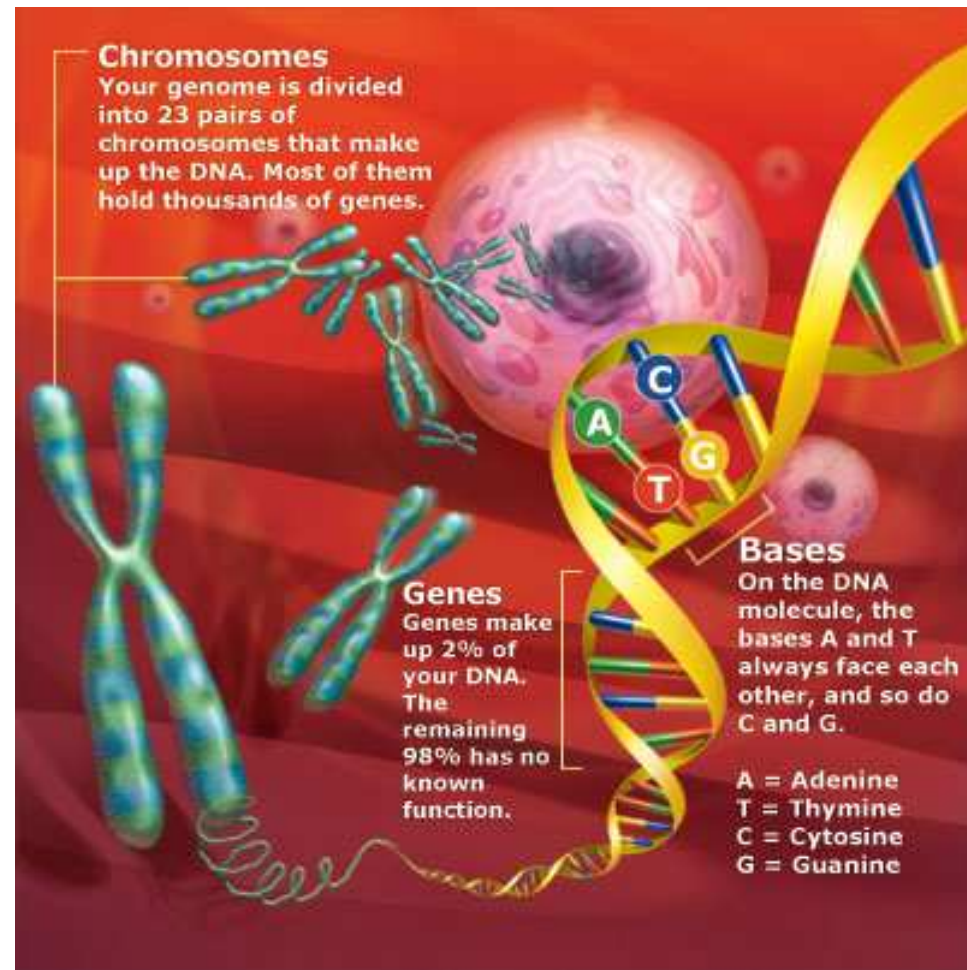


Genetically Modified Organisms (GMOs)

