



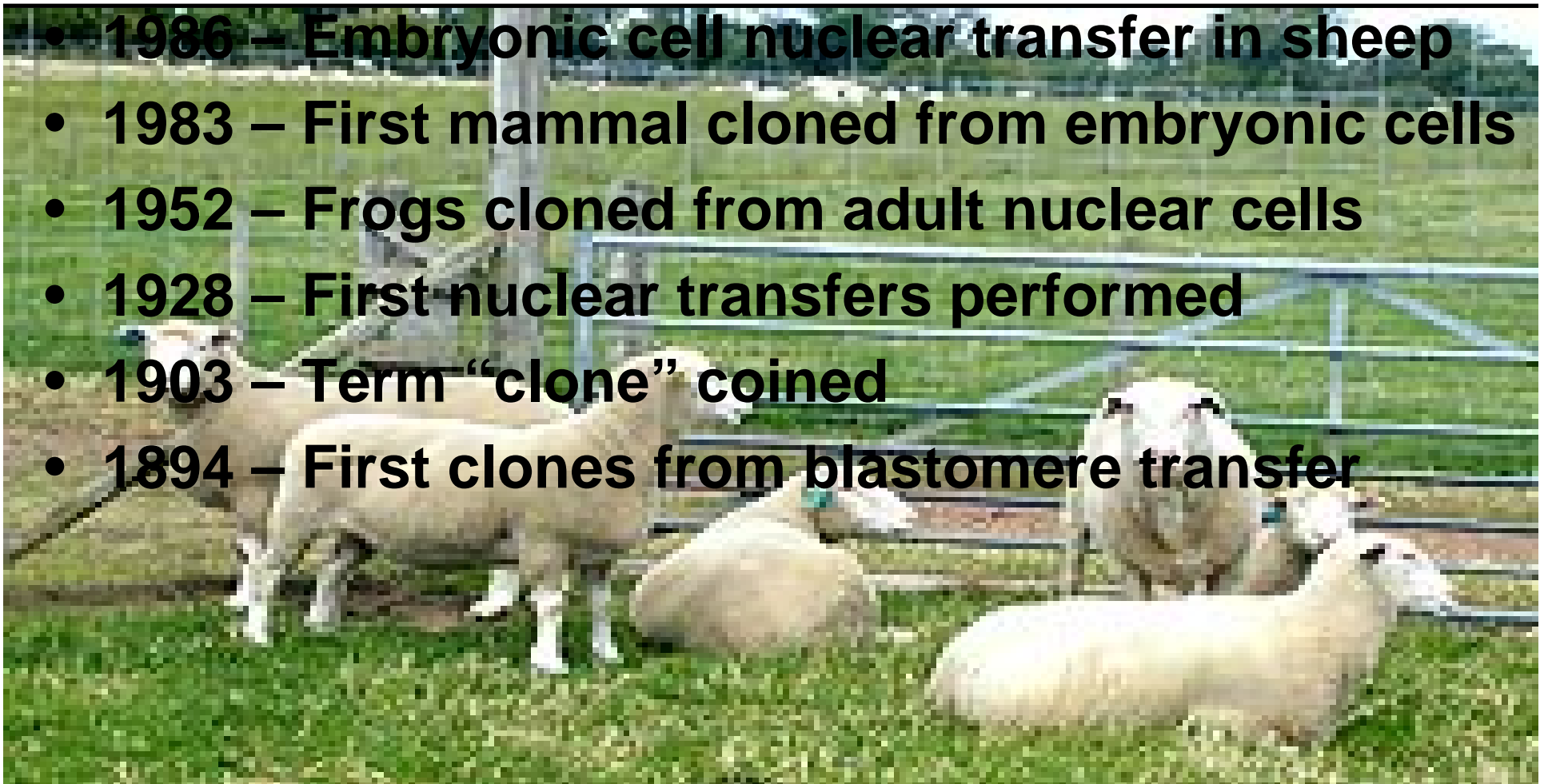
Livestock Cloning Commercial Applications

