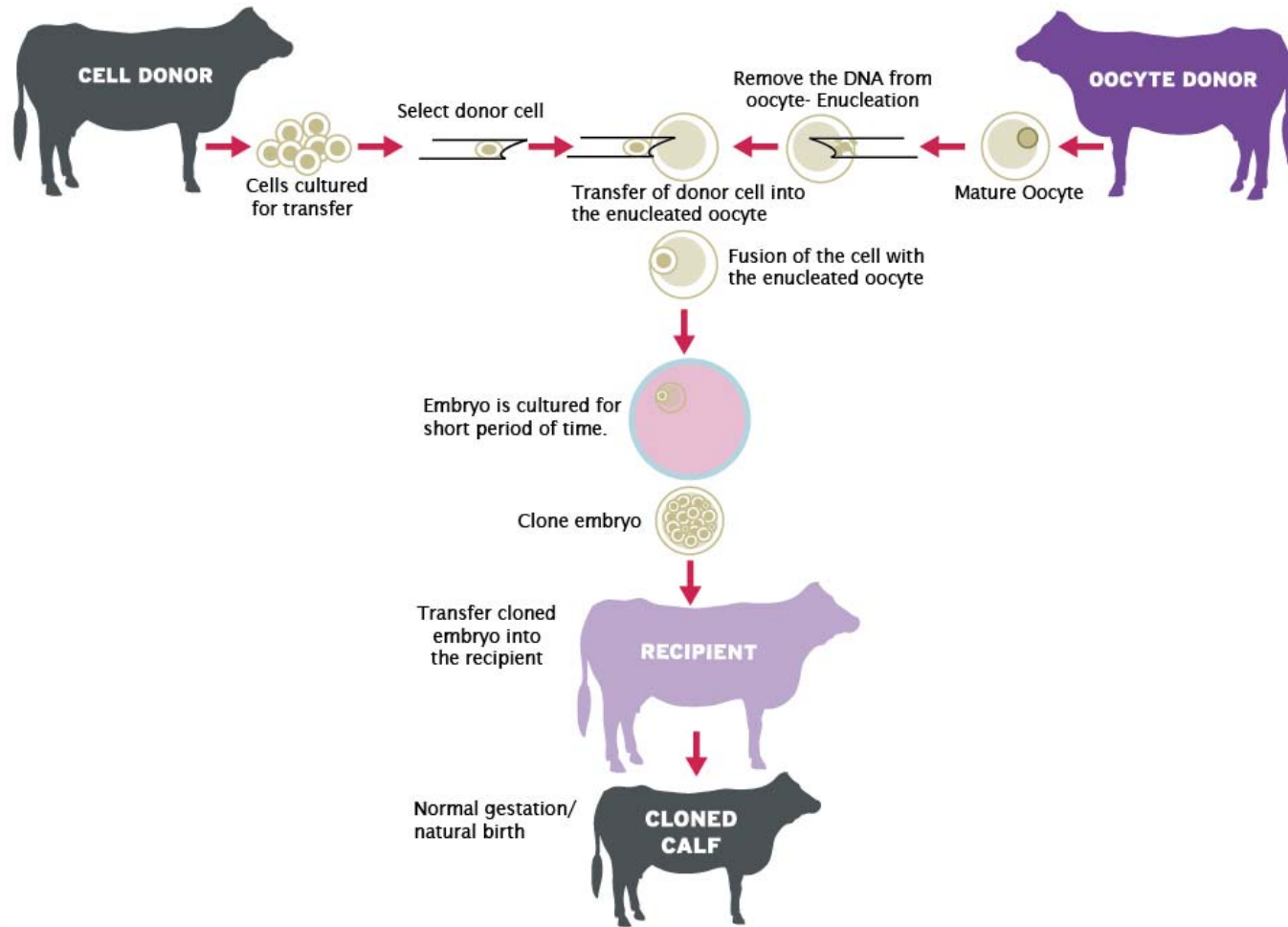
- Use Assisted Reproductive Technologies
- Share genetics between parents
- Slow advancement
- Technology adopters



