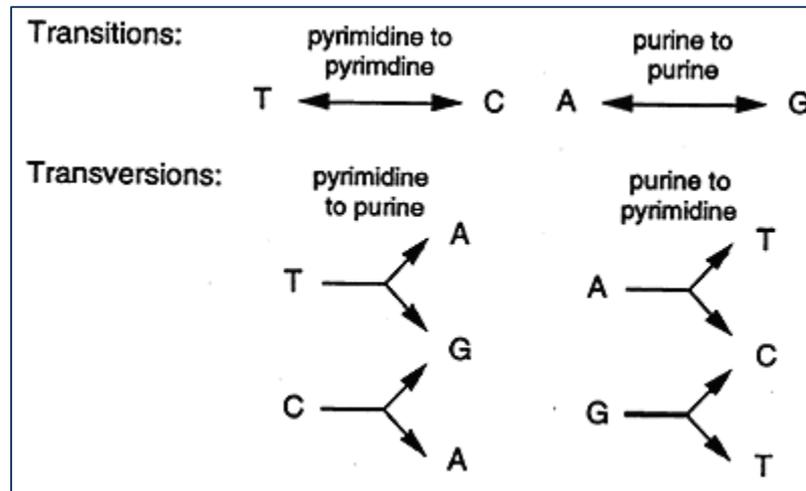


# MUTATION

- **Mutation** is the process by which the sequence of base pairs in DNA molecule is altered. A mutation may result in a change to either a DNA base pair or a chromosome.
- If a mutation occurs in a somatic cell (in multicellular organisms), it is a **somatic mutation**. The mutant characteristic affects only the individual and is not passed on to the succeeding generation.
- If a mutation occurs in a germ line of sexually producing organisms, it is **germ line mutation**. It may be transmitted by the gametes to the next generation, producing an individual with the mutation in both its somatic and its germ line cells.

# Point Mutation Types

- # Basepair substitution – **Transition** and **Transversion**
- # Basepair insertion/deletion



Base pair substitutions in protein coding genes also are defined according to their effects on amino acid sequences in proteins.

The mutation may result in a noticeable change, or an insignificant change or no change in protein.

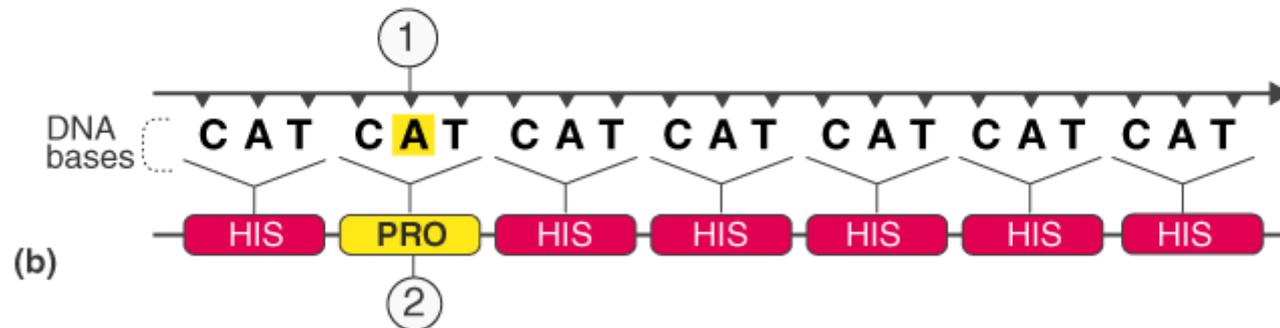
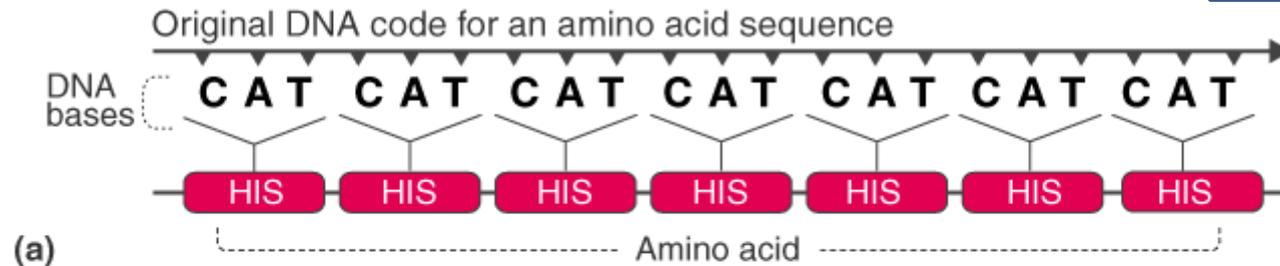
# GENETIC CODE

