Belarussian State Pedagogical University named after M.Tank
Inclusive Education Institute
Correction and Development Technologies Department

Human Genetics Foundations

What is Mutation?

D. L. Nikolaev, associate professor

Mutations

- **Mutation** = change in DNA sequence
- Mutations can be caused by errors in replication, transcription, translation, cell division, or external agents.
- Mutations in **Reproductive Cells** can affect potential offspring *(ex: inheritable genetic disorders)*
- Mutations in **Body Cells** ***do not*** get passed onto offspring *(ex: if an individual develops skin cancer)*

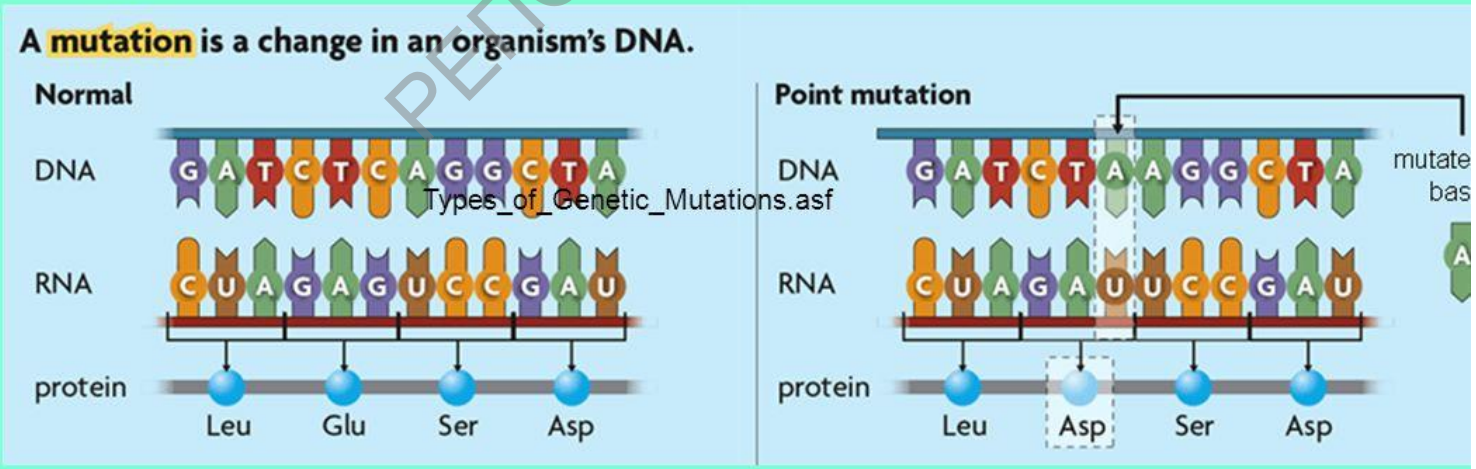
Hugo de Vries

MUTATIONS

*Mutations are mistakes made in DNA.

*Mutations can be caused by either naturally occurring, random events, or by factors in the environment.

*Any environmental factor in the environment that causes a mutation is a mutagen. (UV light, radiation, chemicals, etc...)



Types_of_Genetic_Mutations.asf

What Causes Mutations?

- Can be caused by mutagens- a physical or chemical cause of mutation. Examples: UV light, radiation, drugs, and benzene.
- Mutagens are often also carcinogens – anything that causes cancer
- Can be natural, random events.
  - mutations occur in 1/100,000 DNA replications
- Mutations do not have to be bad (evolution)

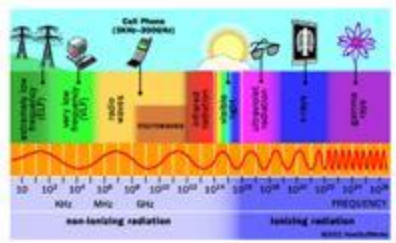
- Mutations are **random** events that tend to be recessive so appear in a **low number** of the population
- Mutations are the source of new variation
- Variation is the differences between members of a species
- Mutagenic agents that can increase mutation rates