25 Years of Conventional Improvement (photo by PIC)

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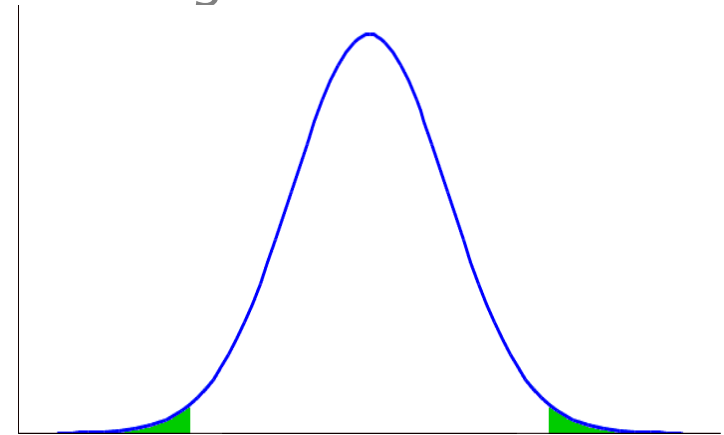
Cloning Process



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Why Cloning Fits

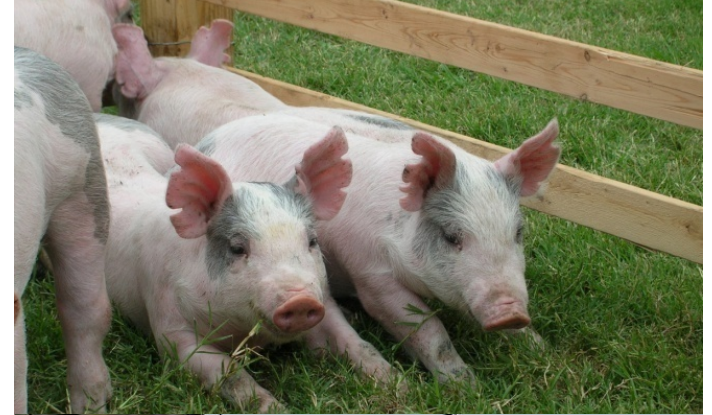
- **Unique genotypes = significant opportunity**
 - Amplify impact of outliers through cloning
- **Rapid response**
 - Introduce new traits
 - Leverage genetic diversity
 - Genetically associated disease resistance / tolerance



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Cloning Solutions

- **Product Attributes**
 - Low fat, high Omega 3 milk
- **Pro-environment**
 - Increased feed efficiency
 - Reduce water consumption
 - Reduce waste stream
- **Animal health and welfare**
 - Disease resistance
 - Reduce antibiotic usage
- **Preserve Superior Genetics**
 - Support biodiversity



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Omega/Skim Dairy Cow

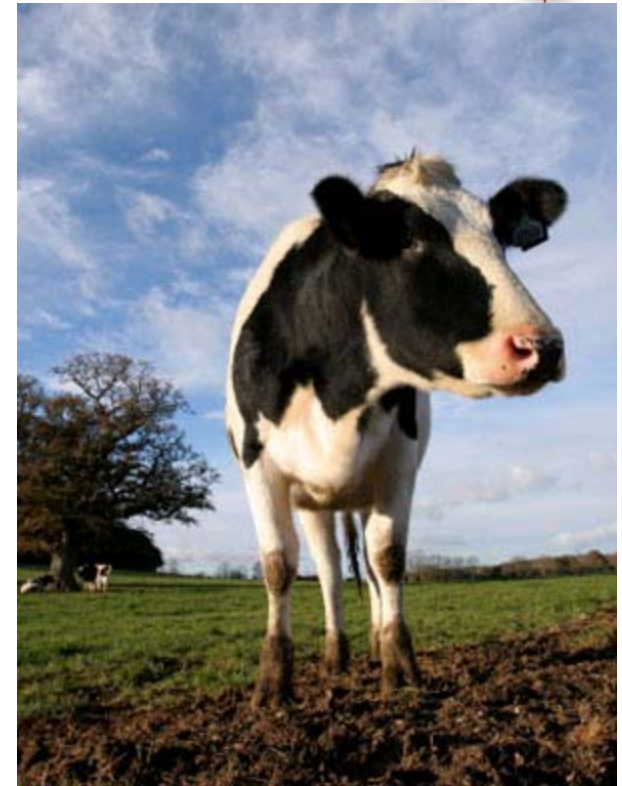
FREE
SAMPLE

The 2005 Dietary Guidelines for Americans recommended:

- Consumption of 8 oz of fatty fish/week = 416 oz/year = 26 pounds/year
- When selecting and preparing meat, poultry, dry beans, and milk or milk products, make choices that are **lean, low-fat, or fat-free**
- Limit intake of fats and oils high in saturated and/or *trans* fatty acids, and choose products low in such fats and oils

***Fast Fact**

Consumers lack 1/3 of the recommended intake of Omega 3



Marge— A dairy cow in New Zealand that produces naturally skim milk and high levels of Omega-3 oils.

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Preserve Superior Genetics

- **Post-disease outbreak**
 - Insurance against loss of genetic progress
- **Neutered animals**
 - Produce genetically identical studs to top-performing steers, barrows and geldings
- **Endangered species**
 - Prevent extinction of endangered species



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Adoption Hurdles

Food Safety/Technology Challenges



Consumer Fears



**Livestock
Producer Risk**



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Adoption Milestones

Risk Assessments

- FDA
- EFSA
- New Zealand
- France



“...we conclude that meat and milk from cattle, swine, and goat clones are as safe as food we eat every day. Our additional review strengthens our conclusions on food safety.”

- Stephen F. Sundlof, D.V.M., Ph.D., director of FDA's Center for Food Safety and Applied Nutrition. January 2008

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International Acceptance

- **Europe**

- EFSA risk assessment
- EGE report
- Parliament resolution
- Consumer opinion survey
- Novel food regulations



