20.109 MOD1 Measuring Genomic Instability

Fall 2022 Lecture 4

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Compton Lecture 2021: Sylvester James Gates

Gates: American theoretical physicist, known for work on supersymmetry and supergravity.

"Don't be afraid to do something you have never done before."

"Just because you don't know how to do something doesn't mean you should not try."

The key is to learn how to teach yourself.

Upsides for Mars Mission

A detailed look at BER

More about γ H2AX

Antibody Fundamentals

What is CometChip?



More about γ H2AX







Histone Octamer or Nucleosome







Histone Octamer or Nucleosome



Occasionally H2A is replaced by H2AX

(Not all histones are the same; their structure can vary.) Phosphorylated H2AX = γ H2AX







How Might H_2O_2 Lead to γ H2AX? **Upsides for Mars Mission**

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Antibody



Three Different Epitopes







Monoclonal versus Polyclonal Antibodies



Monoclonal versus Polyclonal Antibodies



A single cell type makes one unique antibody





Monoclonal



How does BER affect your Covid Booster Shot?





Create Mutations To Make Different Antibodies



How to Damage DNA on Purpose: Deaminate Cytosine

Activation Induced Cytidine Deaminase (AID)



Converts C to U in Certain Regions

Activation Induced Cytidine Deaminase (AID)



C G G G

Qi Qiao... Hao Wu



Another way to change the DNA sequence is via Sloppy BER

Translesion Synthesis Polymerase Is Error Prone

TLS Polymerase Makes Errors during BER







Create Mutations To Make Different Antibodies



Your booster shot wouldn't work without BER!

What is CometChip?



No damage

DNA is highly supercoiled, doesn't migrate in a gel

High damage Damaged DNA migrates during electrophoresis







Patterned Cells



Bottomless 96-well Plate









Automated Imaging and Analysis





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