Biotechnologies et bioéthique

Hervé Chneiweiss
Laboratoire Plasticité Gliale
Centre de Psychiatrie et Neurosciences
Inserm U894/ Université Paris Descartes/Hôpital Ste Anne
IEP 25 mars 2009

PLAN

I. Introduction : Des lois de bioéthique Pourquoi?

- A. De Nuremberg à Helsinki
- B. La mort
- C. L'accès aux soins
- D. Encadrer la recherche. La loi Huriet-Sérusclat 1988
- E. Encadrer la génétique et la PMA 1992/94
- F. le temps des révisions 2000-2010

II. potentiel des biotechnologies et problèmes éthiques

- A. La volonté du marché : des entreprises rentables ou vendables
- B. La volonté du public : des traitements efficaces
- C. Une convergence non-automatique : nouvelles exigences publiques (principe de précaution), nouvelles exigences financières (les business angels), nouveaux acteurs (les associations de malades face aux agences réglementaires), nouvelles réalités biologiques (le générique en matière de biotechnologies)

PLAN

III. Génétique et médecine prédictive Us et abus du déterminisme

A. Définitions

B. Dépister quoi et pour qui. Valeur du test, Individu et société

C. la dérive prédictive: ADN et filiation, punir un crime qui n'a pas eu lieu, les nouveaux atours du biopouvoir

IV. Neurosciences et neuroéthique

De nouveaux enjeux pour le futur des biotechnologies et de la bioéthique

De l'éthique au droit

- Eugénisme et darwinisme social (Galton)
- Nuremberg
- La dialyse rénale
- Mollaret et les critères d'Harvard
- Helsinki 1960-2008

- La loi Huriet-Sérusclat 1988
- Les lois de bioéthiques 1992/1994
- La révision 1999-2004
- La révision 2009

Enjeux des lois de bioéthique

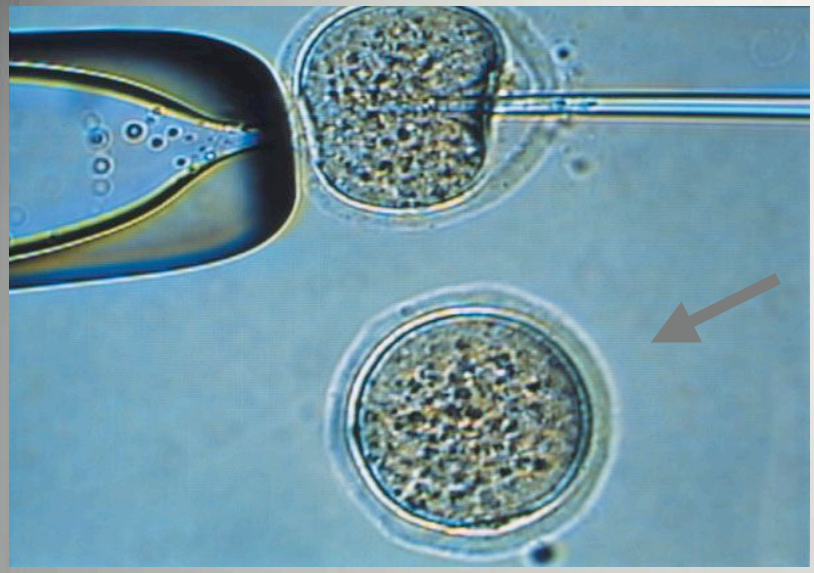
- Une occasion unique de confronter connaissances scientifiques et pratiques sociales
- Des débats qui dépassent les clivages traditionnels
- Des questions économiques majeures
- La vie, la mort, l'amour, l'argent, la guerre, tous les ingrédients du biopouvoir.

