

REPRO TECHNOLOGY IN THE 21ST CENTURY

FUTURE APPLICATIONS OF PGD

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2-Cell Embryo



Fertilized Egg



4-Cell Embryo



8-Cell Embryo



INCREASING USE OF PGD

- Available since 1990 for aneuploidy and genetic diseases
- Until recently, more discussed than used
- With 3500+ cycles and 1500+ births, a trend toward greater use

POTENTIAL EXTENSIONS BEYOND ANEUPLOIDY

- Susceptibility and late onset mutations, e.g., P53, BRCA 1&2, HD
- HLA match for existing child
- Gender
- Non-medical traits

FACTORS AFFECTING FUTURE USE

- Technical factors
- Legal Factors
- Ethical factors

TECHNICAL FACTORS

- Safety of IVF and PGD
- Advances in genetic knowledge
- Access to genetic resources
- Cost

LEGAL FACTORS

- Illegal in Germany and Italy
- Need HFEA license in U.K.
- Permissible unless banned in U.S.
 - Professional guidelines as a limit
 - FDA regulation?
 - Constitutional limits on bans

ANEUPLOIDY SCREENING

- Recurrent miscarriers and older IVF patients
- Liability for screening errors/omission
- Standard of care for new technology

LIABILITY and SCREENING

- Aneuploidy screening
 - Liability for failure to screen or inform
 - Is clinical efficacy established?
- Errors in diagnosing mendelian disorders
 - Inevitable with point mutations
 - Prenatal confirmation

ETHICAL FACTORS

- Embryo status issues
- “Giftedness” of children
- Eugenics
- Commodification & offspring welfare

EMBRYO STATUS

- PGD unacceptable if embryo a rights-bearing entity
- Acceptable if no moral duty owed embryo
- Symbolic/expressive concerns only

CHOICE VS. “GIFTEDNESS”

- Selection unethical because children are “gifts”—Kass, Sandel, PCB
- But choice of children occurs after carrier and prenatal screening
- Assess each selection choice on its own terms

EUGENICS

- PGD a practice of “eugenics”
- Voluntary vs. forced eugenics
- Carrier screening, prenatal diagnosis also “eugenics”
- Impact on persons with disabilities

WELFARE OF OFFSPRING

- Commodification
- Excessive expectations of children
- No more likely than with other children

PROCREATIVE LIBERTY

- Reprod liberty prized in liberal societies
- Its exercise may depend on info about prospective child
- Right to act on such info essential for repro freedom

METHOD FOR EVALUATING NEW USES

- Importance to choice of individual or couple
- Impact on offspring and others
- Answer will vary with trait selected

LATE-ONSET AND SUSCEPTIBILITY MUTATIONS

- Huntington's, BRCA genes, APO-E4, P53 mutations
- Demand will grow with allelic knowledge and microarrays
- Early vs. later onset not morally significant

PGD FOR HLA MATCHING FOR EXISTING SICK CHILD

- Parents may conceive child to serve as stem cell donor (Fanconi anemia case)
- Avoid adoption or abortion if child not correct match?
- PGD for HLA matching improves chance of close match (3/16 in FA)

PGD FOR HLA MATCHING FOR EXISTING SICK CHILD

- Embryo status issues
- Does it commodify embryos or children?
- Access, cost, and efficacy
- UK: no, if “child” not at risk until recently

PGD FOR NONMEDICAL GENDER SELECTION

- Impact on women
- Impact on offspring
- Embryo status issues

GENDER SELECTION AND EFFECT ON WOMEN

- Sex ratio imbalances unlikely
- Sexist or harmful to women?
 - First born male preference
 - Gender variety in family

PGD FOR GENDER VARIETY AND EMBRYO STATUS

- Does need for variety outweigh impact on embryos?
- HFEA: no sex selection at all
- ASRM: Ethics Committee: Unclear
- India: Choose male after female

PGD FOR NON-MEDICAL TRAITS

- Unlikely—most traits are multifactorial
- Deafness, musical pitch, sexual orientation (?) in mid-future
- Embryo status issues
- Impact on offspring, deselected groups

PGD FOR DEAFNESS

- Connexion gene mutations
- Sign language and assortative mating has preserved genes
- Carrier screening now used

PGD AND DEAFNESS

- Avoid deaf child: no harm to child or to the deaf
- Select deaf child
 - Richness of deaf culture
 - No harm to child (not otherwise born)
- Program may offer either option

SEXUAL ORIENTATION

- Genetic markers unlikely
- If available, should not bar parents from using
- Nor gay persons from selecting for gay offspring

CONCLUSION: THE FUTURE OF PGD

- Depends on growth in genetic knowledge
- Acceptance of trait choice as part of reproductive freedom
- Balance of perceived needs and harms will drive future uses