		Second letter							
		U	C	A	G				
First letter	U	UUU } Phe UUC } UUA } Leu UUG }	UCU } UCC } Ser UCA } UCG }	UAU } Tyr UAC } UAA STOP UAG STOP	UGU } Cys UGC } UGA STOP UGG Trp	U	C	A	G
	C	CUU } CUC } Leu CUA } CUG }	CCU } CCC } Pro CCA } CCG }	CAU } His CAC } CAA } Gln CAG }	CGU } CGC } Arg CGA } CGG }	U	C	A	G
	A	AUU } Ile AUC } AUA } AUG Met	ACU } ACC } Thr ACA } ACG }	AAU } Asn AAC } AAA } Lys AAG }	AGU } Ser AGC } AGA } Arg AGG }	U	C	A	G
	G	GUU } GUC } Val GUA } GUG }	GCU } GCC } Ala GCA } GCG }	GAU } Asp GAC } GAA } Glu GAG }	GGT } GGC } Gly GGA } GGG }	U	C	A	G

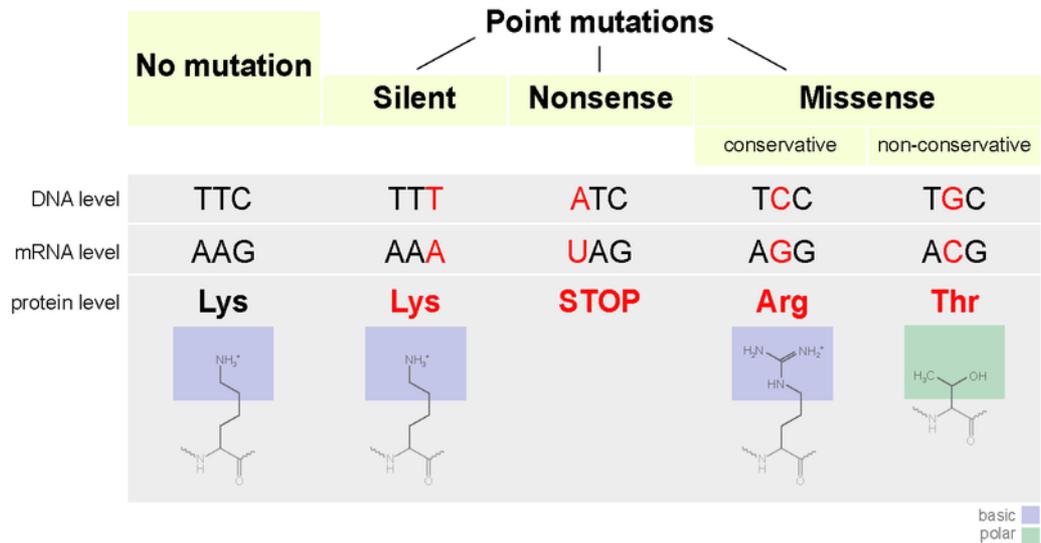
## Key:

- Ala = Alanine (**A**)
- Arg = Arginine (**R**)
- Asn = Asparagine (**N**)
- Asp = Aspartate (**D**)
- Cys = Cysteine (**C**)
- Gln = Glutamine (**Q**)
- Glu = Glutamate (**E**)
- Gly = Glycine (**G**)
- His = Histidine (**H**)
- Ile = Isoleucine (**I**)
- Leu = Leucine (**L**)
- Lys = Lysine (**K**)
- Met = Methionine (**M**)
- Phe = Phenylalanine (**F**)
- Pro = Proline (**P**)
- Ser = Serine (**S**)
- Thr = Threonine (**T**)
- Trp = Tryptophan (**W**)
- Tyr = Tyrosine (**Y**)
- Val = Valine (**V**)