Status of the embryo

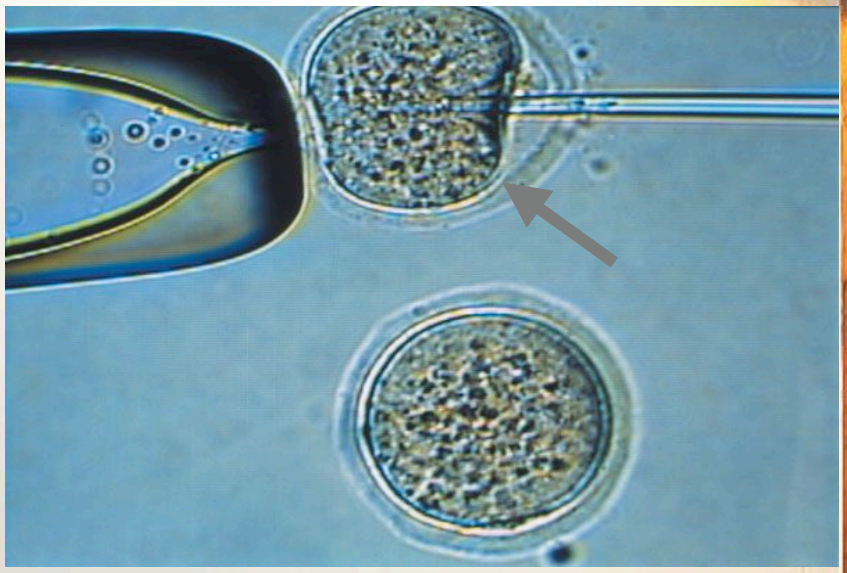
- A fertilised egg is a human being:
  - Inviolable value
  - Right to life
  - No possible selection, and no conservation
  - No research
  - No destruction

- Gradualist positions:
  - The rights are reinforced in the course of the development process.
  - Several steps are considered: implantation, appearance of the primitive streak…

