



**House Health and Human Services Committee**

Monday, February 5, 2007

**HB 2098**

**An Act Providing for the Defining of Certain Terms Relating to Human Cloning**

Neutral Testimony Offered by the University of Kansas Medical Center

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**Testimony**

**Introduction**

Good morning, Madam Chair. Thank you for the opportunity to provide testimony on House Bill 2098. As Vice Chancellor for Research at the University of Kansas Medical Center, my purpose in appearing today is to provide an objective, scientific viewpoint.

First, let me tell you briefly about my education and research background. Both my undergraduate and my master's degrees are in Biology. I received my Ph.D. in Physiology from Louisiana State University. I then completed a National Institutes of Health postdoctoral fellowship in the Department of Obstetrics and Gynecology and Anatomy at KU Medical Center. I then became an assistant professor at KUMC and worked my way up through the ranks of tenured associate professor, professor, associate dean and center director, then finally my current position of Vice Chancellor.

I am an NIH-funded scientist. Currently, my NIH research is in the areas of reproductive sciences. In the past I have received grants from the National Cancer Institute, National Institute of Child Health and Human Development and Environmental Protection Agency and conducted research on ovulation, various aspects of ovarian function, ovarian cancer and early pregnancy.

My research background provides evidence that I understand the issues associated with stem cell research. I will not address ethical or emotional issues relating to embryonic stem cells. I do want to address the fact that some of the definitions in HB 2098 are not consistent with the definitions developed by the National Academies of Sciences (NAS), and I would strongly encourage you to use NAS guidelines in your legislative work. The NAS is this country's premier authority on science, medicine, and engineering. It brings together the nation's top scientists and physicians in these disciplines and serves as an advisory body to the highest-level policymakers in our federal government. Our own Executive Vice Chancellor, Dr. Barbara Atkinson, is a member of the prestigious Institute of Medicine, which is the medical academy within the NAS.

### **Comments on Certain Terms**

Allow me to highlight some of the terms in HB 2098 that could be better understood and utilized if they were given the NAS definitions.

- Asexual reproduction
  - This term is not used often enough in biomedical research to be relevant in this legislation. It is primarily used in the literature in reference to plant and invertebrate reproduction
- Blastocyst
  - The NAS defines this term as “a preimplantation embryo of 50-250 cells depending on age. The blastocyst consists of a sphere made up of an outer layer of cells (the trophoctoderm), a fluid-filled cavity (the blastocoel), and a cluster of cells on the interior (the inner cell mass)
  - I would also note that it is not useful to define “blastocyst” and “blastocyst stage” separately
- Cloned embryo
  - Should be eliminated from the legislation. Consider that one of the pair of identical twins is a clone (not by SCNT)
- Cloning-to-produce-children
  - It would be more accurate to say “reproductive cloning”
- Cloning-for-biomedical-research
  - It would be more accurate to say “therapeutic cloning”

- Diploid
  - Means the chromosome number in a somatic cell or zygote
- Gene (molecular) cloning
  - This term is used in biomedical research. A more useful terminology could be: “replication of DNA.” I am unsure how this applies to embryonic stem cell research.
- Human cloning
  - I would again refer you to the term “reproductive cloning” as the most accurate way to convey the concept of cloning a whole human being. An identical twin is considered a clone by your definition
- Embryo
  - HB 2098’s definition is different from the NAS definition of an embryo; HB 2098 defines embryo as a developing organism from the time for fertilization until significant differentiation has occurred. The NAS definition, however, helps to eliminate some ambiguity by detailing what sorts of characteristics to look for in a developing organism when trying to determine what stage of development it is in
  - NAS states an embryo is, “An animal in the early stages of growth and differentiation that are characterized by cleavage, laying down of fundamental tissues, and the formation of primitive organs and organ systems; especially the developing human individual from the time of implantation to the end of the eighth week after conception, after which it becomes known as a fetus.” The difference between HB2098 and NAS is that HB2098 includes early stages of development (from fertilization) to the fetal stage whereas NAS includes from implantation (of the blastocyst) to the end of the 8<sup>th</sup> week, the fetal stage. The fertilized egg is known as a zygote. Cell division of the zygote produces a ball of cells known as a morula after which further cell division and migration produces an internal cavity and the organized cells are then referred to as a blastocyst. The blastocyst implants into the uterine wall about day 7 after fertilization and is thereafter referred to as an embryo until the end of the 8<sup>th</sup> week after conception.
- Enucleated egg
  - I would suggest that this term be eliminated, simply because it is not useful in this context. Enucleated is simply an adjective meaning “without a nucleus”

- Epigenetic modification, epigenetic reprogramming, and eugenics
  - I am also not sure these terms are very useful in the context of this legislation
  - Nevertheless, if used, the term epigenetic refers to modifications in gene expression that are controlled by heritable but potentially reversible changes in DNA methylation or chromatin structure without involving alteration of the DNA sequence.
  - In SCNT, genes are altered to allow cell division and differentiation by a process known as epigenetic reprogramming (of the chromosomal DNA).
- Gamete
  - The scientific definition identifies a gamete as a “mature germ cell” rather than a “reproductive cell”
- Infertility
  - Infertility is generally defined as the inability to conceive after 6-9 months of unprotected intercourse. There are numerous reasons for infertility such as at the level of the ovaries (failure to ovulate), tubes (blocked), uterus (endometriosis), and testis (low sperm count) as well as numerous others and combinations of the above.
- Mitochondria
  - This portion of a cell is not particularly relevant to stem cell research
- Multipotent cell
  - The bill also includes definitions of “pluripotent” and “totipotent,” which are the more commonly used terms in science. It appears redundant to also use the term “multipotent”
- Nuclear transfer
  - “Replacing the nucleus of one cell with the nucleus of another cell”
- Parthenogenesis
  - “Development in which the embryo contains only maternal chromosomes”
- Pluripotent cell
  - “A cell that has the capability of developing into cells of all germ layers (endoderm, ectoderm, and mesoderm)”; your definition of multipotent (produce several different types of differentiated cells) and pluripotent (give rise to many different types of differentiated cells) are very similar

- Somatic cells
  - “Any cell of a plant or animal other than a germ cell or germ cell precursor”
- Somatic cell nuclear transfer (SCNT)
  - “The transfer of a cell nucleus from a somatic cell into an egg (oocyte) whose nucleus has been removed.” Do not include intent to produce a cloned embryo. The SCNT process may be used to study cell growth and differentiation.
- Stem cells are cells that have the ability to divide for indefinite periods and give rise to specialized cells
- Totipotent
  - Definition uses “complete organism”; thus, no need for “and all of its tissues and organs”

Considering the use of the term “germ cell” in several other important definitions, you may also want to include a definition of germ cell, which the NAS states is “A sperm or egg or a cell that can become a sperm or egg. All other body cells are called somatic cells.”

### **Appropriate Use of Terms**

- Cloned embryo
  - It is not logical to use this term to differentiate between embryos created through somatic cell nuclear transfer and embryos created through sexual reproduction since identical twins are natural clones

### **Conclusion**

Thank you for your time today. I would be happy to answer any additional questions you might have about the science behind this terminology and related research. The government affairs staff at KUMC is also available any time – in or out of session – if you need further information on this or any other health care, medical education, or biomedical research issue.

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