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International Acceptance

- Japan
- Canada
- Argentina
- Brazil

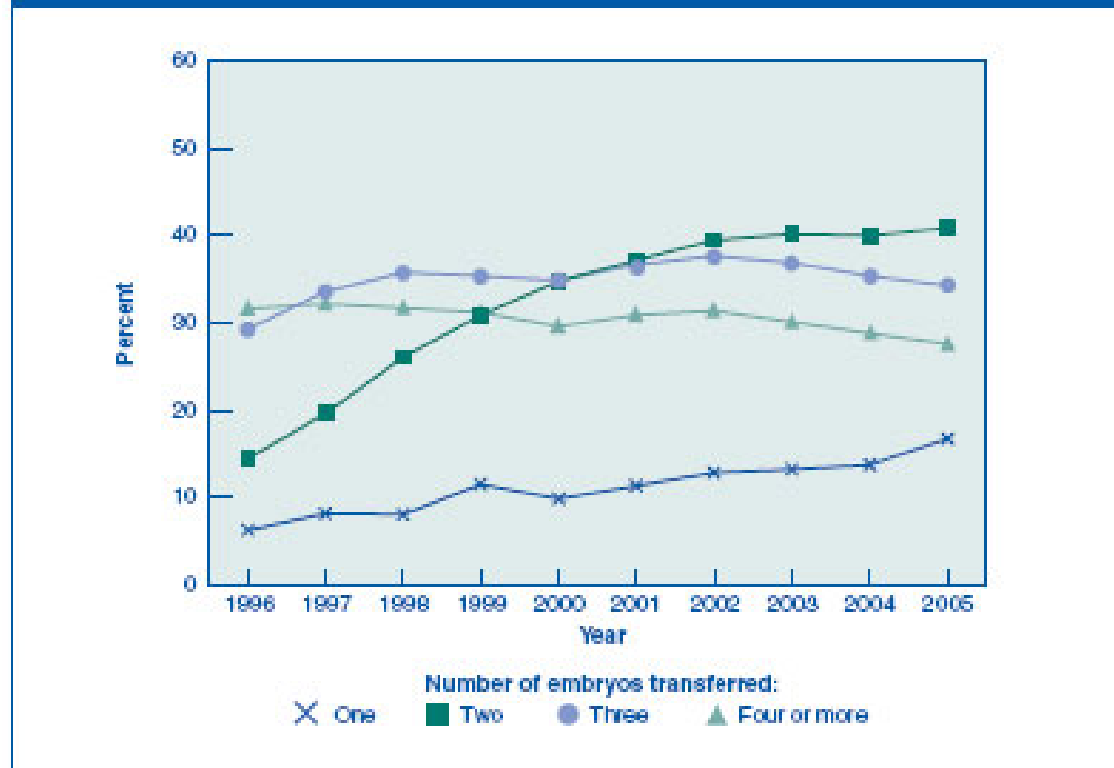


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Repro-Technologies Face Similar Challenges

Figure 56

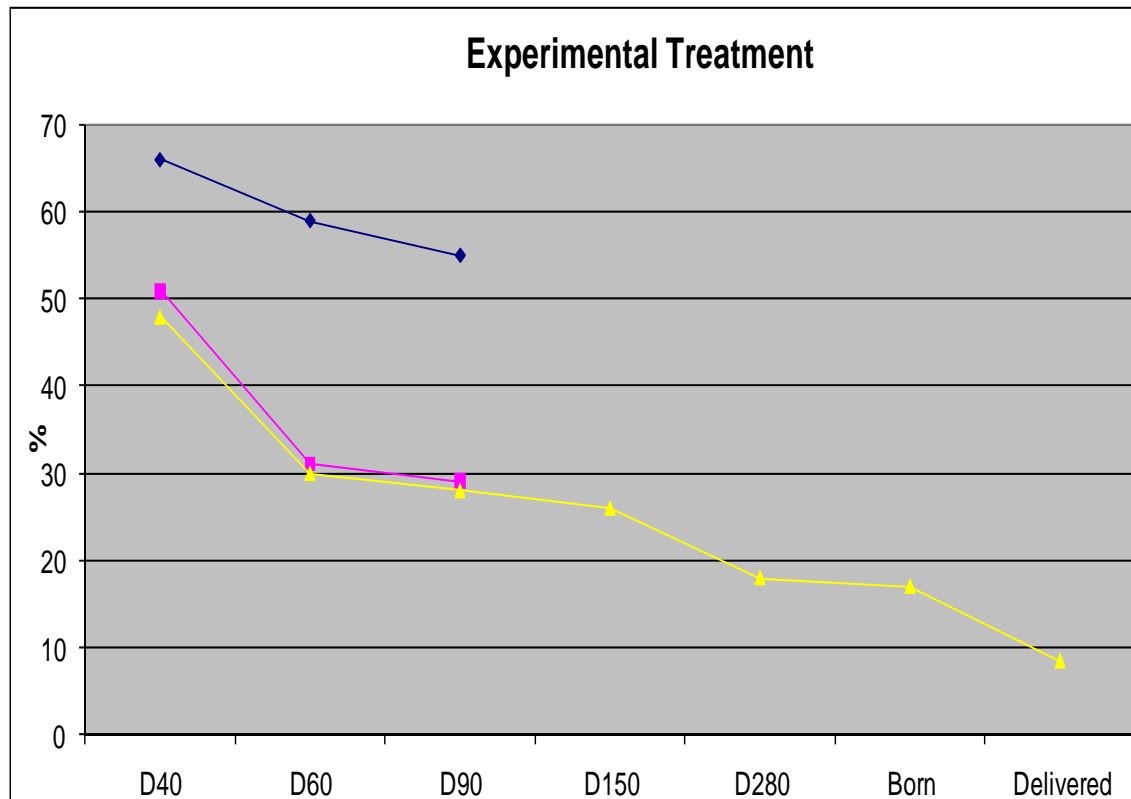
Percentages of Transfers (Using Fresh Nondonor Eggs or Embryos) That Resulted in Live Births, by Number of Embryos Transferred, 1996–2005



CDC, 2007

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Technology is Improving



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Consumer Fears

"We don't like the notion of fake food."