# GENETIC CODE AND MUTATION



- 1 Replacement of a single nucleotide
- 2 Incorrect amino acid, which may produce a malfunctioning protein

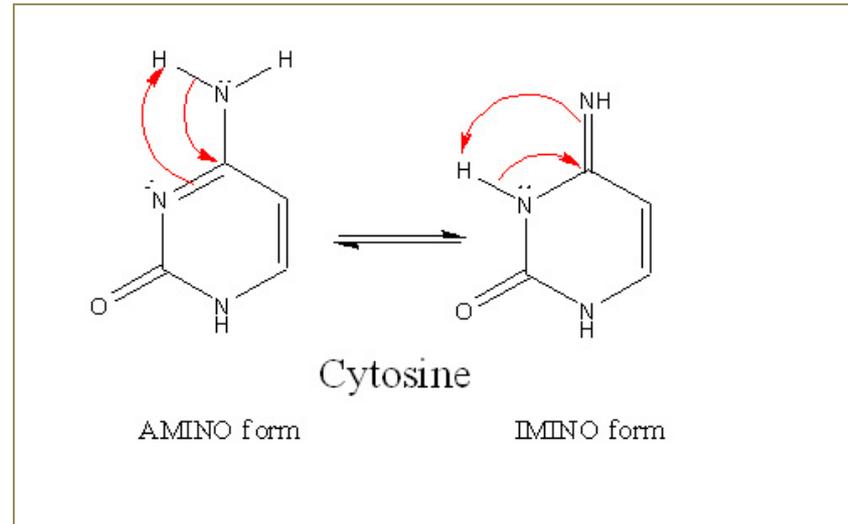
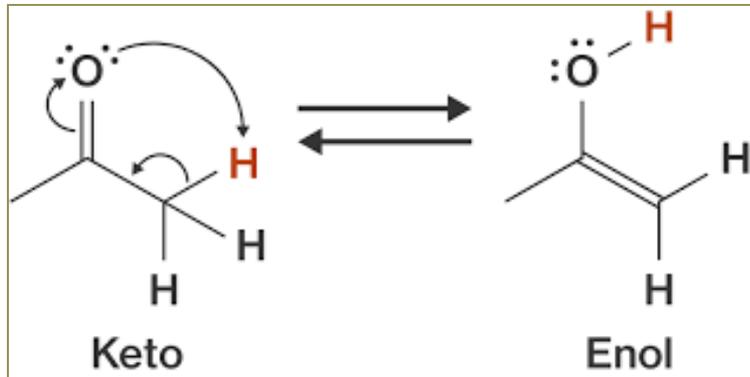


normal	AUG GCC TGC AAA CGC TGG met ala cys lys arg trp
silent	 AUG GCT TGC AAA CGC TGG met ala cys lys arg trp
nonsense	 AUG GCC TGA AAA CGC TGG met ala --- --- --- ---
missense	 AUG GCC GGC AAA CGC TGG met ala arg lys arg trp
frameshift (deletion -1)	 AUG GC- TGC AAA CGC TGG met ala glu asn ala
frameshift (insertion +1)	 AUG GCC C TGC AAA CGC TGG met ala leu gln thr leu
insertion +1, deletion -1	 AUG GCC C TGC AAA -GC TGG met ala leu gln thr trp

