

Hazard and problems of
recombinant DNA technology
and the possible techniques to
minimize bio-hazard

Introduction

- Recombinant DNA technology, sometimes referred to as "genetic engineering," are ethical in nature.
- Some people feel that recombinant DNA technology goes against the laws of nature, or against their religious beliefs, due to how much control this technology gives humans over the most basic building blocks of life.



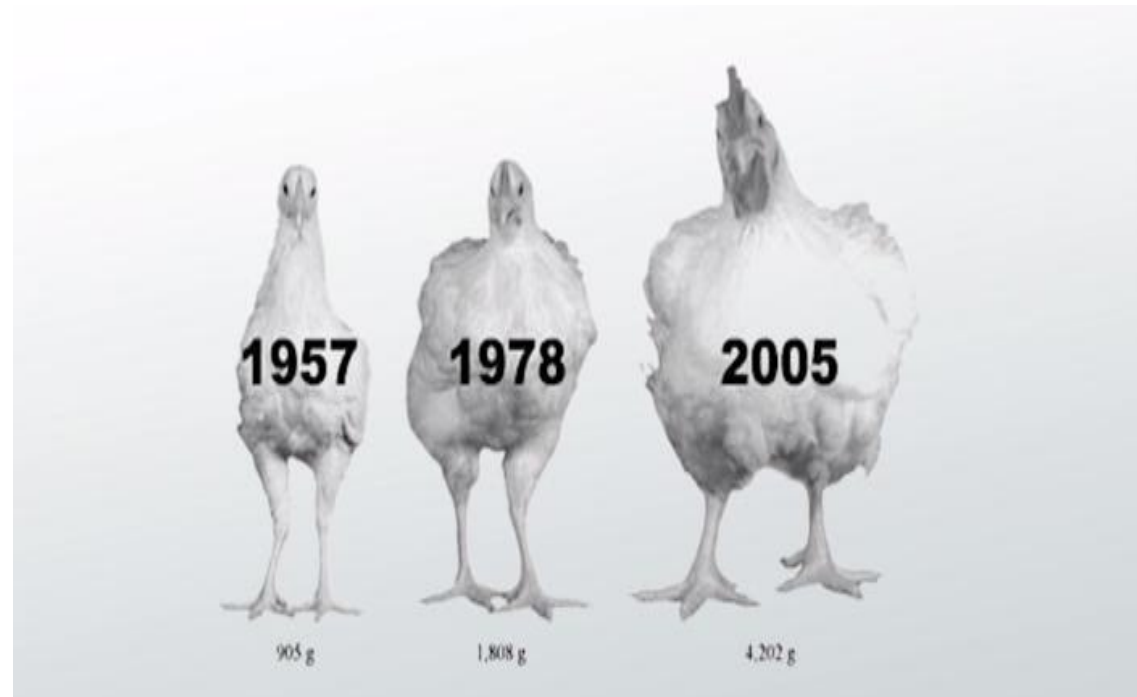
Hazard and problems of recombinant DNA technology



- During early era of life sciences, biosafety principles and guidelines were mostly applied in the field of microbiology and medical practices. In recent time, biosafety guidelines are designed and applied to research involving recombinant DNA (rDNA) techniques. Handling, production, storing and transportation of genetically modified organism (GMOs) involve different biosafety issues under different category. Biosafety practices deal with the application of standard safety principles handling hazardous material/agents to minimize potential harmful effect on human health and environment.

- - The use of recombinant DNA technology in production of transgenic animals can lead to problems due to mistakes or unexpected results from experiments. There is evidence that certain transgenic species show increased gestation length, body weight, and abnormalities for example in sheep and cattle.
- - Genes inserted into these animals can create new insertion mutations, causing loss of most gene function and hence developmental defects.

Example



- Transgenic animals with increased growth hormone production to provide more food and grow faster have been shown to develop symptoms such as arthritis, stress, irregular heart and lung function and early death.
- -Production of transgenic plants reduces genetic diversity of plants due to selection of these plants against the traditional varieties. These could lead to extinction these traditional varieties. It also leads to increased expenditure on germplasm conservation of the traditional varieties.



- Today Scientists are making so many mutants by this technology, especially of plants that any wrong mutant plant species if introduced accidentally in crop fields can become invasive very soon and will compete the native important plant species for space , nutrients and light.
- Genetically modified organism (plants or animals) can interbreed with natural organisms and contaminate natural environment with loss of natural flora and fauna. Also the result of such **interbreed** is unpredictable and is matter of concern.



One of the major problem

- **Resistance of people** to genetically modified foods.
People don't like to eat foods which have been genetically altered. (GOM)





GENETIC ENGINEERING
BAD FOR FARMERS ■
BAD FOR OUR HEALTH
BAD FOR OUR PRIVACY
BAD FOR ANIMALS ■
AND THE ENVIRONMENT



- Utilization of Recombinant DNA requires high technical skill and complicated equipment. And some techniques require long days to complete.
- Some techniques especially in transgenic animal development have got a high failure rate e.g. implantation. This failure rate is significantly increased for embryos manipulated in Petri dishes. Soma clonal variation created during tissue culture creates differences which are not related to the gene of interest.

- Sometimes even when transgenes are developed, they become unstable and lost in the genome even if they are still present (lose expression).
- Some recombinant DNA technologies involve the exposure to harmful carcinogenic substances. For example during organic DNA extraction, exposure to ethidium bromide during Gel electrophoresis and UV light this can lead to cancer.



- Other people worry that humans may begin tampering too much with their own genetic material and create societal problems.
- What if people use recombinant DNA technology **to live longer?**
- **become stronger?**
- **or handpick certain traits for their offspring?**
- Will **societal division** swell between genetically modified people and "normal" people?
- These are questions that scientists and the public will likely continue to consider as humanity moves toward a future where manipulating DNA is easier than ever before.

- There are international concerns about the utilization of Recombinant DNA technology e.g. for development of **super human races**, development of **bioweapons** , since there is the slippery slope argument which says that (what can be done with animals may someday be done with humans)



Minimize bio-hazard



- **Only** qualified and trained personal is allowed to do genetic engineering works.



- In case of accidental release of genetically modified organisms in high amounts, alert colleagues and **close the area** if necessary and call the biological safety.



- if there is Spillage, it has to be absorbed immediately.
- Inactivate contaminated items and surfaces using disinfectants (Ethanol 70%).



- Take care of self-protection measures when removing contaminated material (lab coat, gloves, glasses etc.).
- Disinfect contaminated skin areas immediately

Personal Protective Equipment (PPE)



Safety Goggles



Labcoat



Gloves

- The genetic engineering laboratory should be isolated and separate from the rest of the labs and their activities in order to avoid biological and physical containment.