African Regional Training of Trainers workshop on the Identification and Documentation of LMOs

Item 6:

SAMPLING AND DETECTION OF LMOs

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African Regional Training of Trainers workshop on the Identification and Documentation of LMOs

SAMPLING AND DETECTION OF LMOs

Introduction And Overview

WHAT IS A LMO/GMO?

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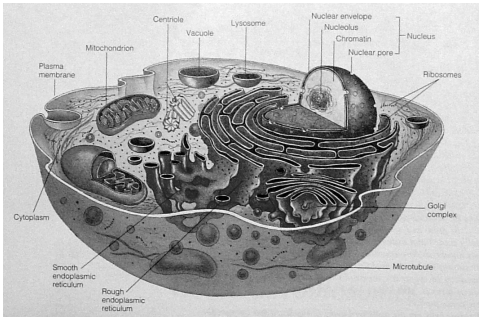
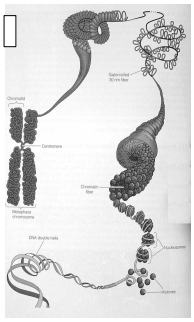
Biology 101



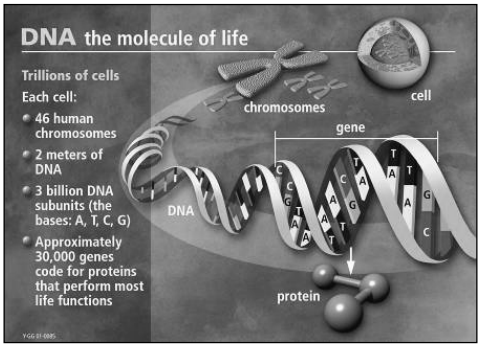
Genetics 101

Genes are the unit of Heredity

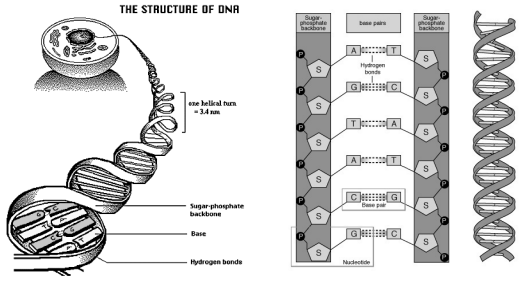
- **Genetic material is like a Recipe Book**
- **Chromosomes are Chapters in the Book**
- **Genes are like Individual Recipes**
- **Genes act as the Blue Print for Life**



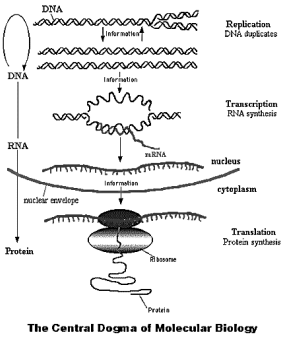
Genetics 101



Gene expression



Gene expression



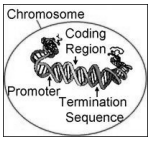
The Central Dogma of Molecular Biology

LMO: Living Modified Organism

GMO: Genetically Modified Organism

GM: Genetic Modification

GE: Genetic Engineering

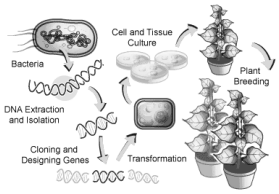


Conventional Breeding

- **Based on Selection of Plants with Desirable Traits**
- **Limitations of Plant Breeding**
  - **Sexual Barriers between Species**
  - **Undesirable traits are transferred and several back crosses must be made to minimize this effect**

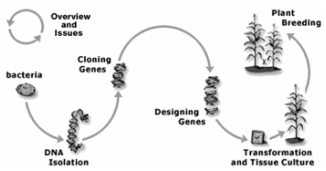
Genetic Engineering

- **It is the purposeful addition of a foreign gene or genes to the genome of an organism through the use of recombinant DNA techniques**



Process of making LMOs

1. **DNA Extraction**
2. **Gene Cloning**
3. **Gene Design**
4. **Gene Transformation**
5. **Backcross Breeding**

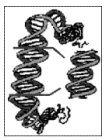


1. DNA Extraction

The isolation of the DNA (containing the gene of interest) from the desired organism DNA Extraction

2. Gene Cloning

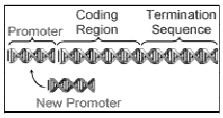
To isolate and select the gene of interest. Scientists use gene cloning and gene libraries to separate the single gene of interest from the rest of the genes extracted



The process of gene cloning.

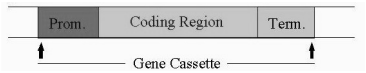
3. Gene Design

- **Promoter**
  - **35S: Active in every cell of a plant**
  - **PEP Carboxylase: Only active in cells making photosynthetic proteins**
- **Coding Region**
- **Termination Sequence**



Replacing an existing promoter with a new promoter.

The Transgene Construct

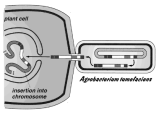


Virus	Bacteria Plant Animal Human	Bacteria

4. Gene Transformation

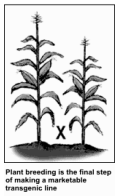
- **The new gene is inserted into the plant cell using different techniques of transformation**
- **Transformed cells are regenerated into transgenic plants**
- **Transgenic plants are grown to maturity to produce transgenic seed**

Using the gene gun method to transform plant cells.



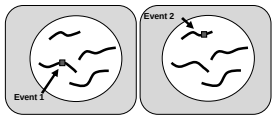
5. Backcross Breeding

An event is a location specific insertion of a transgene into a specific location on a chromosome



GM Events

- **Gene transformation inserts genes into the genome randomly**
- **Each transformation is unique and creates a different event**
- **Different insertion "events" of the same gene**

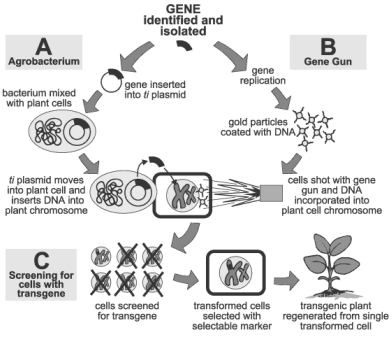


Asynchronous Release of Events

Examples of approved maize for environmental release		
South Africa[1]	**EU[1]**	**USA[2]**
	Bt176	
BT11		BT11
MON810	MON810	MON810
NK603		NK603
NK603 x MON810		
	T14, T25	T14, T25
		TC1507
		MON863
4	**3**	**24**

1 Regulate Events 2 Regulate Genes

Genetically Modified Organism

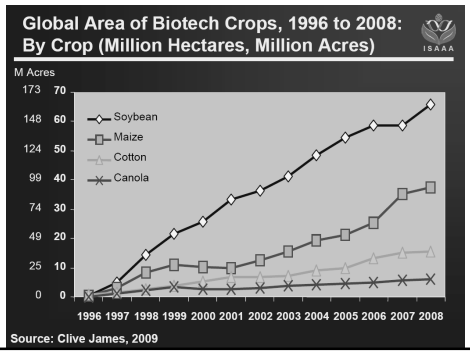


World Distribution of GM Crops

Distribution by Country	million Ha
USA	62.5
Argentina	21.0
Brazil	15.8
Canada	7.6
India	7.6
China	3.8
Paraguay	2.7
South Africa	1.8

(James, 2009)

World Distribution of GM Crops



World Distribution of GM Crops