Design-Your-Own-Baby

The Techniques, Feasibility, and Ethics of Human Genetic Enhancement
**Eugenics: A Historical Perspective**

- "Eugenics is the study of the agencies under social control that may improve or impair the racial qualities of future generations either physically or mentally."
  
  —Sir Francis Galton, 1904

- **20th Century America**
- **Nazi Germany**
Nazi poster bearing the phrase, translated from German,

"A strong and healthy nurse is there only to give care to a dangerous madman. Shouldn't we be ashamed?"
A New Kind of Eugenics

• The Human Genome Project
  - Published Initial Working Draft Sequence (2001)
  - Expected Completion: 2003-2006
  - When the purposes of all of the expressed genes are identified, genetic manipulation of traits like eye color, intelligence, and height will be possible.

• Recent developments in IVF, pre-implantation DNA analysis, and improved techniques for gene transfer, insertion, and conversion
1. Identify gene of interest

2. Synthesize gene
   - to make it tissue-specific, select or create a well-characterized promoter that will bind to homologous sequence in DNA to be spliced out
   - Clone transgene fragment using PCR
   - Purify transgene
3. Isolate large numbers of fertilized eggs from superovulated females.

4. Using a micro-injection needle, inject transgene DNA into pronucleus of each single-cell fertilized egg.

5. Re-implant eggs into oviducts of anaesthetized pseudopregnant females.

6. After birth, progeny tested for incorporation of transgene by PCR or Southern Blot.
Problems with Current Techniques

• Only a fraction of the animals derived from microinjected embryos carry the transgene.

• While some transgenic animals do not have developmental problems, they often have high rates of tumor incidence during adult life.

• Some kinds of manipulation unsuccessful.
  - growth hormones in pigs
  - increase muscle mass in cattle
Genetic Treatment vs. Genetics Enhancement

- **Treatment**: Fixing a genetic defect (i.e. trisomy 21, myopia)

- **Enhancement**: Genetic manipulation becomes enhancement when alteration is for “improving a characteristic that would be within what is regarded as a ‘normal’ range, or as installing a characteristic that would not normally be present.”
Design-A-Child

Your child deserves the best possible start. We have enough imperfection built in already. You don’t want to give your child any additional burdens.

<table>
<thead>
<tr>
<th>Sex</th>
<th>Hair Color</th>
<th>Disposition (check all that apply)</th>
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<tbody>
<tr>
<td>Male</td>
<td>Red</td>
<td>☐ Good-natured</td>
</tr>
<tr>
<td>Female</td>
<td>Brown</td>
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<tr>
<td></td>
<td>Black</td>
<td>☐ Aggressive</td>
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<tr>
<td>Brown</td>
<td>Blond</td>
<td>☐ Passive</td>
</tr>
<tr>
<td>Hazel</td>
<td>100-150</td>
<td>☐ Charming</td>
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<td>Hazel</td>
<td>150+</td>
<td>☐ Happy</td>
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<td></td>
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<td>Sexual Orientation</td>
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<td>Height</td>
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<td>☐ Bisexual</td>
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<tr>
<td>6’+</td>
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*Note: Our basic service provides genetic defect corrections*
Athletes, Supermodels, and Einsteins
What Do We Have Against Genetic Enhancement?

- Ethical Issues
- Legal Issues
- Genetic Diversity Issues
Ethical Issues

• Link to the dreaded word “eugenics”
• Will widen gap between rich and poor
• Psychological welfare of genetically-engineered children
• Sacredness of genes
Legal Issues

- 19 countries have already banned human cloning and genetic manipulations
- U.S. Constitutional Issues
  1. Physical Freedom
  2. Self-determination
  3. Parent’s right to make decisions on behalf of their children
  4. Personal Privacy
  5. Rights to Procreation
Genetic Diversity Issues

• **Genetically-Enhanced individuals** will be more fit to survive

• **Homogenization of Society?**

• **Counterarguments:**
  - Although genetically enhanced individuals might have some physical advantages, there is no certainty that they would have greater reproductive fitness.
  - Neither gene transfer nor any of the other emerging reproductive technologies will ever have a significant impact on human evolution.
Why Genetic Enhancement Won’t Hurt Diversity

• Babies born every month worldwide: 11,000,000

• Assuming “enhanced” individual had his/her first child at age 20, the number of unengineered children born during the lifetime of enhanced individual before reproducing: 2,640,000,000

• Assuming 1000 successful “enhanced” babies created per year, % population they constitute: 1/132,000
Future of Genetic Enhancements?
I am the single most important consideration in any health care decision!!

Is your name "profit"?
Future of Genetic Enhancements?

• Testing on humans will be difficult initially due to limitations on embryonic stem cell and human cloning research.

• However, when treatment for genetic disorders will be approved, it will open doors for other types of "therapy".

• The first genetic enhancements that come before the FDA will be cloaked in therapeutic guises.

• Acceptance will come slowly.
Would You Enhance Your Babies?