BIO 2006

April 11, 2006

A Brief History of Cloning

- 1996 – Roslin Institute clones “Dolly”
- 1986 – Embryonic cell nuclear transfer in sheep
- 1983 – First mammal cloned from embryonic cells
- 1952 – Frogs cloned from adult nuclear cells
- 1928 – First nuclear transfers performed
- 1903 – Term “clone” coined
- 1894 – First clones from blastomere transfer



Benefits of Cloning

- **Removes guesswork from breeding**
- **Accelerates dissemination**
- **Increase herd quality**
- **Improve product quality and consistency**
- **Reduce environmental footprint**



Product Implications

- Proven Attributes
- Consistency
- Cost
 - Antibiotics
 - Hormones

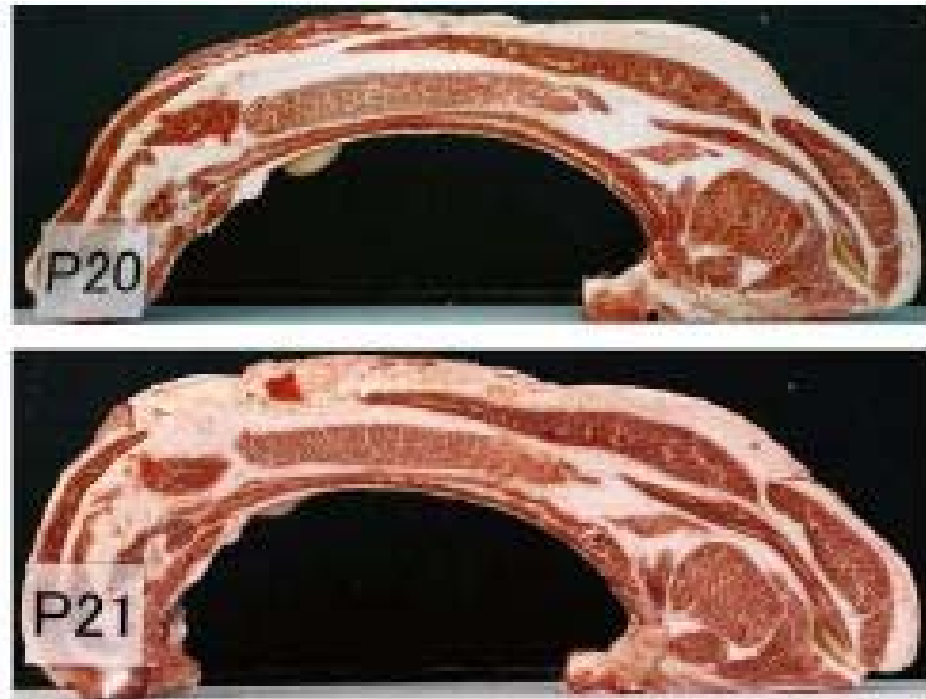


Photo 3: Cross section between the 6 and 7 ribs (Top: Close1, Bottom: Close2)
(Now confirming their positions)

VIA GEN



“It’s like duplicating Michael Jordan until you have five Michael Jordans on a team” – Donald Brown, Throckmorton, TX (*Fort Worth Star Telegram*)



Photo Credit: Carol Guzy, The Washington Post

Applications of Cloning

- Swine
 - Nuclear boars as terminal sires
- Beef
 - Seedstock
 - Commercial bulls
- Dairy
 - Seedstock
 - Milking cows



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Economic Potential

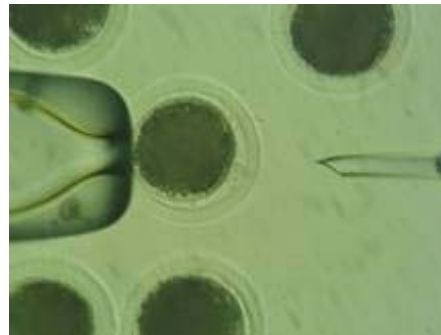
- **U.S. Swine Industry**
 - 100 Million market hogs
 - Clone 15,000 terminal and grand-sires per year
 - \$3.00/animal value
 - \$300 MM impact
- **U.S. Beef Industry**
 - 33 Million cattle
 - Clone 200,000 Natural Service sires per year
 - \$75.00/animal value
 - \$1.8 Billion impact

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What is Cloning?