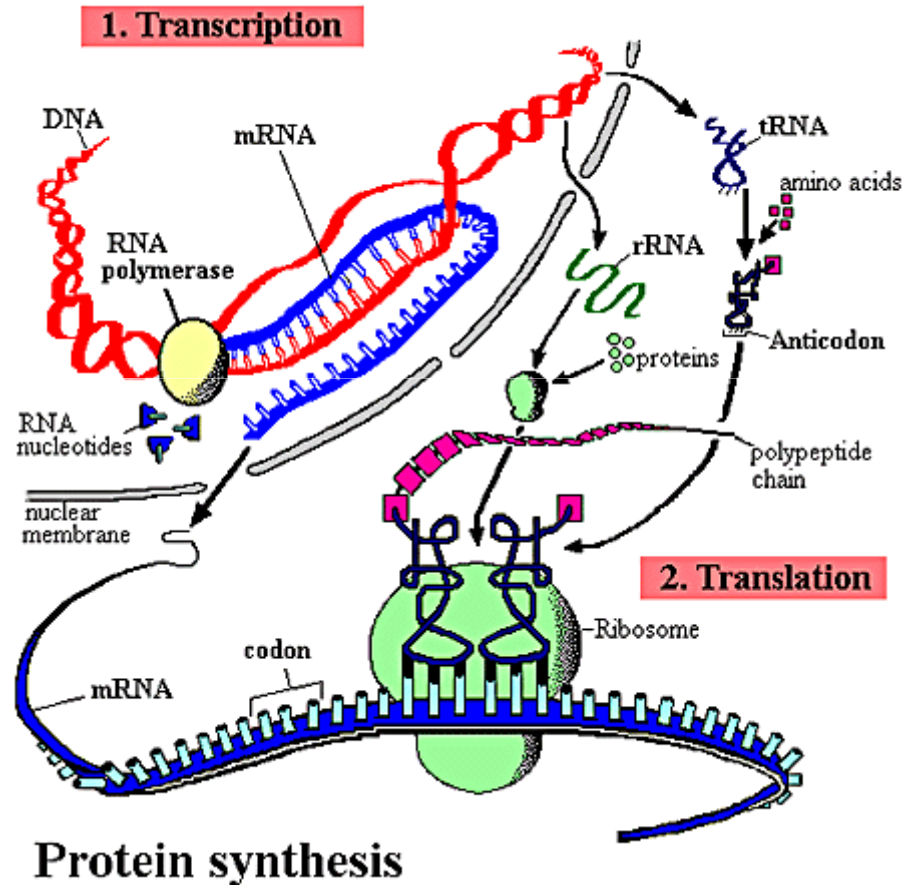
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DNA and Gene

- DNA- Deoxyribonucleic acid, “hereditary molecule”, carries genetic information
- Gene is a segment of DNA that codes for a functional protein



Translation of genetic information into protein synthesis



- The information about “traits” carried by genes is manifest in proteins
- Color of eyes, skin, ability to fight infection, propensity to eat more/less etc. are manifest through proteins

Traits in plants and animals desirable to humans

- Making crops resistant to disease or predators
- Increase yield
- Create plant species easier to grow and better in yield
- Create plant species that can grow in adverse climate
- Introduce desired (by humans) characteristics
- Manufacturing human proteins needed for therapy
- Models for study of human diseases

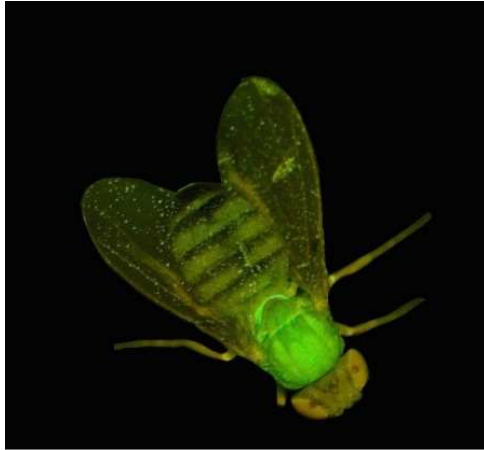
These desirable characteristics may not be available within the species.

It is possible to transfer them from one species to another.

Horizontal and vertical gene transfer

- Horizontal: Transmission or absorption of genetic material not involved with sexual reproduction and independent of acknowledged species boundaries, resulting in “transgenic species”, can introduce new characteristics
- Vertical: Two organisms within a species crossing sexually and passing their genes to following generations, characteristics limited to those of the parents

Transgenic plants and animals



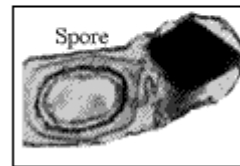
How is it done? (BT Corn)

- *Bacillus thuringiensis* – donor organism
- Gene for BT delta endotoxin
- BT delta endotoxin kills lepidoptera larvae
- Does not effect beetles, wasps, beetles
- Binds to the gut wall and the insect stops feeding
- Gut wall breaks down and normal gut bacteria invade the organism, larva dies
- Promoter sequences are also required for expression

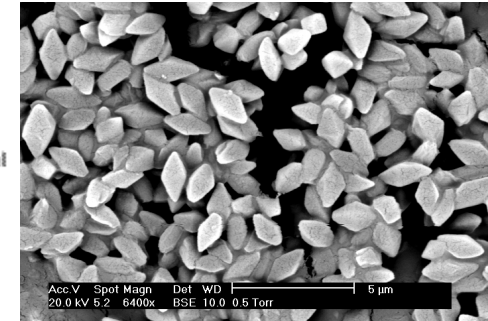
Bacillus thuringiensis



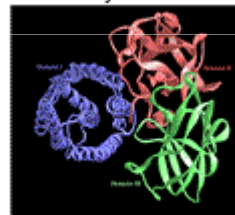
Gram-positive, spore-forming soil bacterium