Embryonic stem cells

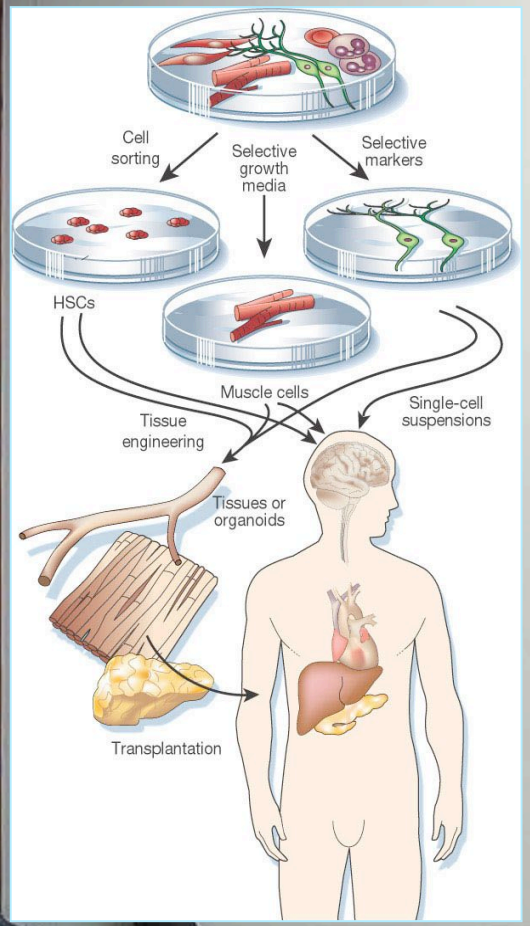


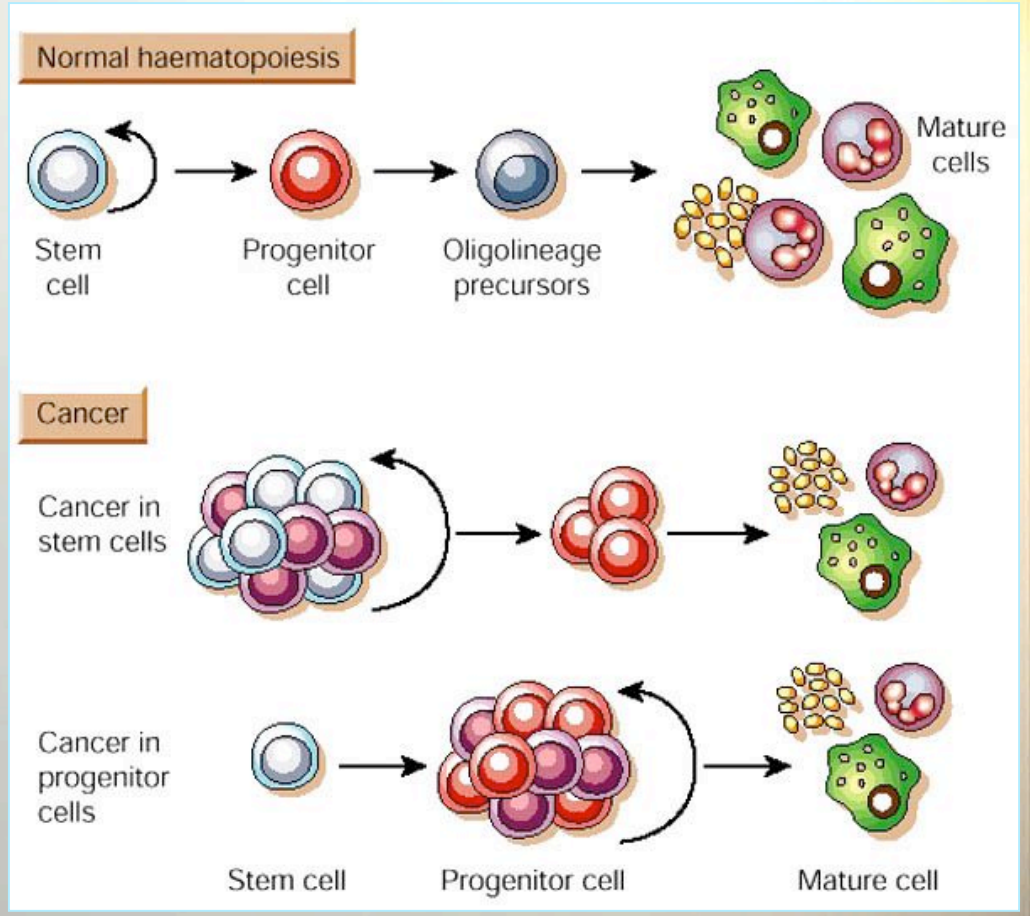
- Use of supernumerary embryos.
- ES cell lines



- Embryo created after somatic cell nuclear transfert.
- Cloning for stem cells
- Cybrids

