

MR. CENTROMERE.



Dr. Phil Hieter

Dr. Phil Hieter is the Director of the UBC Biotechnology Laboratory. His research interests ask how do the cellular contents of a dividing cell separate equally between the two daughter cells? In particular, his lab looks at the processes and molecules that ensure the correct division of DNA during mitosis.

* When cells grow and divide, they must increase their cellular material so that the two new daughter cells will each get an adequate share. This includes elements such as cytoplasm, proteins, membranes, and organelles (like mitochondrion). Generally, this division is achieved by basic dilution principles (just divide the cell down the middle).

* The division of genetic material, however, is a completely different matter. The amount of DNA that each daughter cell receives is very strict. Even a little bit less, or a little bit more can have very harmful effects to cell. Consequently the level of control to ensure correct DNA amounts is very high. Here, one has to worry about the following:

- (i) when to double the DNA genome through the process of replication.
- (ii) how to ensure that the duplication(replication) of the genome has occurred without any errors.
- (iii) how to ensure that each daughter cell gets its exact quota - which is made that much more complicated if the genome is compartmentalized into chromosomes.

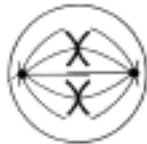
KEY WORDS

mitosis: the process of cell division that ensures correct and equal division of cellular contents, particularly in regards to the genetic material.

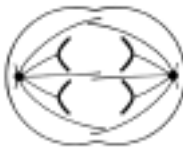
centromere: a region of DNA within a chromosome that can interact with proteins involved in ensuring correct separation of the DNA during mitosis. The centromere with its associated proteins is also known as a kinetochore.

The procession from metaphase to anaphase is arguably the most crucial part of mitosis since it is here that the DNA finally separates into two distinct regions. It is the centromere that is ultimately responsible for making sure this transition is done correctly.

metaphase



anaphase



* Dr. Hieter is one of the world's leading researchers on centromere function. The centromere is a key player in ensuring that division of the genetic material proceeds smoothly.



The centromere is usually depicted as a blob in the middle of the chromosome.

If you remember the act of mitosis, the centromere was the part of the chromosome that aligned the duplicate chromosomes and was attached to the spindle elements.

Dr. Hieter uses the yeast as his organism for studying centromere function. Yeast is used instead of mammalian tissue because experiments are generally more efficient and more convenient with the more simple cells. Results can also be more readily deciphered since the number of genes involved should be less.



The yeast species that Dr. Hieter uses to study is the same that is used to produce wines

Add to that the notion that genetic manipulation is fairly straightforward, and that many handy mutant strains already exist, and you have an incredibly powerful experimental system.



The correct division of genetic material is so important that the cell has several checkpoints where everything is checked before proceeding to the next step.