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Genetics:
Lesson 11 – Inserting DNA into organisms

Biotechnology: the use of technology and organisms to produce useful products.

Cloning: a process that produces identical copies of genes, cells or organisms.

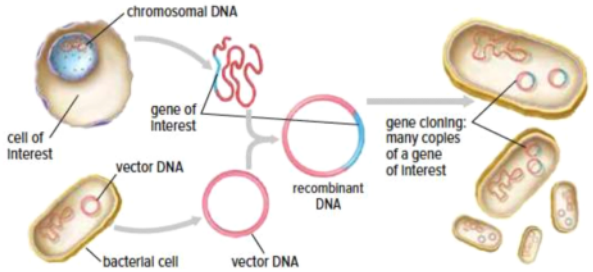
Gene cloning:

manipulating DNA to produce multiple copies of a gene or another piece of DNA in foreign cells

Ex Gene cloning is used to mass produce bioproduct (ie insulin)

Steps in Gene Cloning: ↳ ie plasmid

1. Choose a vector to be carrier of gene to clone
2. A plasmid is a small, circular piece of DNA in bacteria. ↳ gene for insulin
3. insert a segment of DNA to clone into vector
4. This DNA molecule that has genetic material from both gene and vector is called "recombinant DNA"
5. Introduce the recombinant DNA into foreign cells
6. Once inside foreign cells, they divide and make insulin



Transgenic organisms: organism that have foreign DNA from a different species inserted into them

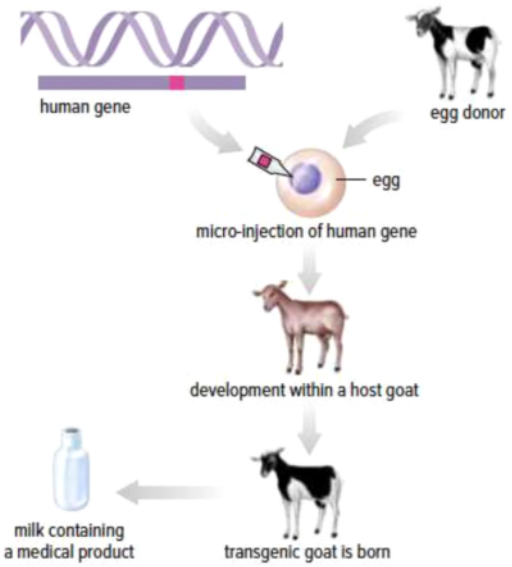
- These are types of genetically modified organisms (GMOs)
- Transgenic crops have been genetically modified to be resistant to herbicides, pests, fungus, and viruses

Ex Golden Rice

- Golden rice has been genetically modified with genes from four different plants
- It has increased iron and vitamin A content to help reduce malnutrition
  - iron ↓ Bean genes
  - vitamin A ↓ daffodils genes

Ex Animals

Transgenic goats are used to produce proteins and human growth hormone in their milk.



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Genetics:
Lesson 12 – DNA technologies

a) Reproductive Technologies

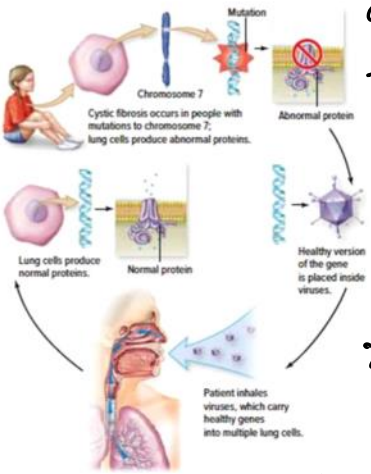
Two biotechnology advancements that help people conceive children:

1. **Artificial insemination:** a process that involves collecting and concentrating sperm and then placing it in the female's uterus
2. **In vitro fertilization (IVF):** a process that results in a female's eggs being fertilized by sperm outside of the body
   → need to implant into surrogate

b) Gene Therapy

An experimental treatment to cure genetic disorders that involves inserting a "normal" gene into tissue cells affected by disease Ex Cystic Fibrosis

ex cystic fibrosis



- C.F is a disease where genes produce abnormal proteins in lungs
  → Prone to persistant lung infections

Gene therapy treatment:

1) Healthy version of gene and place it into a virus.
2) Patient inhales virus, which carry genes into multiple lung cells
3) lungs produce normal proteins

c) DNA technology in British Columbia

1. **Food Crops and Testing for Viruses**

Biotechnology can be used to reduce testing time for the presence of viruses in crops for export.

Ex romaine, ecoli recall.

2. **Invasive Species and Forests of British Columbia**

Invasive species: a species that is not native to an ecosystem and can cause harm to it

a. Scottish broom, Asian gypsy moth

b. Detection of invasive species can be done by extracting DNA samples from insect eggs on cargo (incoming)

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Genetics:
Lesson 13 – Ethical Issues of Biotechnology

Concerns about GMOs

- Environmental threats include:
  - Use of herbicide-resistant plants can lead to stronger herbicides that leak into soil and water systems
  - Genes can cross to other species
  - GMO may out compete species in the wild
- Health effects include:
  - long-term effects of GMOs are not known
  - GMOs may produce allergic reactions
  - GMO products do not have labels on them
- Social and economic issues include:
  - A lot of money is spent on genetic research
  - Private companies have too much say over global food market
  - Ethics behind human using other species for their own benefit.

Concerns about Gene Therapy

-Some people exhibit negative effects with G.T

- Safer procedures need to be developed because G.T holds good promise for future.