Hello students. I'm Linette Noronha.

Today I'm going to help you

understand and gain knowledge about

the Watson Crick model of DNA.

This topic deals with the

structural variants of DNA:

A form DNA, also known as A-DNA.

B form DNA or B-DNA,

Z form DNA or Z-DNA and

Triplex DNA also known as H-DNA.

From this presentation, the students

will be able to understand the

organization of DNA in prokaryotes

and gain knowledge about the

different forms of DNA.

Several structural variants of DNA are known.

The most common types of structural

confirmations of DNA are A form DNA or

A-DNA, B form DNA or B-DNA, Z form

DNA or Z-DNA and triplex DNA H-DNA.

Why do different forms of DNA exist?

The various types of conformations that

DNA can adopt depend on factors such as.

Hydration level, salt concentration,

DNA sequence,

Quantity and direction of supercoiling,

Presence of chemically modified bases,

Different types of metal ions

and its concentrations

and presence of polyamines in solution.

These structural variations generally

do not affect the key properties of

DNA defined by Watson and Crick,

that is, strand complementarity,

anti-parallel strands,

and the requirement for A double

bond T and G triple bond C base

pairs. A form DNA or A-DNA was

discovered by Rosalind Franklin,

who was also credited with

the naming of A-DNA and B_DNA.

It is a rare type forming under

dehydrating and high salt conditions.

It is double stranded and

right-handed like B-DNA,

but is shorter and more compact.

It is much wider and flatter than B-DNA.

The helix diameter is 2.6 nano meters.

The helix pitch,

which is the height of a turn,

is 2.86 nano meters.

It contains about 11 base pairs per turn.

The distance between adjacent

base pairs is 0.29 nano meters.

It has an axial hole at the centre, that is,

the central core is hollow.

The base pairs are inclined

to the helical axis.

It has narrow and deep major grooves.

While the minor groups are wide and shallow,

B form DNA or B-DNA is the

most common and dominant type.

Also called the Watson Crick model of DNA.

It occurs under natural

physiological conditions

of pH and salt concentration in the cell.

It is a right-handed helix.

The bases occur at the core, whereas, the

sugar phosphate backbone occurs at

the peripheral portion of the helix.

Each base pair has the same width.

The helical diameter is 2 nano meters.

Each turn of the helix has a

helical height of 3.4 nano meters.

Each turn of the helix contains

10 base pairs.

The distance between adjacent

base pairs is 0.34 nano meters.

It has a solid central core.

The major groove is wide and deep while

the minor groove is narrow and deep.

Z form DNA or Z-DNA was

discovered by Nordheim, Andres

Wang and Alexander Rich in 1984.

It is one of the biologically active forms

of DNA found in the cells.

The exact biological function is not clear.

It is a left-handed helical structure.

It has alternating purines and pyrimidines

forming Z-DNA at high salt concentrations.

The double helix winds in a zigzag pattern,

hence the name.

It is unstable and a transient structure

induced by biological activity.

The helical diameter is 1.8 nano meters.

The height of a helix turn is

4.4 nano meters.

Nucleotide pairs in Z-DNA

occur as nucleotide dimers.

Each helical term contains 12 nucleotides,

that is, 6 dimers.

The distance between each

nucleotide is 0.74 nano meters.

It has a flat major groove.

The minor groove is narrow and deep.

It is a solid core at the centre.

DNA exists in many possible conformations.

A comparison of the various features

of A-DNA, B-DNA and Z-DNA shows

wide differences between them.

A & B forms are right-handed,

helices.

Whereas Z-DNA is a left-handed helix.

There are about 11.

10 and 12 base pairs per Helix turn

in A, B and Z DNA forms respectively.

They differ in their overall structural

proportions as well as in the proportions

of their major and minor grooves.

The image illustrates the differences

between the structures of A-DNA,

B-DNA and Z-DNA. Triplex DNA,

also known as H-DNA

consists of three oligonucleotides

winding around each other

forming a triple helix.

The third strand binds to a B-form DNA

double helix by forming Hoogsteen base pairs.

The image illustrates the

formation of triplex DNA.

The third strand, shown in yellow

binds to a B-form DNA double Helix

by forming Hoogsteen base pairs.

What is Hoogsteen base pairing?

In Hoogsteen base pairing,

nucleotides participating in Watson

Crick base pairs can form a number

of additional hydrogen bonds.

For example, a cytidine residue if protonated

can pair with the guanosine residue

of a G triple bond C nucleotide pair

and a thymidine can pair with

the adenosine of an A double bond

T pair (called Hoogsteen pairing).

This allows the formation of triplex

DNAs. The function of triplex

DNA is in the regulation of several genes.

To summarize what we have learned.

Many significant deviations from

the Watson Crick DNA structure are

found in cellular DNA, that is,

A-form, B-form and Z-form DNA.

These structural variations generally

do not affect the key properties

of DNA defined by Watson and Crick

that is, strand complementarity,

anti-parallel strands.

and the requirement for A double

bond T & G triple bond C base pairs.

In triplex DNA structure,

Three oligonucleotides

wind around each other,

forming a triple helix.

The third strand binds to a B-

form DNA double helix by forming

Hoogsteen base pairs.

The references.