

Genetic Engineering & Biotechnology

Transgenic Organisms

Genetic Engineering

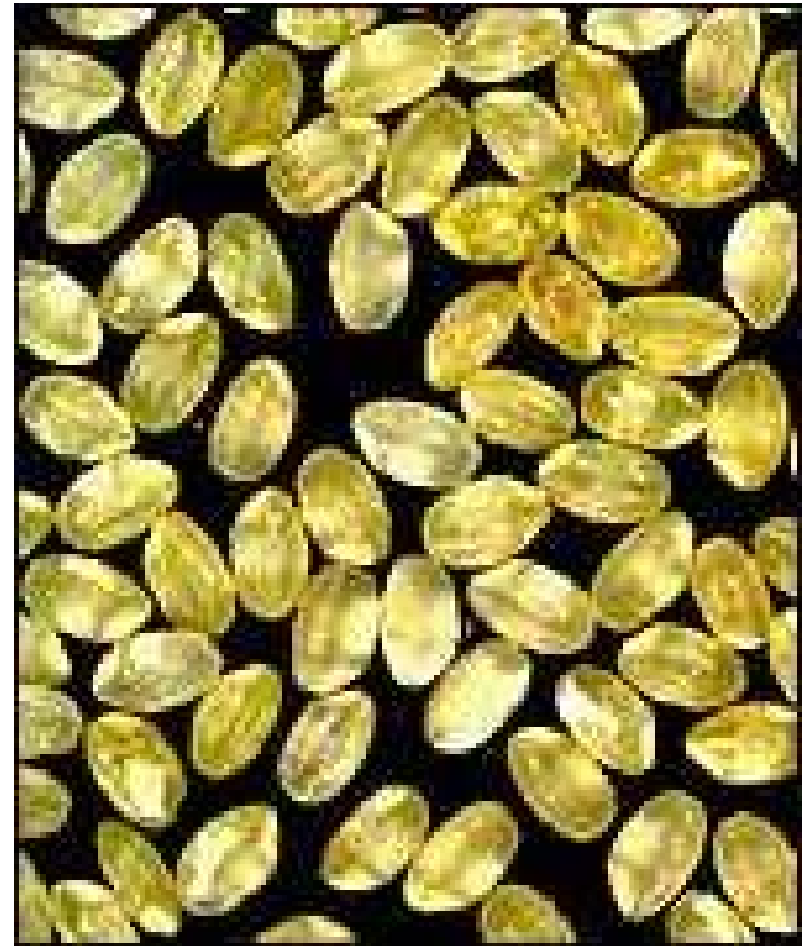
- **Transformation:**
introduction of a new gene from one organism into another organism (often across species)
- Transgenic organisms are created through the addition of new genes or the suppression of existing genes.



Luciferin & Luciferase Genes



Golden Rice: A cure for Vitamin A Deficiency and Nutritionally-Induced Blindness?



Golden rice vs. White Rice



GloFish: Zebra fish + coral genes



Cloned Animals – To perpetuate transgenic varieties and other special animals

Dolly the Sheep
1996 - 2003



Cc the Cat
2002 -



Snuppy the Cloned Dog



- a, Snuppy, the first cloned dog, at 67 days after birth (right), with the three-year-old male Afghan hound (left) whose somatic skin cells were used to clone him. Snuppy is genetically identical to the donor Afghan hound. b, Snuppy (left) was implanted as an early embryo into a surrogate mother, the yellow Labrador retriever on the right, and raised by her.
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 - p641 Lee BC, Kim MK, Jang G, Oh HJ, Yuda F, Kim HJ, Shamim MH, Kim JJ, Kang SK, Schatten G, Hwang WS (2005) Dogs cloned from adult somatic cells. *Nature* 436(7051):641.
 - http://pharyngula.org/index/weblog/comments/snuppy_the_cloned_puppy/

Potential benefits of transgenic organisms (GMOs - Genetically-modified organisms)

- **Genetic engineering can produce organisms that are:**
 - able to synthesize oils, starches, hormones (e.g., bacteria that produce human insulin for use by diabetics) and plastics
 - edible vaccines from vegetables and milk
 - able to synthesize enzymes for food processing and other uses
 - more nutritious foods (e.g., plants with a higher protein content, and wider profile of essential amino acids - methionine-rich beans or lysine-rich corn; golden rice to help enrich the diets of those not able to eat foods rich in beta-carotene or Vitamin A to prevent blindness caused by a nutritional deficiency)
 - plants able to fix their own nitrogen for growth
 - freeze resistant plants
 - pest resistant plants
 - herbicide resistant plants
 - disease resistance in animals and plants
 - gene therapy to help cure certain diseases linked to the under or over abundance of a protein product by a genetic disorder

Potential problems of transgenic organisms (GMOs - Genetically-modified organisms)

- Allergies to transformed plant and animal products.
- Accidental movement of novel genes into wild relatives from domesticated plants and animals.
- Consumer resistance to using genetically-modified products, especially food and drugs.
- Ethical and moral considerations. (e.g., exploitation of genetic resources for personal gain).