- **Assisted reproduction technology**
 - Artificial Insemination (1322)
 - Embryo Transfer (1891)
 - *In vitro* Fertilization (1959)
 - Embryo Freezing (1972)
- **Exact genetic copy of the donor animal**
 - “Identical twins separated in time”



VIA GEN



Keep in mind...

- Clones are NOT “Genetically Modified”
- Clones are indistinguishable from donors
- Offspring from clones ARE NOT clones

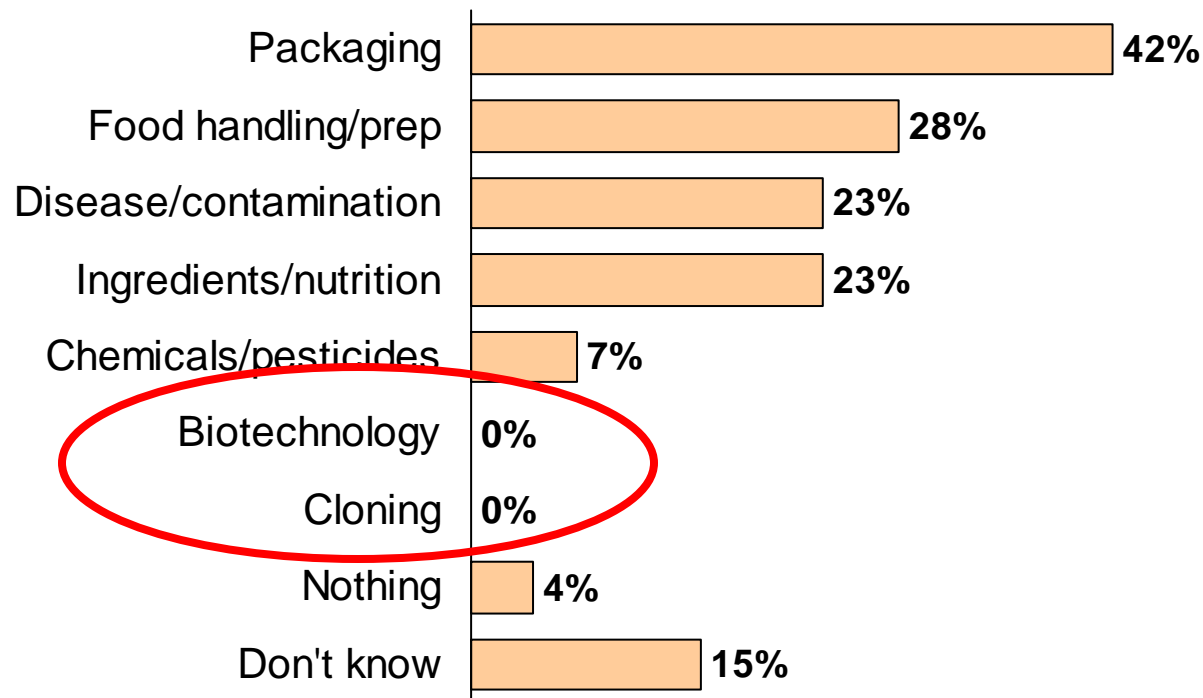


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Cloning is Off the Radar As a Food Safety Issue