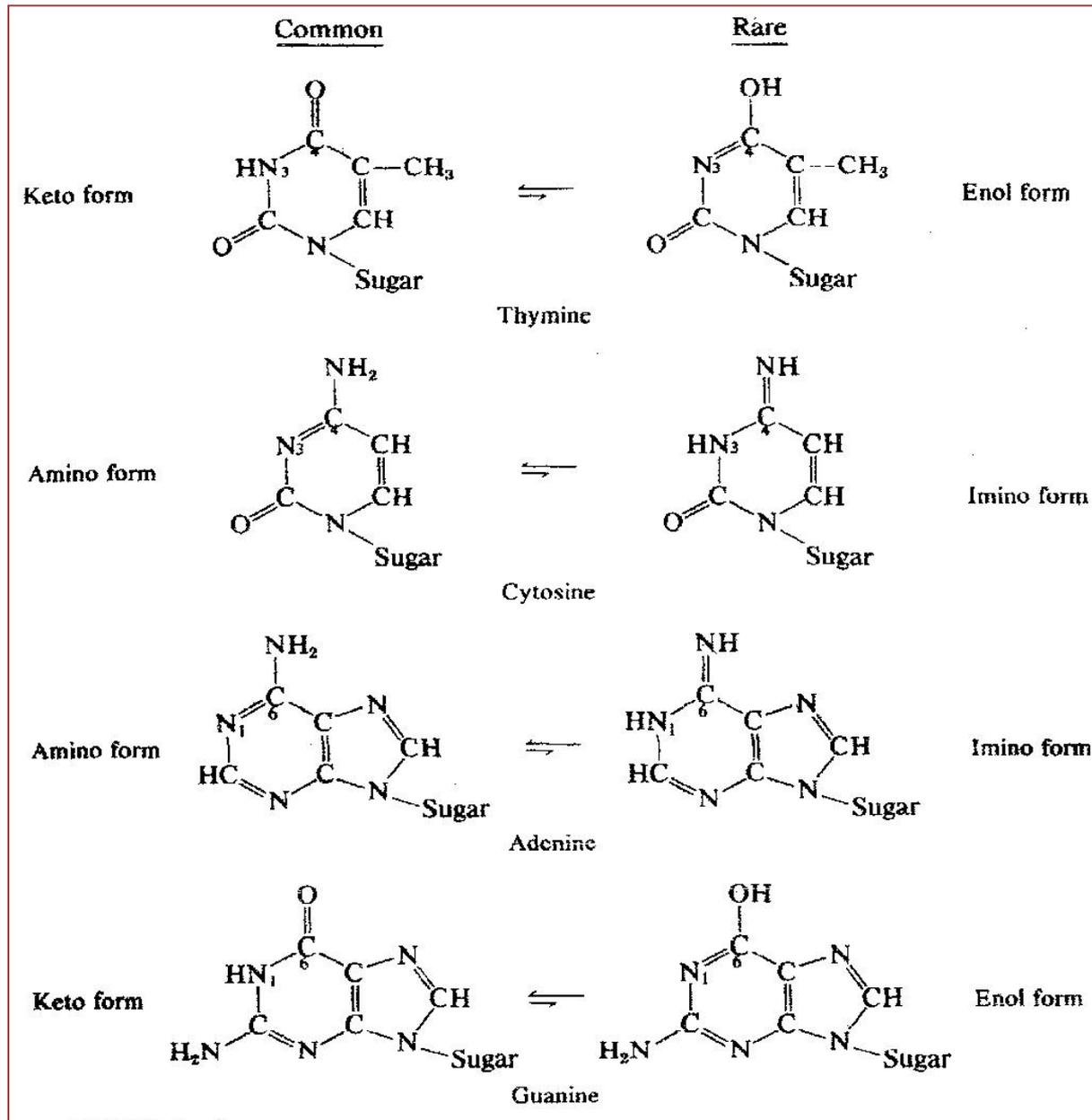
# Mutation Types

Spontaneous Mutation	Induced Mutation
<b>*Tautomerization</b> (Basepair Substitution)	<b>By Physical Mutagens</b> # Ionizing radiation – UV Rays
	<b>By Chemical Mutagens</b> # Base Analogs # Deaminating agent (HNO <sub>2</sub> ) # Alkylating agent (MMS,EMS) # Hydroxylating agent (NH <sub>2</sub> OH) # Intercalating agent (acridine dye, proflavin, ethidium bromide)
<b>* Depurination</b>	
<b>* Deamination</b>	