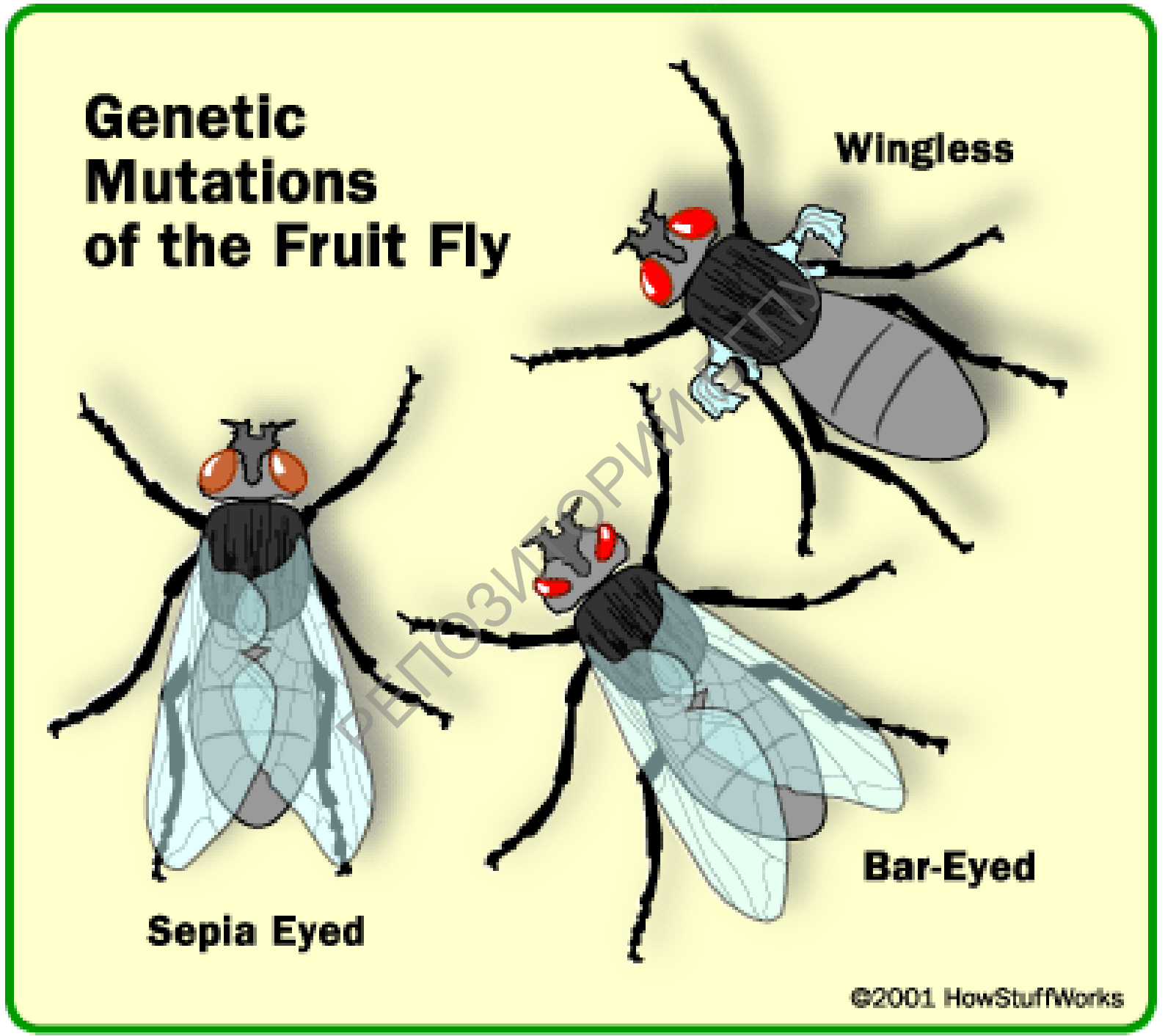
There are 2 main categories of mutagenic agents:

- Chemicals & Radiation

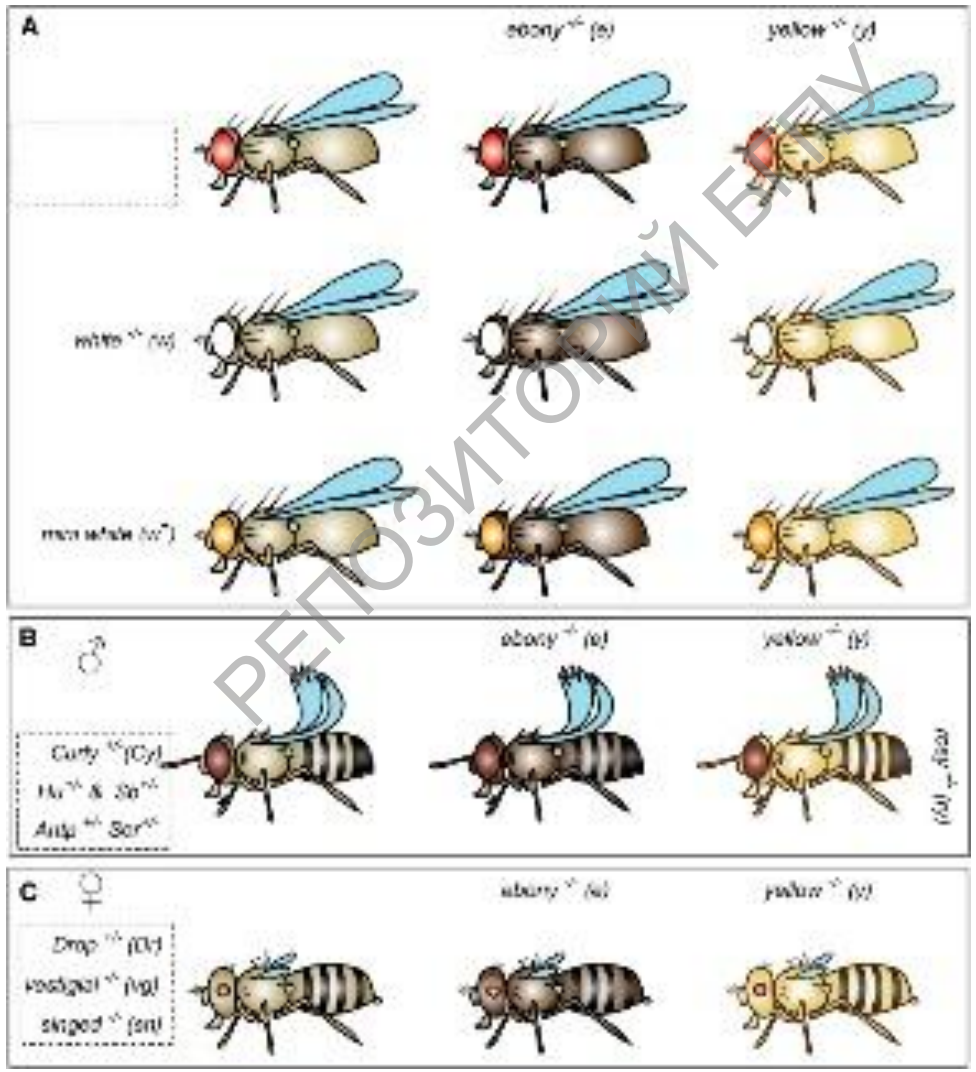
Chemical Mutagenic Agents:
- Mustard Gas
- Colchicine
- Caffeine
- Formaldehyde

Radiation Mutagenic Agents:
- X-rays
- UV Light
- Gamma Rays




Genetic
Mutations
of the Fruit Fly
Wingless
Sepia Eyed
Bar-Eyed
©2001 HowStuffWorks

Mutations of the Fruit Fly



Reduction deformities

Reduction deformities

Types of Mutations

Normal gene

AS THE MAN SAW THE DOG HIT THE CAN END ITIS

Point mutation

AS THE MAN SAW THE DOT HIT THE CAN END ITIS

Deletion

AS THE MAN SAW THE HIT THE CAN END ITIS

Insertion

AS THE MAN SAW THE FAT DOG HIT THE CAN END ITIS

Frame Shift

AS THE MAN SAW THE DGH ITT HEC ANE ND ITI S

The highs and lows of mutation rates

The rate at which new mutations appear in a genome (sizes of circles) is inversely proportional to the so-called effective population size of the species. Microbes (right) have the largest populations and lowest mutation rates.