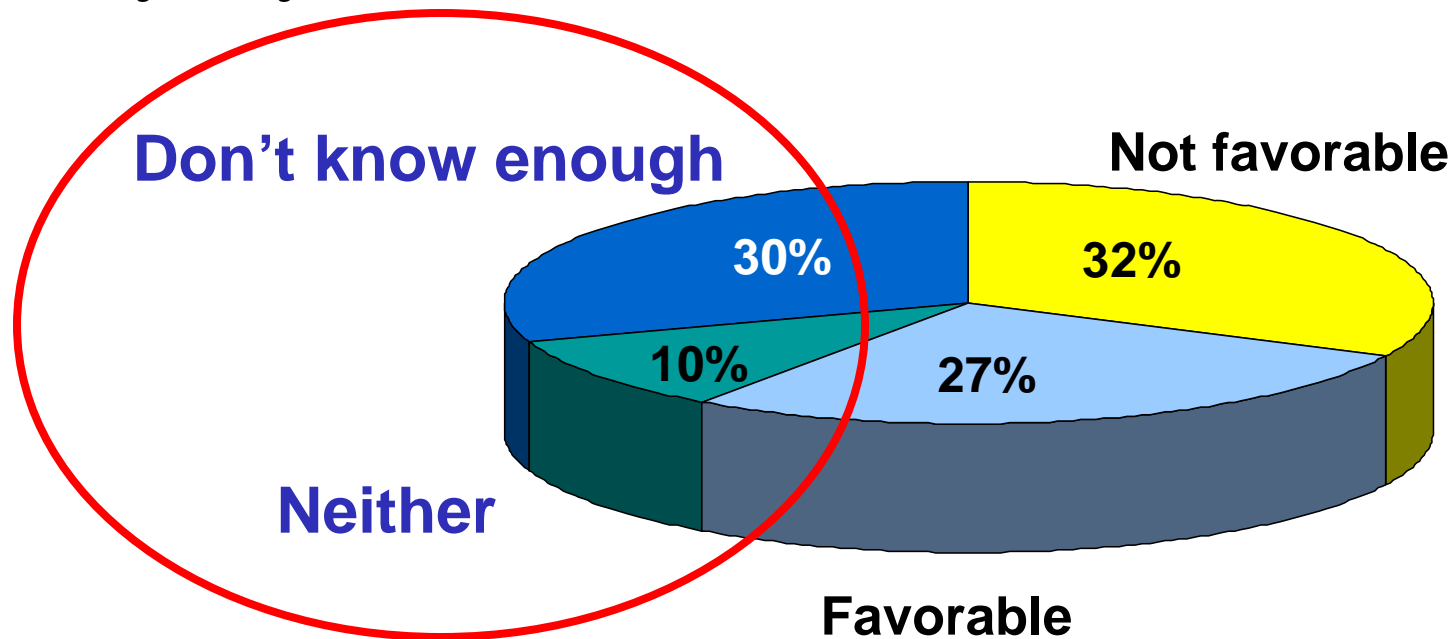
*What, if anything, are you concerned about when it comes to food safety?
(Open-ended question)*



*Source: Cogent Research for the **International Food Information Council (IFIC)**.
Nationally representative survey of 1,000 adults, March 2005. Margin of error is ± 3.1
percentage points.*