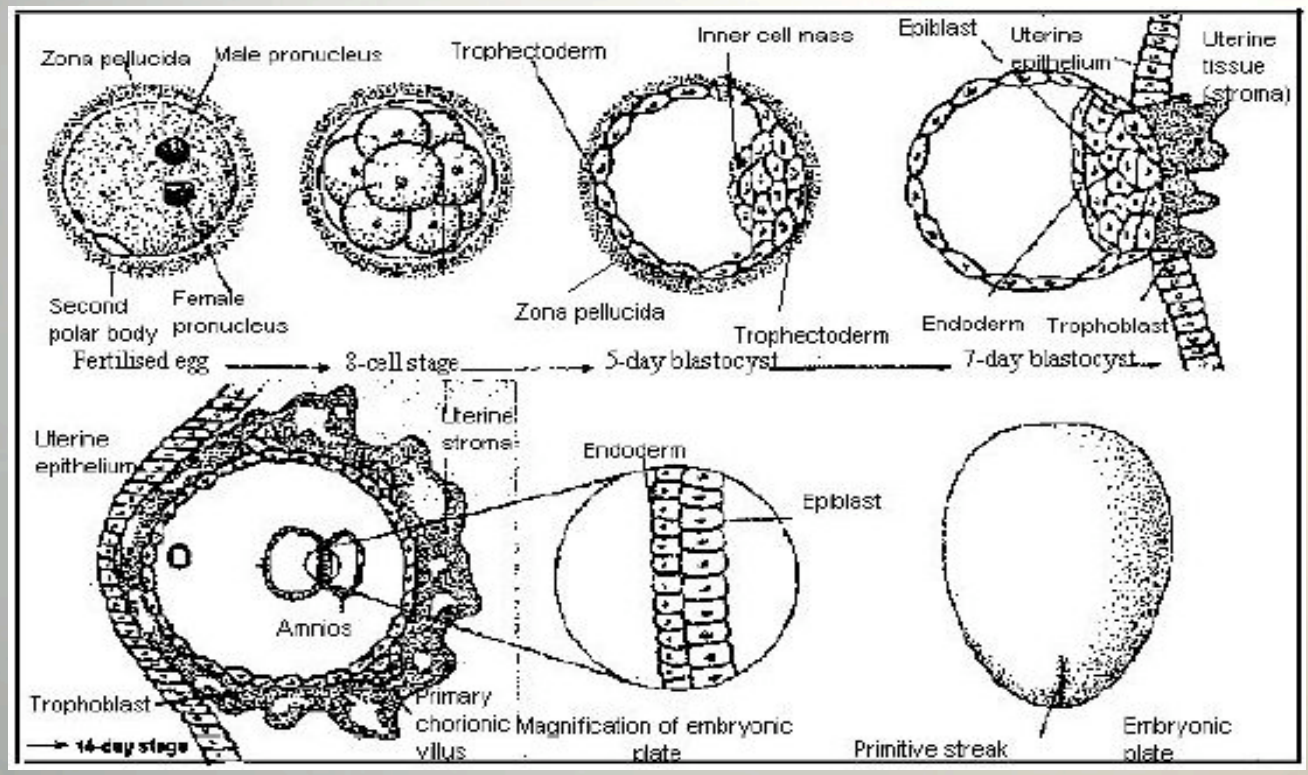
Do we really need embryonic stem cells?





+ Fusion hybrids and iPS

When does an individual life begins?



Market Versus Public wellfare

- **Industrial € 1500 bn market globally in 2010 in sustainable industrial and environmental technology**
- **Pharmaceutical € 506 bn world market in 2004 and more than € 800 bn in 2008**
- **Agricultural : the future would depend on the possible development of a non-GM feed market. Million hectares world-wide (2001: 53 GMP)**
- **estimates in 2010 : total world market (excluding agriculture) of above 2.000 billion Euro in sectors where a major portion of the new technology and a substantial part of the total technology comes from biotechnology companies.**

- **Need for responsible and coherent policies to govern these fast-moving technologies.**
- **Societal dialogue and scrutiny**
- **ethical values and societal goals**
- **Sustainable cost and development**
- Societal priorities and agenda

Shareholders versus stakeholders

- Good Practice
- Internal cost/benefit evaluation
- producer/consumer
- Safety/efficiency/ industrial property/profits

- Ethics
- Societal risk/benefit evaluation
- citizen/needs
- Priority/availability/ Affordability

Central Dogma of Biology

- Classical terms

- DNA makes RNA makes Proteins

that make everything else

•Biotech expectation

•DNA makes RNA makes Proteins

that make money

People expectation

DNA makes RNA makes Proteins

that make treatment

BIOTECHNOLOGY AND ETHICAL VALUES AND SOCIETAL GOALS

Research into socio-economic and ethical issues and dissemination of results, including criteria for assessing the benefits of using biotechnology in agri-food production

Ethical, legal and social implications are taken into account at the earliest possible stages

Establish consensus on ethical guidelines. Areas might include stem cell research, biobanks, xenotransplantation, genetic testing and use of animals in research.

Examples: BRCA1

- Patenting DNA: **Exclusivity. The patent allows its owner to prevent anyone to produce and/or market the invention without an agreement. Three kinds of patents: product/matter, process, application. The product patent gives rights on any further application and/or process of production of the product. A new patent for a new invention concerning the product is possible but will be dependent of the first, named dominant.**

- Genetic testing

La Médecine Prédictive

I. Qu'est que prédire? La notion de facteur de risque en génétique

- A. De rares maladies, monogéniques et à haute pénétrance. Exemple la maladie de Huntington
- B. De très fréquentes maladies multifactorielles. Facteur génétique prédisposant. Révélation de ce facteur par un changement de l'environement: sel, sucre, soleil, tabac..
- C. Mutation tragique dans un cas, favorable dans un autre: drépanocytose et paludisme