Produce insecticidal crystal proteins (δ -endotoxins) during sporulation



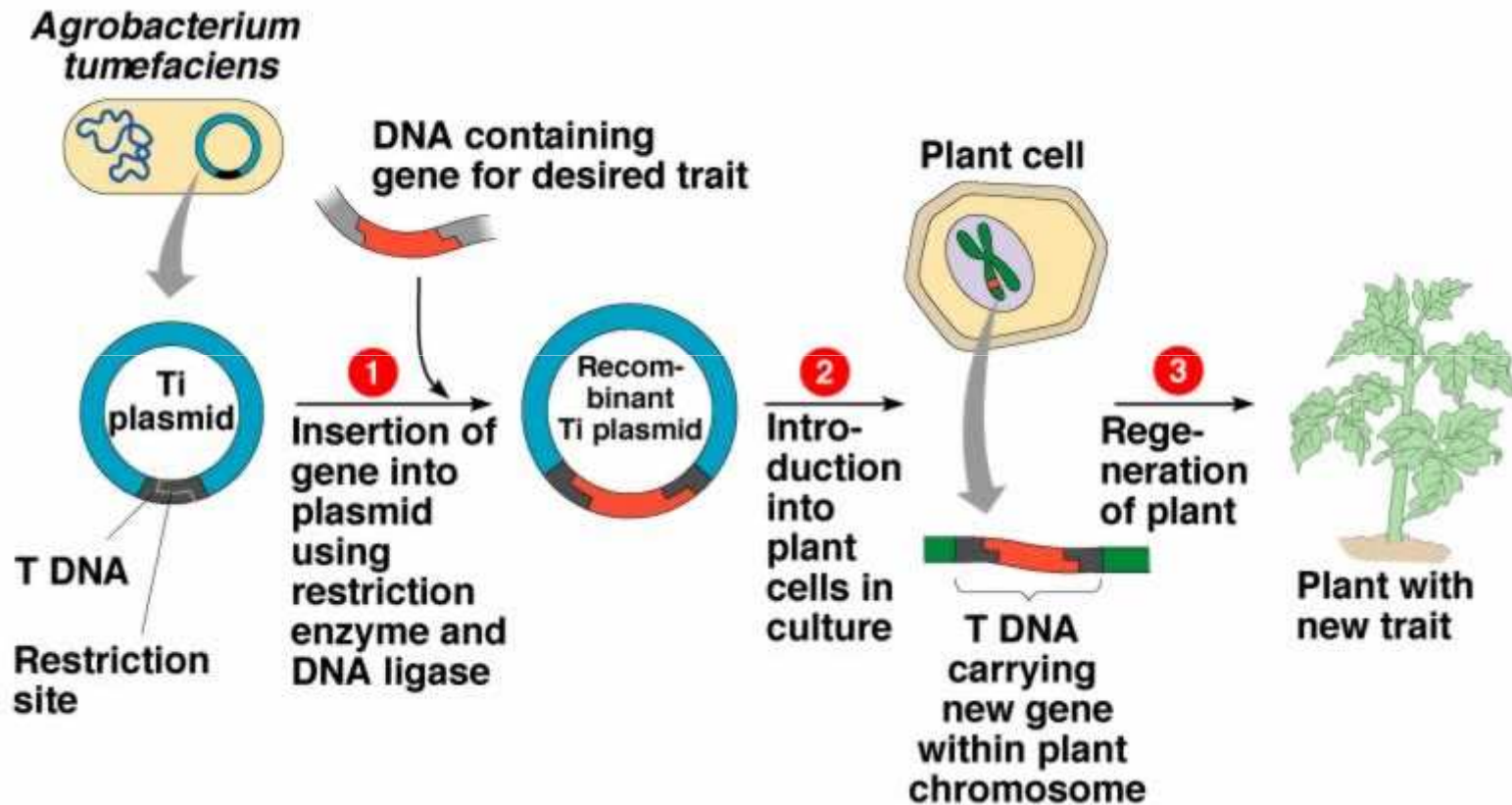
Cry toxin



Most *Bt* strains can synthesise more than one crystal, which may be formed by different Cry toxins



Genetic Modification in plants



Are transgenes transferable?



No transgene transfer from plants to animal gut



No transgene transfer from plants to soil fungi



Transgene transfer from potato to special bacteria and from sugarbeet to soil (as free DNA) has been demonstrated.

