

Chapter 8

Animal Biotechnology

Animal Biotechnology

- The application of scientific and engineering principles to the processing or production of materials by animals or aquatic species to provide goods and services
- Originally in mouse and *Drosophila* models and have only more recently been extended to other domesticated animals

Benefit to Human

- Agricultural Applications : Best breed for animal and to have the best traits that it can possible have
- Medical Applications: As a model for disease study / Xenotransplantation / Gene therapy
- Industrial Applications : Animals that have transgenes have been produced to for testing on chemical safety as these animals are sensitive to toxic

Animal model

- Mice and human have similarity of genome
- Examples:
 - Polio vaccine develop from animal : High % of children and adult die or suffer from the side effect
 - Cataract surgery: Million of people will lost their sight
 - Dialysis: Tested on animal; Thousand suffer from kidney disease will die

- Major medical advance depend on animal tested
- Approved veterinary and vaccines for human used:arthritis, allergies, heart disease etc
- Safely tested by FDA before marketed
- Safety testing involve vigorous scientific methodology called phase testing
- The choice of animal usually similarity to human genome

In vitro cell testing

- Not sufficient
- New drugs have side effect beyond single cell in tissue and organ
- Therefore must be tested in animals
- Eg. Drugs might be kill cancer cell but may destructive to unrelated organ
 - Propecia:encourage hair growth
 - Pregnant women should not handle broken or crush pill

Other animal model

- Vertebrate (zebrafish), invertebrate (fruit fly) and nematode (worm)
- Zebra fish testing on drug because they have rapid growth and development
- Dog: Study of heart disease and lung disorder
- Monkey and chimpanzees: AIDS and HIV
- Recently not use animal but other alternative method

Alternative to animal model

- 1. Cell culture
 - Preliminary scan to check the toxicity
 - Collecting evidence from cellular level
 - Cannot provide the potential impacts on the organism

- 2.Computer-generate model
 - Stimulate specific molecular and chemical structures
 - Provide clues but cannot provide the answer
 - Excellent for processing data and see the pattern
 - Can reduce the use of animal
 - Eg. Through the computer programm, Propecia is a powerful drug but computer model could not be expected to address the unexpected birth defect

Ethical concerns

- Pain and suffering
- Methods of euthanizing laboratory animals are chosen to induce rapid unconsciousness and death without pain or distress

Regulation of Animal Research

- Standard concern: housing, feeding, cleanliness and medical care
- Research must identify and select appropriate animal species
- Follow the standard of care set: *The Guide for the Care and Use of Laboratory Animals*