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# The Packing of the DNA Chromatin

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## Introduction

The Histone protein present within the nucleus are responsible for the maintenance and the regulations of the dynamic chromatin along with the taking care of the gene activation, DNA repair and much other related process involved in the nucleus. The governing of the reversible as well as the irreversible post-translational modifications is done by histone proteins that would help in mediating the biological functions that includes recruitment of the transcription factors to the specific DNA template regions, the arrangements of the epigenetic reader/writer/eraser complexes onto the genetic matter, tracking the DNA–protein interactions. Histones thereby regulate chromatin structure and performance, propagate inheritance and provide memory functions within the cell.

The one of the major reasons for the cause of the diabetes and cancer diseases nowadays is because of the mis-arrangement of the chromatin structure which is caused by the environment we live in or the type of food we take in. Thus, the research work in this area has been increased tremendously. Mass spectrometry has quickly been accepted as a flexible tool to know insights into chromatin biology and epigenetics.

The comprising of the billions/millions genes in a uniform way of the genetic makeup of organism is to be done in a very precise manner as it is responsible for taking out the cellular level process such as transcription, recombination, replication and repair. The DNA organization takes place by its incorporation into the chromatin, which is arranged spirally by the essential subunit of the chromatin called as nucleosomes. The octamer which is formed by the two molecules of each histone that is the H2A, H2B, H3 and H4 has the ability to coil upto 147 of base pairs of DNA. The histone H1 is responsible for the regulation of the higher order of the chromatin structure that is placed outside the core octamer unit. Chromatin and chromosomes undergoes many of the dynamic changes along with the dramatic alterations in the midst cellular signaling. Damaged DNA adopts a singular structure that facilitates repair. Critical to cell function, most of the genome must remain during a transcriptionally silent state, save for specific combinations of genes, which vary significantly between cell types. These processes must be tightly regulated to take care of the integrity of the genome and therefore the proper function of the cell.

There number of mechanism in nucleus which is responsible for the functioning as well as organizing the genome according to the different signals or inputs. The recruitment of transcriptional regulators and chromosomal proteins brings along enzymes that modify the cellular process to be taken place. The involvement of specific functional groups on the histones and the required addition and subtraction of the events have great impacts on the structure and performances of the chromatin.

Chromatin and its interaction with enzymes have been researched, and a conclusion being made is that it's relevant and a crucial thinks about organic phenomenon. The RNA synthesis is claimed to histone acetylation. The lysine amino acid attached to the highest of the histones is charged. The acetylation of these tails would make the chromatin ends neutral, allowing DNA access.

When the chromatin decondenses, the DNA is hospitable entry of molecular machinery. Fluctuations between open and closed chromatin may contribute to the discontinuity of transcription, or transcriptional bursting. Other factors are probably involved, just like the association and dissociation of transcription factor complexes with chromatin.

Metazoans while spermatogenesis, their spermatid's chromatin is remodeled into a more spaced-packaged, widened, almost crystal-like structure. This process is related to the cessation of transcription and involves nuclear protein exchange. The histones are mostly displaced, and replaced by protamines (small, arginine-rich proteins). It's proposed that in yeast, regions barren of histones become very fragile after transcription.

The positive charge of the histone are the sole reason for the keeping the DNA chromatin to be kept intact as they are negatively charged and thus, the positive and negative attraction/ interaction among them. The interaction of the packaged DNA with that of the proteins is involved in the maintenance and the regulations of the cellular activities. The size of cells is in micrometers and a DNA is often as long as 3 meters. In order to suit such a lengthy structure into a micrometer cell, tight packing is required.

## Conflict of Interest

We have no conflict of interests to disclose and the manuscript has been read and approved by all named authors.

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