CHAPTER 17:
Stem Cell Research, Cloning and Genetic Engineering
AREAS OF ETHICAL CONCERN:

- Human Cloning
- Genetic Engineering
- Genetically Modified Plants and Animals
- Genetic Screening
Stem Cell Research:

- Is classified in field of regenerative medicine
- Traditional method takes naïve inner mass cells from blastocyst during first week of embryonic development - debate primarily centers on moral status of early embryo from which the cells are harvested.
- Recent advances have been made using induced pluripotent stem cells (iPSC) (pluripotent stem cell is artificially derived from a non-pluripotent cell, typically an adult somatic cell, by inducing a "forced" expression of specific genes), and totipotent stem cells (reprogramming is mediated through a mature metaphase II oocyte as in somatic cell nuclear transfer). Because these cells are derived from adult cells, the moral status of an embryo is not at question.
- Results from iPSC’s have been accompanied with increased likelihood for cancerous tumors and immunodeficiency's not found with embryonic stem cells
- Stem cell research shows promise in area of diabetes, heart disease, Parkinson’s disease, Lou Gehrig’s disease, spinal cord injuries, etc.
FEDERAL POLICY PRIOR TO 2009:

- Only 150 lines existed worldwide and in the US. Due to a ban on further harvesting, only 15–20 lines exist, and many have been contaminated.
- Due to a presidential veto in 2007 (Executive Order 13435), no funding at the federal level was available so all work had to be done at the state and/or private level.
- Because the federal government was out of the funding stream, so was it also out of proposing ethical guidelines.
On March 9, 2009, President Barack Obama issued Executive Order (EO) 13505, entitled Removing Barriers to Responsible Scientific Research Involving Human Stem Cells.

The March 9, 2009 EO changes the way National Institutes of Health (NIH) can support and conduct human stem cell research. The HHS Secretary, through the NIH Director, is required to review existing NIH and other widely-recognized guidelines on human stem cell research and issue new NIH guidance within 120 days of the date of the EO.

The EO also revokes two items:
- the presidential statement of August 9, 2001.
CURRENT NATIONAL ACADEMY OF SCIENCES GUIDELINES OF SELF-POLICING:

- chimeric animals should not be allowed to mate (chimera = animal which has some portion of human cells or organs)
- human stem cells should not be allowed to become all or part of an animal’s brain
- embryos should not be allowed to develop beyond 14 days
- human donors of eggs should not be paid
Distinction between therapeutic cloning (sometimes used in conjunction with stem cell research) and reproductive cloning (somatic cell nuclear transfer)

Technique already somewhat successful with sheep (Dolly) and many other mammals (dogs, cats, horses, etc.)

Most cloned animals seem to have some health and other reproductive viability problems - though no conclusive data yet available.
Would origins through asexual reproduction affect one’s moral, social or legal status as a person: Even if it is technologically possible, are we ready to deal with rights of clones?

Cloning eliminates the uniqueness of each individual - would this undermine concerns of dignity & worth as a human being?

Would the clone enjoy full right to an open future or would the expectations for the clone be established by the originating person?

Is clone exploitation possible or likely? (cloning done for sake of others)

Wouldn’t cloning add confusion within families - blur lines between generations, etc.?
Human Genome Project completed in 2000 - an international research project, has now deciphered the more than three billion DNA letters of the human genome. Follow-up research is expected to discover the structure and function of thousands of new genes.

Current research focusing on individual genes and links to certain diseases & dispositions (“Skinny gene”) and aging issues.

ScienceDaily (Sep. 5, 2007) — Researchers at UT Southwestern Medical Center have found that a single gene might control whether or not individuals tend to pile on fat, a discovery that may point to new ways to fight obesity and diabetes.

Dr. Jonathan Graff led a research team which found that a single gene might control whether or not individuals tend to accumulate fat. (Credit: Image courtesy of UT Southwestern Medical Center)
In therapeutic research, problems arise with issues of informed consent - people want treatment and do not want to risk being part of control group undergoing same procedures and subject to same risks without any benefit. (see problem with Tuskegee syphilis study in Chap 5)

Social justice problems with access to and cost of potentially expensive procedures

Raises issues with developing changes to generations of offspring - super children - see “Beggars in Spain” or “Gattaca”

Concerns have arisen in athletics over “gene-doping” since genetic engineering leaves no trace in blood or urine.
Tests to Detect Risky Gene Doping in Athletes

As more athletes try gene therapy to boost their performances, scientists step up efforts to detect the cheating.