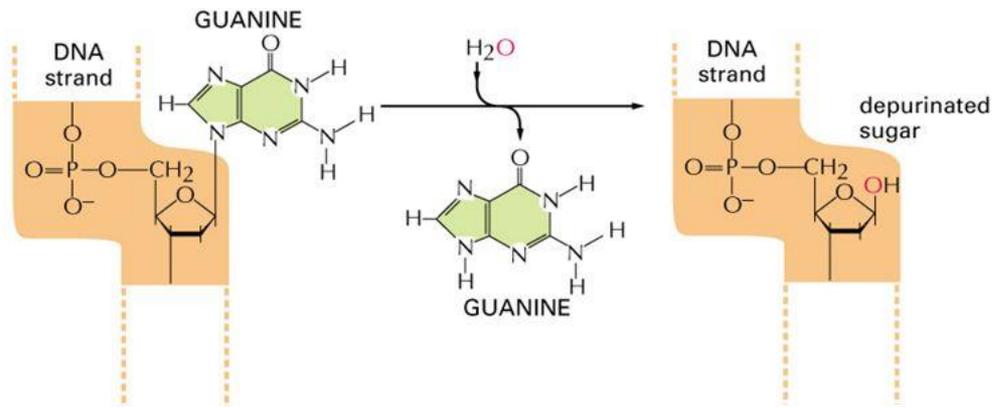
# Tautomerization



## Tautomers : Alternative states of Bases

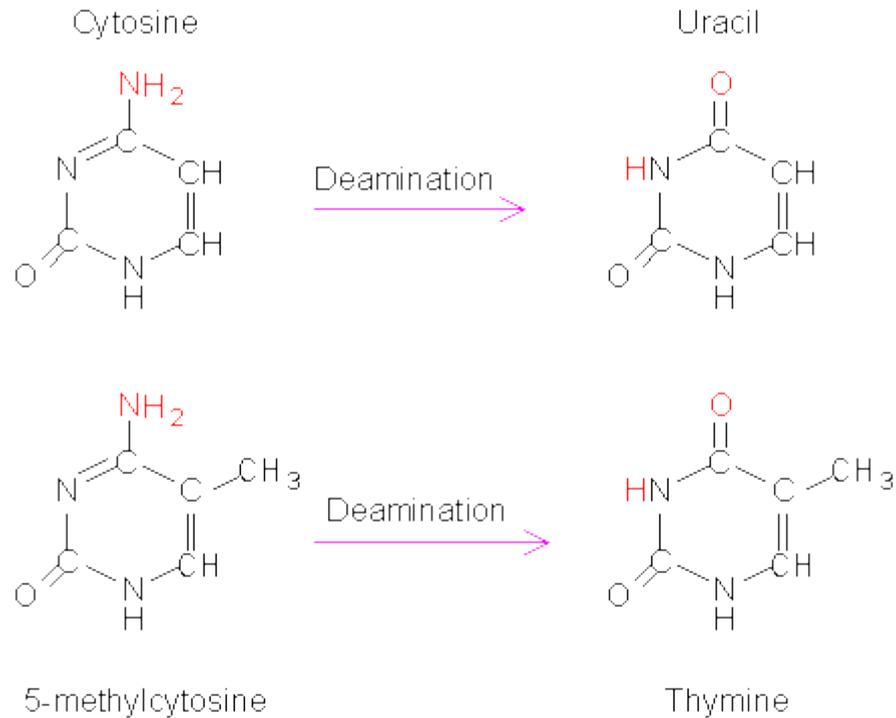


# Depurination

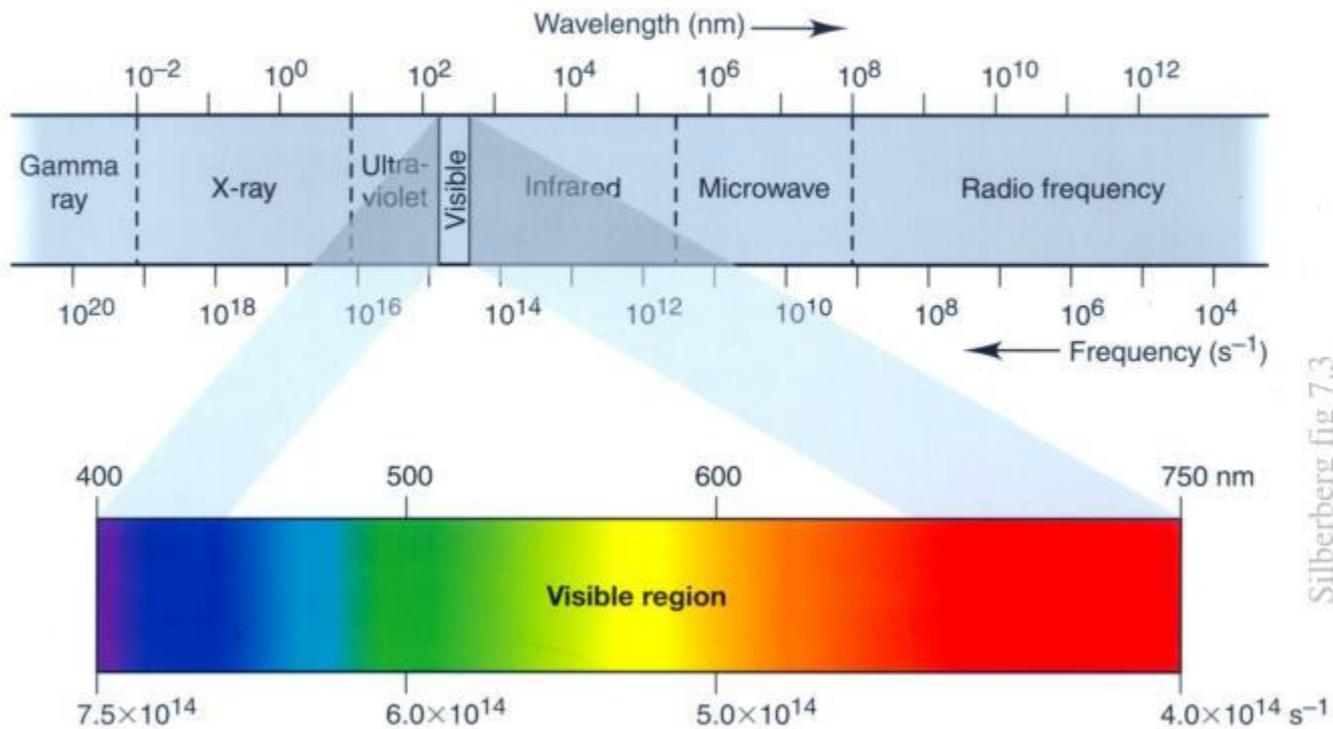


- Release of adenine or guanine bases