II. Les test génétiques

- A. Sensibilité: taux de détection
- B. Spécificité : taux de faux positifs
- C. la dérive prédictive: ADN et filiation, punir un crime qui n'a pas eu lieu, les nouveaux atours du biopouvoir
- Adieu au déterminisme génétique

La bioéthique: un exercice ignoré de globalisation

Et les pays du Sud? La question de l'accès aux soins reste ouverte après l'échec de Doha

Le trafic d'organe

Le trafic de la procréation

Que peut une loi nationale?

L'émergence de nouveaux risques

- Du mandarinat au vedettariat. Le savant au temps de la communication.
- La multiplication des fraudes: de Hwang à Reuben. Enjeux financiers, connivences, conflit d'intérêt.
- La jurisprudence Wyeth vs Levine

Neurosciences and Ethics

- Understanding neurophysiological process: mood, memory, sex, eating, sleep,
- neuropathological process
- illuminating the relation between mind and brain

- Enhancing physiological functions: mood, memory, sex, wakefulness, sleep..
- Enhancing psychological function
- monitor and manipulate the human mind

Enhancement: better brains through chemistry

- antidepressant and antianxiety drugs : easy access and aggressive marketing make more and more consumers
- vegetative functions such as wakefulness-promoting agent, sleep inducer, eating suppressor, and sex enhancer
- cognitive enhancement for healthy people : executive function and memory

Nonpharmaceutical methods for Enhancement

- Transcranial magnetic stimulation (TMS) as a means to alter mood and cognitive style.
- Surgery, brain and vagus nerve stimulation, brain-machine interfaces

Neuroethical issues of brain enhancement : risks to the individual and society

- **health issues**: safety, side effects and unintended consequences.
- **social effects** : freedom to remain unenhanced in a society where one's competition is using enhancement. Direct or indirect coercion: school (Methylphenidate), army (brain-machine interface), financial cost
- **philosophical issues:** enhancement challenges our understanding of personal effort, accomplishment, autonomy, and the value of people as opposed to things

Brain imaging and privacy

- false-color images

positron emission tomography (PET),
functional magnetic resonance imaging (fMRI),
electroencephalography-derived methods (ERPs),
magnetoencephalography (MEG)
near infrared spectroscopy (NIRS)

- ‘neuromarketing’ brain imaging, lie detection

- ‘brainotyping’ to reveal mental health vulnerabilities and predilection for violent crime, unconscious racial attitudes, sexual attraction , extraverion and neuroticism, risk-aversion, pessimism, persistence and empathy detection

Responsibility, brain and blame

- clinical observations of personality change in patients with ventromedial prefrontal cortex damage
- A developing set of brain regions that play a role in decision-making to include other prefrontal and limbic areas
- Damage to these areas impairs the ability to understand ability to understand the mental states of others
- These areas are also involved in empathy and a sense of moral violation

Legal responsability

- We do not blame people for acts committed reflexively (e.g. as the result of a literal knee-jerk), in states of diminished awareness or control (e.g. while sleep-walking or under hypnosis) or under duress (e.g. with a gun held to the head), because the acts as not resulting from the exercise of free will
- What remains from Free Will in the light of neurosciences?

rethinking moral and legal responsibility

- it seems reasonable to punish a person less harshly if they are less responsible. This puts us on a slippery slope as all behavior is 100% determined by brain function, which is in turn determined by the interplay of genes and experience.
- alternative interpretations of responsibility that do not depend on free will and to so-called ‘forward thinking’ penal codes, designed not to mete out punishments for previous behavior but to encourage good behavior and protect the public

Neuroethics: oldies and novelty

- the practical issue of brain privacy has much in common with the privacy concerns that arise in genetics.
- the practical problems of overconfidence in new technologies and long-term safety of pharmaceuticals have ample precedents
- Are we the same person on Prozac as off? This is a good question, but so is: are we the same person after a glass of wine as before – or even during a vacation as before?