TnT Review Video 1

TNT Rap 1

Mutations in the News

Study: Mutating virus may be killing honeybees

A rapidly mutating virus has leapt from plants to honeybees, where it is reproducing and contributing to the collapse of colonies vital to the multibillion-dollar agricultural industry, according to a new study.

The mysterious mass die-offs of honeybees that have wiped out roughly a third of commercial colonies each year since 2006 may be linked to a rapidly mutating virus that jumped from tobacco plants to soy plants to bees, according to a new study.

The research, reported Tuesday in the online version of the academic journal mBio, found that the increase in honeybee deaths that generally starts in autumn and peaks in winter was correlated with increasing infections by a variant of the tobacco ringspot virus.

Bee virus video

Topic 1: Sometimes genetic codes change

- Changing the letter codes of a gene = MUTATION

A. Mutation CAUSES:

1) During DNA Replication:
   - Base-pairing mistakes can happen but most are fixed by an army of repair enzymes (i.e., DNA Spellcheck)

2) Exposure to powerful chemicals:
   - Cigarette smoke = smoke, smokeless tobacco, exhaust from burning petroleum fuels, pesticides, herbicides, alcohol, sawdust from CCA lumber, paints, mineral spirits & oils, asbestos, etc.,

3) Exposure to powerful radiation:
   - Gamma rays (nuclear fuel & bombs)
   - X-rays (at hospitals & dental offices)
   - UV rays (from sunlight and tanning beds)

The Ultimate Token of Love: a UV toothbrush sterilizer

Topic 1: Sometimes genetic codes change

- Changing the letter codes of a gene = MUTATION

A. Mutation CAUSES:

4) Exposure to Viruses:
   - Some viruses insert their DNA into the middle of the host cell's DNA

5) Exposure to byproducts from the metabolism of food and oxygen called reactive Free Radicals

B. Mutation TYPES

			Original gene		**mutated** gene
1.	Addition	= add 1+ letters	TAGACAT	→	TAGACCAT
2.	Deletion	= lose 1+ letters	TAGACAT	→	TGACAT
3.	Substitution	= switch 1+ letters	TAGACAT	→	TAGAGAT

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C. Mutation EFFECTS: Did the mutation change any of the protein's Amino Acids?

1. NO effect = NO amino acids changed → same shape
2. Small effect = a few amino acids changed → small shape change
3. Big effect = many amino acids changed → big shape change

- **KEY IDEA**: Any change to the protein's STRUCTURE usually results in a ⇩ in protein FUNCTION

Mutation Conclusions:

- Any protein _different_ than the original probably will NOT fold into the same 3-D _SHAPE_ = NOT FUNCTION = cause a _health_ problem
- Most mutations have a _negative_ (-) effect that lowers an organism's chance for survival

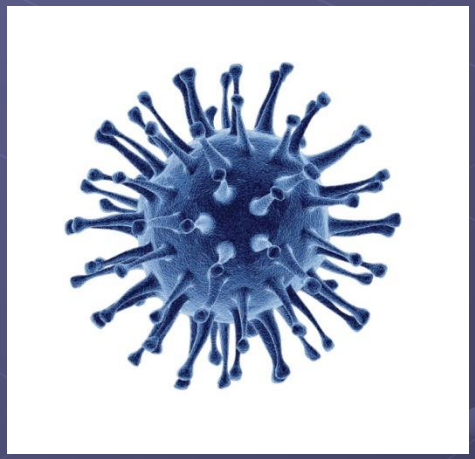
  Ex. - enzyme shape change video
- Some mutations have a _positive_ (+) effect for an organism in a certain environment that helps them better survive the challenges of life

  Ex. + enzyme shape change video Grant Hill video
- Accumulating DNA mutations often lead to diseases like _cancer_
- Only DNA mutations in _eggs_ and _sperm_ cells can be inherited
  - These _inherited_ mutations often result in a variety of genetic _diseases_

Mutation Conclusions:

- Some viruses mutate _quickly_ because mistakes during _replication_ of their genetic material are NOT fixed by proofreading repair enzymes
- This leads to new _strains_ of disease-causing viruses that sometimes emerge to cause major health _epidemics_
- This happens because people have little immunity to the viruses' newly-shaped _proteins_

Ex.

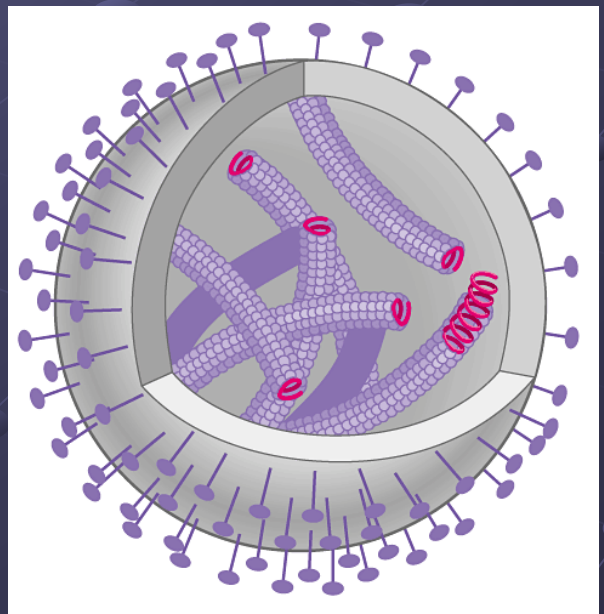


Flu video intro

Flu antibodies

Flu video 1

Flu pandemic 1918



ORIGINAL: **THE ONE BIG FLY HAD ONE RED EYE**

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1) THE ONE BIG WET FLY HAD ONE RED EYE

ORIGINAL: **THE ONE BIG FLY HAD ONE RED EYE**

2) THE ONE BIG FLY HAD ONE RET EYE

ORIGINAL: **THE ONE BIG FLY HAD ONE RED EYE**

3) THE OEB IGF LYH ADO NER EDE YE

ORIGINAL: **THE ONE BIG FLY HAD ONE RED EYE**

4) THE ONE BIG FLY HAO NER EDE YE

ORIGINAL: **THE ONE BIG FLY HAD ONE RED EYE**

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Let's Review Mutations

Video 1: 3 types of Point Mutations