**Deamination** : the removal of an amino group from a base.

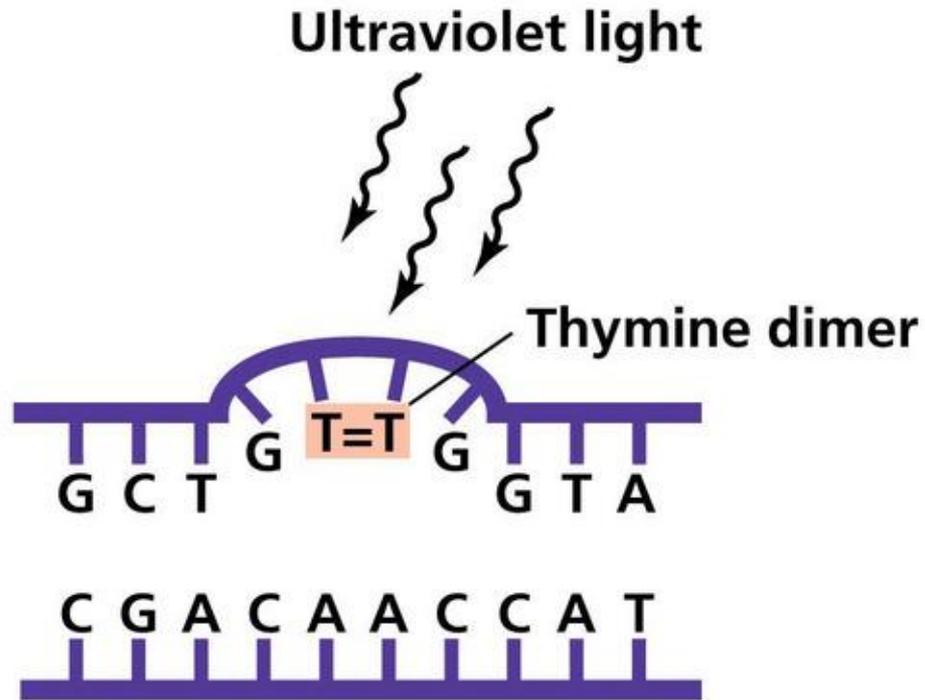


# Electromagnetic Radiation



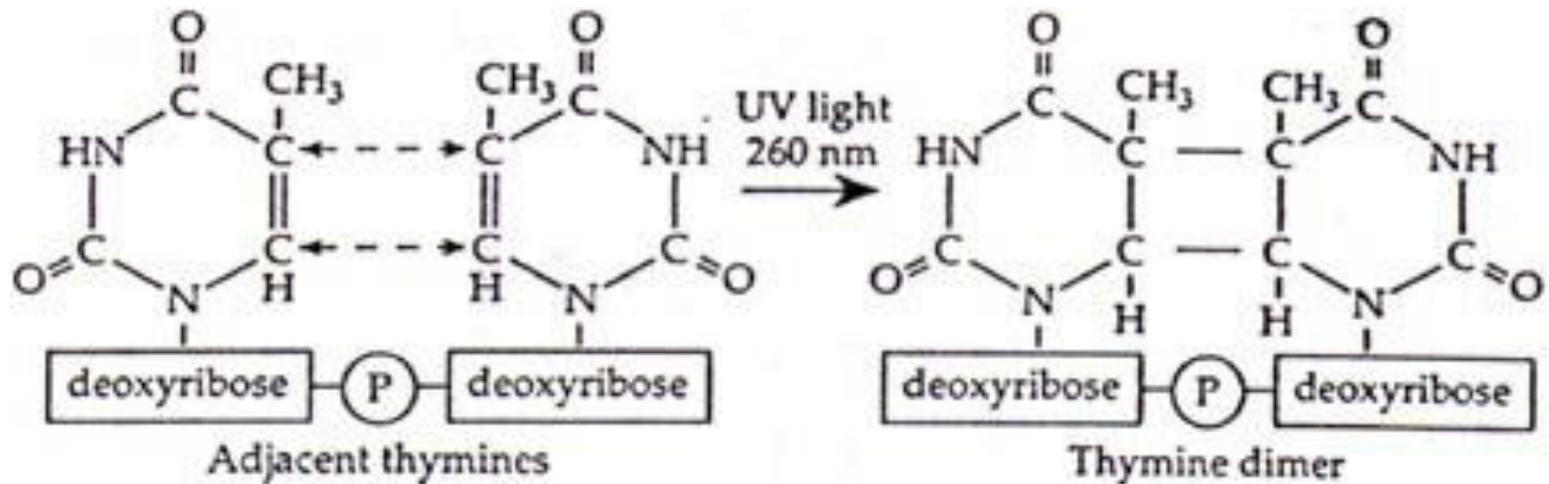
Silberberg fig 7.3

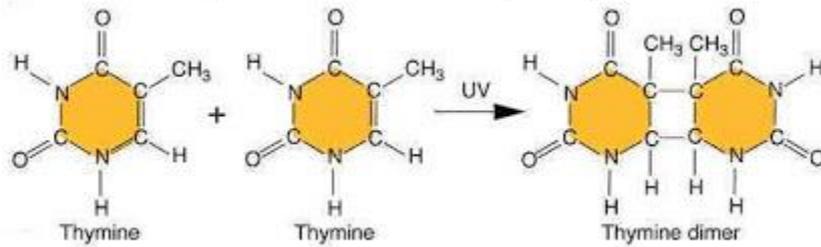
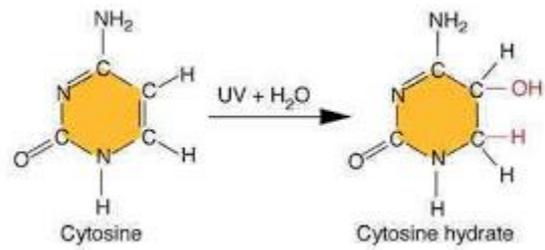
## INDUCED MUTATION : By Ionizing Radiation (UV)



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## Formation of Thymine Dimers





# Repair of Thymine Dimer