-California State Senator Carole Migden

- **Distrust for Government**
- **Animal Welfare**
- **Slippery Slope**
- **Labeling**

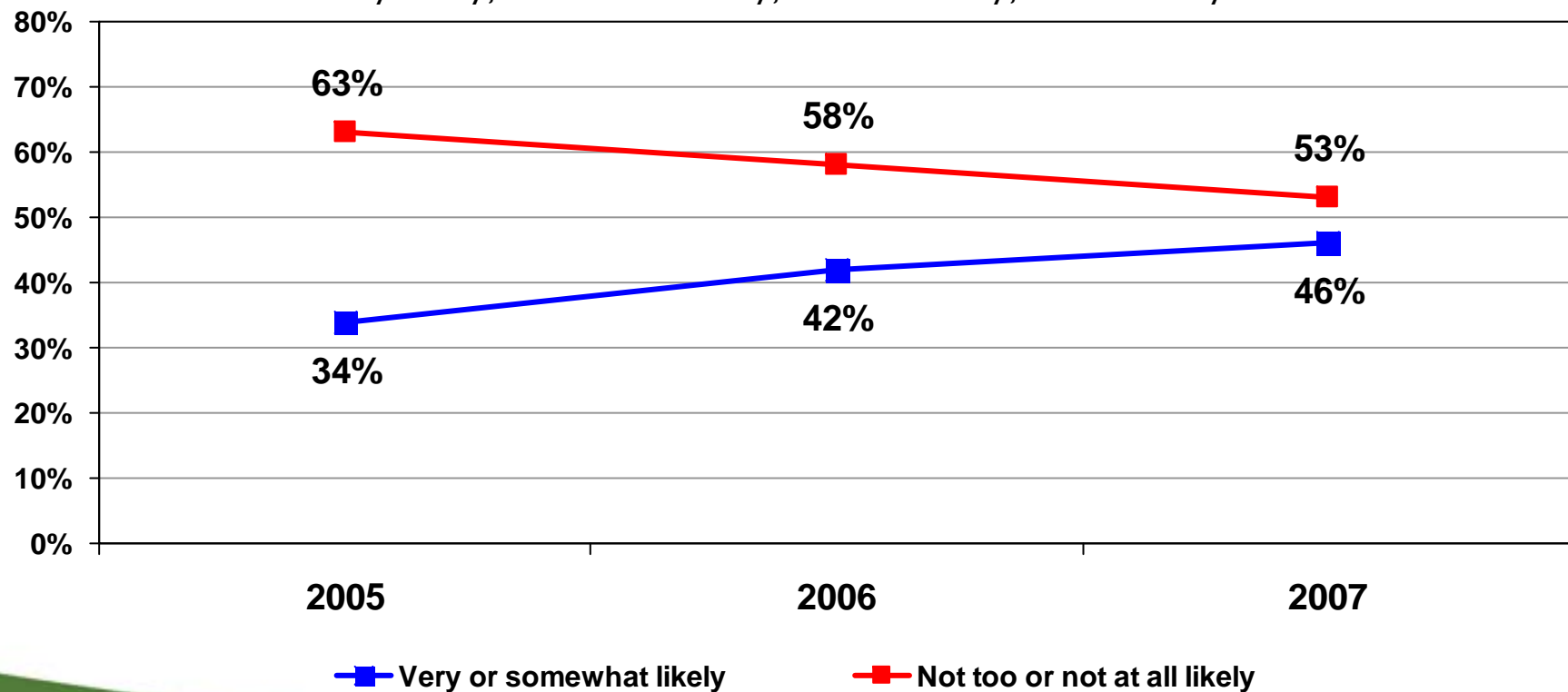


Toy clones manufactured for children. Sold by Club Earth, a Rhode Island company.

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Growing Consumer Confidence

If the U.S. Food and Drug Administration (FDA) determined that meat, milk, and eggs from cloned animals were safe, how likely would you be to buy them? Would you say very likely, somewhat likely, not too likely, or not likely at all?