By Eric Niiler
Fri Sep 10, 2010 08:47 AM ET

THE GIST:
- A new test to detect gene doping is expected to be ready by the 2012 London Olympics.
- The test detects a modified form of the blood-boosting hormone, EPO, that appears after doping.
- Gene doping is still in its infancy in people and can pose dangers to athletes.
Sometimes referred to as “Frankenfoods”

NAS determined GM foods “do not pose health risks that cannot also arise from crops created by other techniques including conventional breeding.” (p.416)

FDA has ruled that GM foods are “substantially equivalent” to non-GM foods

Practice could lead to reduction in herbicides & pesticides, greater production of foods thus reducing world famine, more widespread distribution of certain edible vaccines not available in poorer countries, etc.
GENETICALLY MODIFIED PLANTS AND ANIMALS: SOME ETHICAL ISSUES

- It is a new process with potentially serious but unknown risks
- Objections raised are sometimes based on issues of naturalism - constitutes interference with nature.
- Potential environmental problems arise with genetically modified species altering or harming native species.
- Economic concerns regarding gene-patenting which results in sterility of seeds and increased reliance on corporate sales & distribution each season.
- Issues arise with labeling and consumer’s informed consent
“Nearly every food we eat has been genetically modified.” (p.416)

08/21/2006 ABC News report on GM Food: “Frankenfoods Sneak Into Your Menu: Genetically modified ingredients may be in many of the foods you enjoy everyday.”

http://abcnews.go.com/Video/playerIndex?id=2337659
May 4, 2011 - The California Assembly Health Committee in Sacramento on May 3 approved a bill requiring that all GE salmon sold in California contain clear and prominent labeling.

Assembly member Jared Huffman introduced the bill, AB 88, due to widespread dissatisfaction by consumer, fishing and environmental groups and Indian Tribes with the U.S. Food and Drug Administrations (FDA) current review of the first-ever proposed commercialization of genetically engineered (GE) Aqua-Bounty salmon.

Knowing whether our salmon is genetically engineered is important for a host of reasons, including risks to our native salmon species, and allowing consumers to make dietary choices consistent with concerns they may have for the environment, food safety, and religiously or ethically based dietary restrictions, said Assembly member Huffman, in explaining the reason for introducing the bill.

AB 88 "would provide that food is misbranded if the food is a genetically engineered fish or fish product, as defined, and its labeling does not conspicuously identify the fish or fish product as genetically engineered," according to the bill language.
Genetic tests are tests on blood and other tissue to find genetic disorders. About 900 such tests are currently available.

Doctors use genetic tests for several reasons. These include:

- Finding possible genetic diseases in unborn babies
- Finding out if people carry a gene for a disease and might pass it on to their children
- Screening embryos for disease
- Testing for genetic diseases in adults before they cause symptoms
- Confirming a diagnosis in a person who has disease symptoms

May be helpful in predicting likelihood of diseases prior to their onset (e.g. breast cancer) and allow for possibly less invasive preventative treatment.
**GENETIC SCREENING: SOME ETHICAL ISSUES**

- **Genetic discrimination.** People with genetic flaws, not all of which show up as dysfunctions, may be denied life insurance, health insurance, and access to schooling or to jobs.

- **Differential treatment.** Employers could hire only those people whose genes indicate they are resistant to the health hazards of the workplace, which is a cheaper alternative to making the workplace safe for all.

- **Eugenics.** Social or political pressure may be applied to people to make childbearing decisions on the basis of genetic information. Mating between those with valued genes may be encouraged while mating between two people with dangerous recessive traits may be prohibited. Women carrying fetuses with genetic abnormalities may be encouraged to abort.

- **Genetic determinism.** Genetic determinism is the belief that behavioral and personality characteristics, such as intelligence or criminal behavior, are mostly a function of genes. Genetic determinism implies a fatalistic attitude toward health and disease. It can be used to justify bigotry and to perpetuate racial or ethnic inequalities. A genetic underclass could be created.
GENETIC SCREENING: FUTURE ETHICAL ISSUES

- Once it becomes possible to test quickly and reliably for thousands of genetic conditions, will physicians be expected to perform such tests? Will the physician be liable for failing to test or for failing to inform parents of every detail of the test results?

- Who should counsel patients about what their genetic blueprints mean and how will people react to the sure knowledge of their particular genetic makeup?

- Will health insurers deny policies to people with genes for diseases with high economic cost? Will life insurers? Does either have the right to?

- Should laws be passed to protect people against genetic discrimination by private entities?

- How can genetic profiles be kept confidential and how can the discriminatory use of test results be prevented? Since some tests will reveal information about other family members, can the privacy of these relatives be protected?

- Do people have the right to choose not to know about their genes? Do mothers have the right to choose not to have their fetuses tested?