**Is it Cloning or Not?**

<http://learn.genetics.utah.edu/content/cloning/cloningornot/>

1. Sperm taken from a male goat is combined with a female’s egg in a petri dish. The resulting embryo is implanted into the female’s uterus to develop
   1. Is it cloning or not? \_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. Name the technique where fertilization occurs outside the body and the embryo is inserted into the uterus \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. A sheep embryo, comprised of 16 cells, is removed from the mother’s uterus and separated into individual cells. Each cell is allowed to multiply, creating 16 separate embryos, which are then implanted into different female sheep to develop to maturity.
   1. Is it cloning or not? \_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. This is a form of reproductive cloning that happens naturally when identical twins form. What is this “artificial” version that scientists can do called? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Three eggs are removed and discarded. Nuclei taken from the cells of a second female mouse are inserted into the eggs. The resulting eggs are allowed to multiply into embryos, then implanted into surrogate mothers, which carry the young to term.
   1. Is it cloning or not? \_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. This is a form of reproductive cloning called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      1. Will the offspring be genetic clones of the **nucleus donor** or the **egg donor** or the **surrogate mother**? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. A cow with many desirable traits is stimulated with hormones to produce a number of egg cells. Each of these eggs, which are not genetically identical to each other, is fertilized and implanted into a surrogate mother that does not have the desired traits.
   1. Is it cloning or not? \_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. Will the embryos be clones of each other or a parent cow? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. Sperm from a prize bull is used to impregnate cows in different parts of the world.
   1. Is this a form of selective breeding or natural selection? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. Why is selective breeding a valuable technique for managing livestock or crop plants?

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1. A woman had difficulty becoming pregnant. She and her husband consult a reproductive specialist, who uses in vitro fertilization to increase their chances of having a baby.
   1. Embryos that are formed by fertilization of an egg by the father’s sperm inside of the mother’s body is called “in vivo fertilization”. What do you think “in vivo” means?

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1. Researchers are interested in reviving the wooly mammoth, a giant elephant-like creature that disappeared thousands of years ago. They collected a tissue sample from a wooly mammoth that has been frozen in a block of ice for thousands of years; from cells in this sample, they collect several nuclei, which they insert into egg cells from another species. The resulting embryos are implanted into the uterus of a surrogate mother of that species and carried to term.
   1. Is it cloning or not? \_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. Which reproductive cloning technique was use in this example? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. Why is this technique unlikely to “bring back” extinct animals? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**What is Cloning?**

1. SCNT is a method of performing
2. Reproductive cloning B. DNA/gene cloning C. Therapeutic cloning
3. How is cloning a gene different from cloning an organism?

Click and Clone: Do the interactive and answer:

1. What type of cloning is this

A. Reproductive cloning B. DNA/gene cloning C. Therapeutic cloning

1. Where did the resulting offspring’s DNA come from
2. nucleus donor B. egg donor C. surrogate mother

**The History of Cloning**

1. Identify the organism that in 1885 was used in the first demonstration of artificial embryo twinning.
   1. Did it work? Did it result in multiple, functional organisms?
2. Identify the vertebrate that Hans Spemann cloned by artificial embryo twinning.
3. Identify the first mammal cloned by somatic cell nuclear transfer (SCNT) in 1996
   1. RECALL: What are “somatic cells”?
   2. What was the name given to the one that was carried to term (out of 277!)
4. Can primates be cloned?

**Why Clone?**

1. Cloning stem cells to repair/replace tissues/organs is called?

A. Reproductive cloning B. Therapeutic cloning

9. Read the sections of “Why Clone?”; Which do you think is the best application of cloning technology? Why do you think so?

**Cloning Myths**

1. Read the myths – did you believe any of the myths to be true before this lesson?