Genetic Modification in Animals

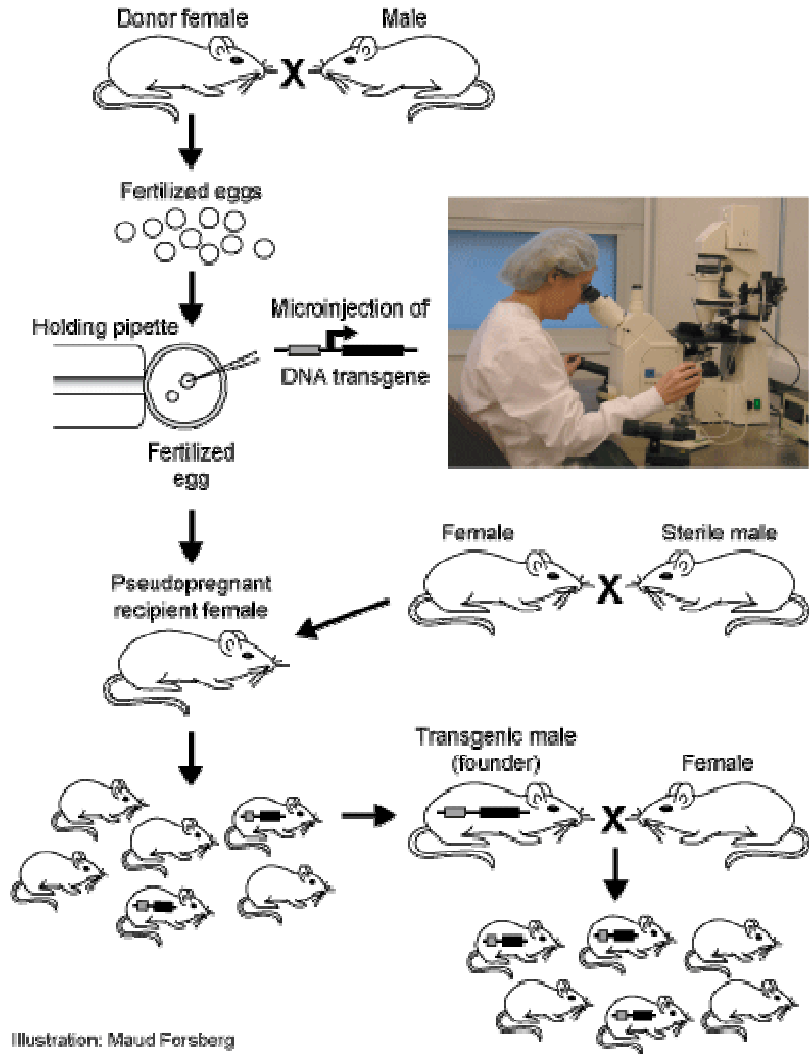
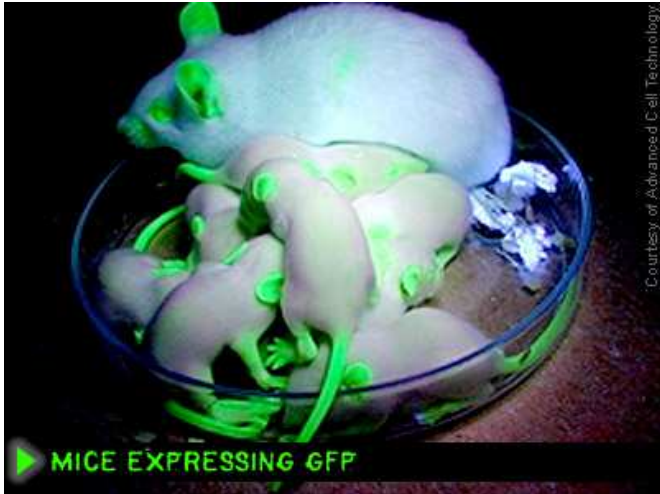


Illustration: Maud Forsberg



Courtesy of Advanced Cell Technology

Transgenic animals in Medicine (Pig)

- Size of pig organs are close to those of humans
- Pig physiology is very similar to humans
- Rejection of transplants is minimized by introducing human
- Genes into the pigs
- Production of human hemoglobin
- Models of human diseases