Attitudes are Soft

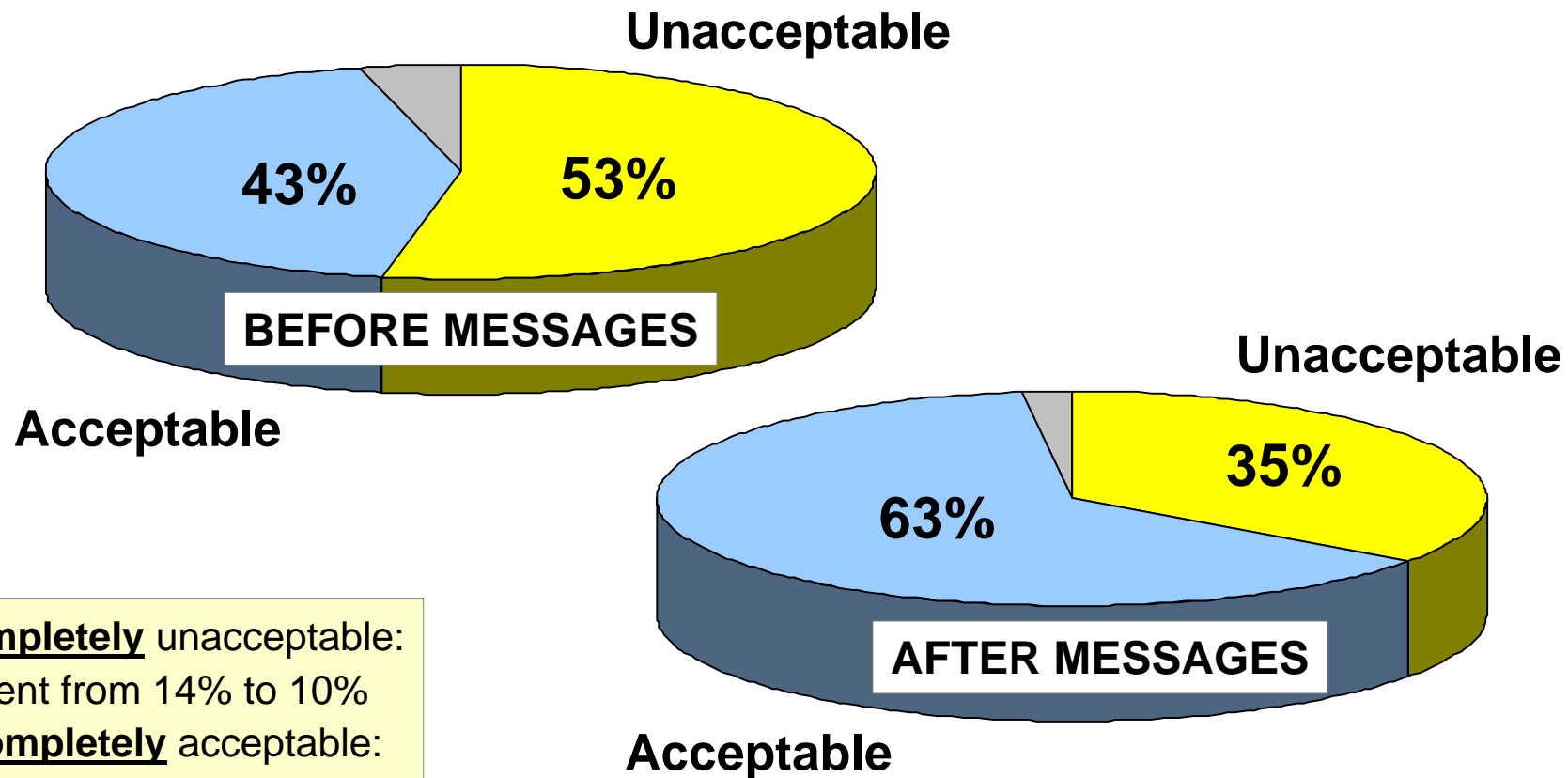
What is your overall impression of **using animal biotechnology with animals that produce food products, such as meat, milk, and eggs?**
Would you say... (IFIC 2005)



ANIMAL BIOTECH

Attitudes are Changeable

Now that you've heard more about cloning, would you say the use of cloning in farming, ranching, and food production is completely acceptable, somewhat acceptable, somewhat unacceptable, or completely unacceptable? (KRC Research, 2004)



Completely unacceptable:

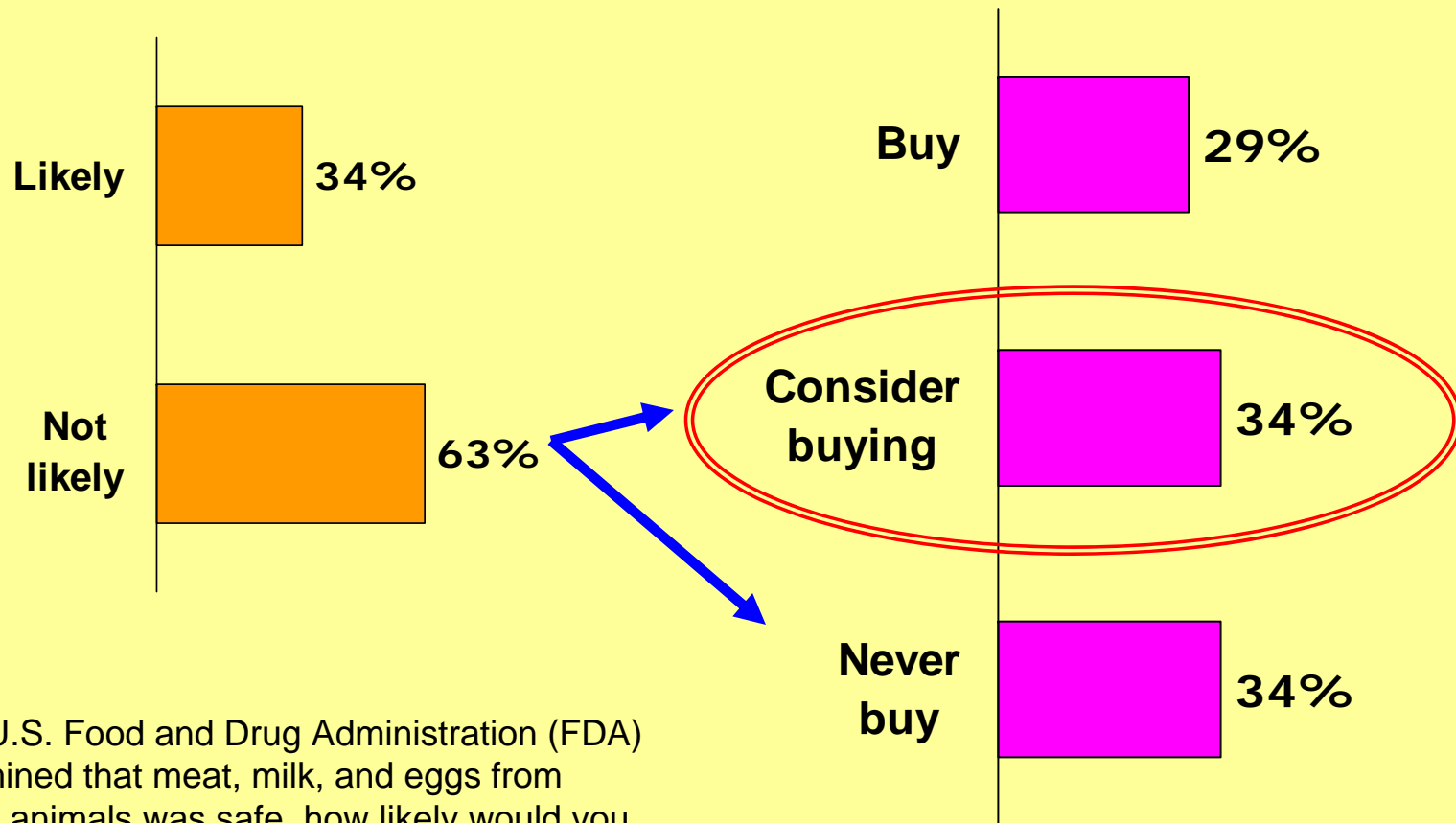
went from 14% to 10%

Completely acceptable:

went from 14% to 13%

Likely to buy vs. consider buying

There has been much discussion of lack of consumer acceptability. But if consumers are given the middle choice of “consider buying” between “likely” and “not likely” to buy, they choose the middle ground.
Comparison of IFIC and ViaGen polls.



If the U.S. Food and Drug Administration (FDA) determined that meat, milk, and eggs from cloned animals was safe, how likely would you be to buy them? **Source: IFIC, March 2005**

“A few years ago, some producers thought embryo transfer was a crazy concept. Cloning could someday take the place of ET.” Cody Gillispie, beef producer, Decatur, TX