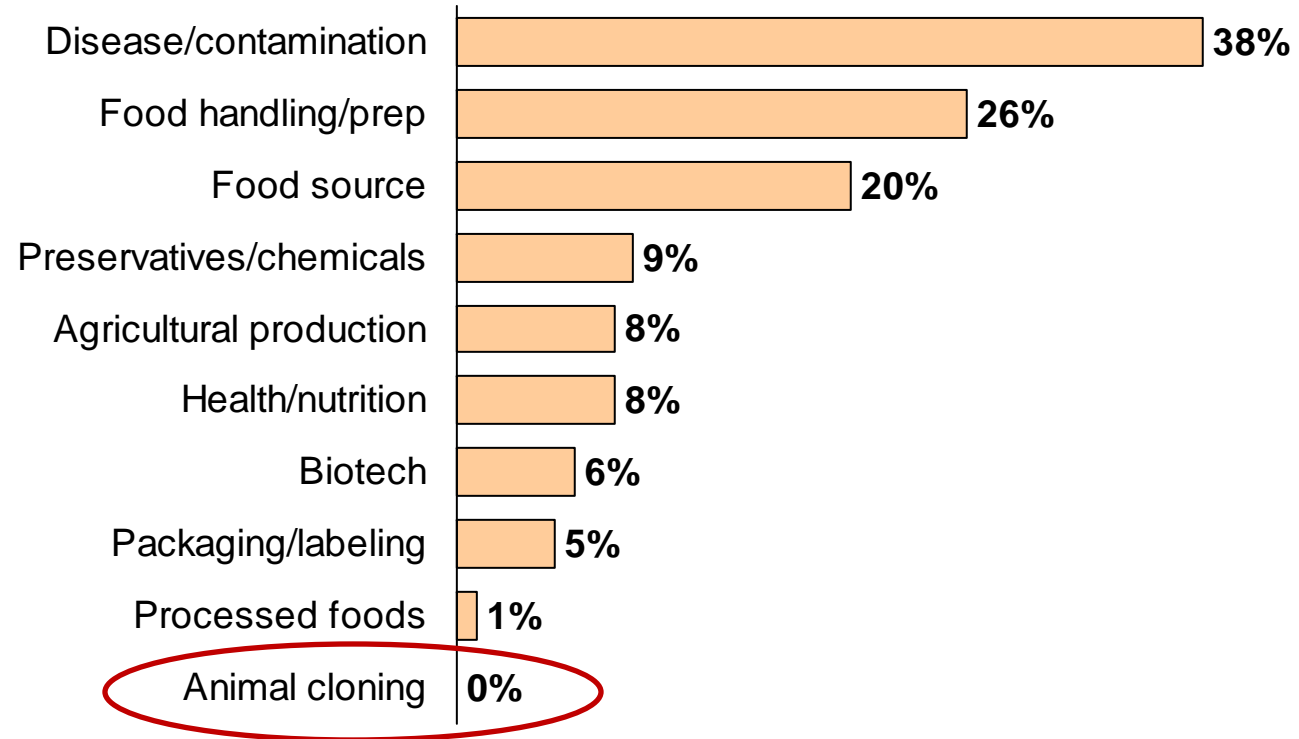


IFIC 2007

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Not A Major Concern

*What, if anything, are you concerned about when it comes to food safety?
(Open-ended question)*



Source: Cogent Research for the *International Food Information Council (IFIC)*. Internet survey of 1,000 adults, July 2007.

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Supply Chain Management

- Consumer Choice
- Industry Support



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Supply Chain Management

- **Clone Registry**
 - RFID ear tags
 - Database
 - Query based
- **Marketing Incentive**
 - 2x market value
 - Refundable deposit
 - Verify disposal



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Technology is Crucial

Over the next **50 years**, the world's farmers and ranchers will be called upon to produce more food than has been produced in the past **10,000 years combined**, and to do so in environmentally sustainable ways.

-Jacques Diouf, FAO Director General, 2007

The logo for VIAGEN, featuring the word "VIAGEN" in a white, sans-serif font. The letter "A" is stylized with a white swoosh that loops under it. The logo is positioned on a dark green background that transitions into a pattern of lighter green circles on the right side.

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