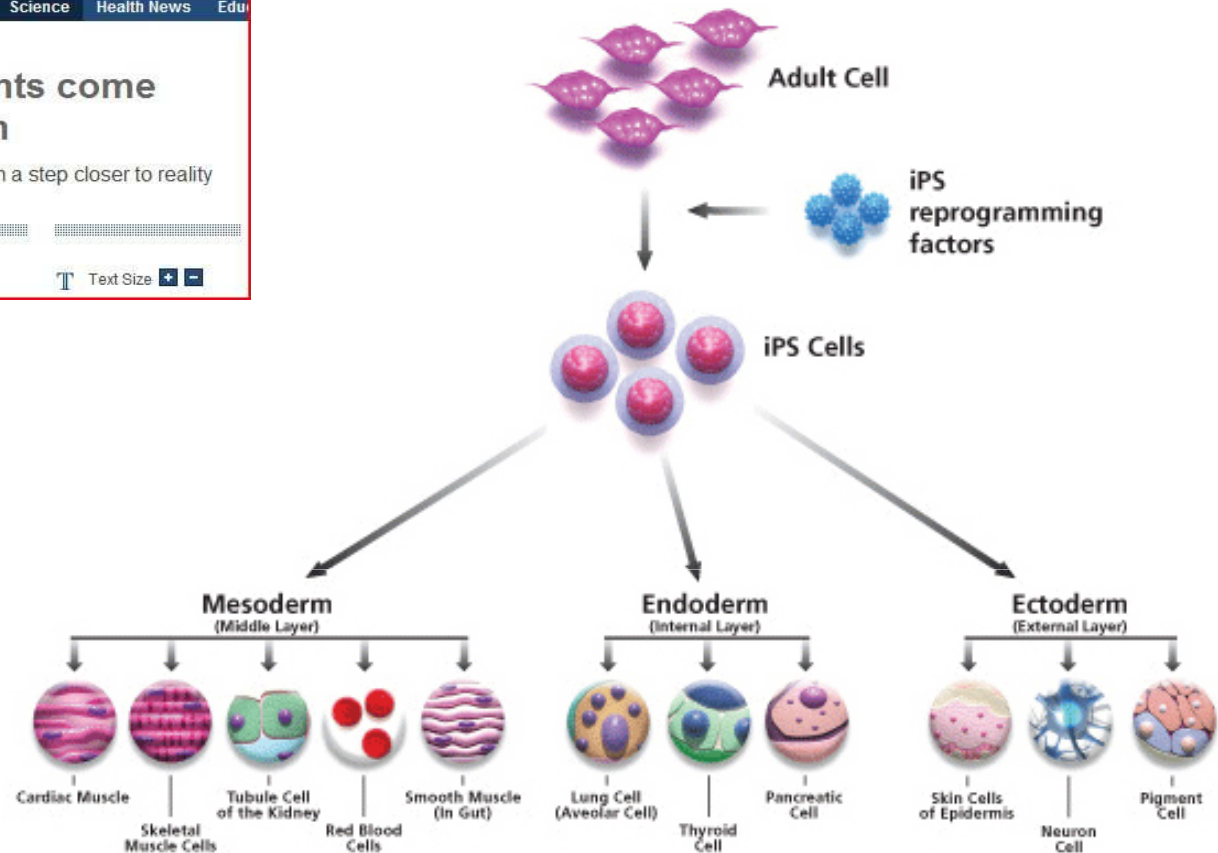


Animal to human organ transplants come closer after GM pig breakthrough

Heart and kidney transplants from animals to humans have taken a step closer to reality after a breakthrough in how to genetically modify pigs.

By Richard Alleyne, Science Correspondent
 Published: 7:00AM BST 03 Jun 2009

Text Size + -



1: [J Mol Cell Biol.](#) 2009 Jun 3. [Epub ahead of print]

Generation of Pig-Induced Pluripotent Stem Cells with a Drug-Inducible System.

[Wu Z](#), [Chen J](#), [Ren J](#), [Bao L](#), [Liao J](#), [Cui C](#), [Rao L](#), [Li H](#), [Gu Y](#), [Dai H](#), [Zhu H](#), [Teng X](#), [Cheng L](#), [Xiao L](#).

Laboratory of Molecular Cell Biology, Institute of Biochemistry and Cell Biology, Cell Bank, Stem Cell Bank, Shanghai Institutes for Biological Sciences, Chinese Academy of Sciences, Shanghai 200031, People's Republic of China.

Transgenic humans?



Sources

- <http://www.gmo-safety.eu/en/glossary/#>
- www.pigprogress.net
- www.utpa.edu/faculty/materon/3401/protein.html

Thank you