

Cancer for the Common Good

Cell type

Hair follicles contain many rapidly dividing cells. Around the base of the hair follicle is the papilla. The papilla is a structure made up of connective tissue and a capillary loop. Around the papilla is the hair matrix. The hair matrix consists of rapidly dividing epithelial cells. Cell division in the hair matrix is responsible for the cells that form hair fibers. The shape of the hair follicle can have an effect on the shape and texture of an individual's hair.

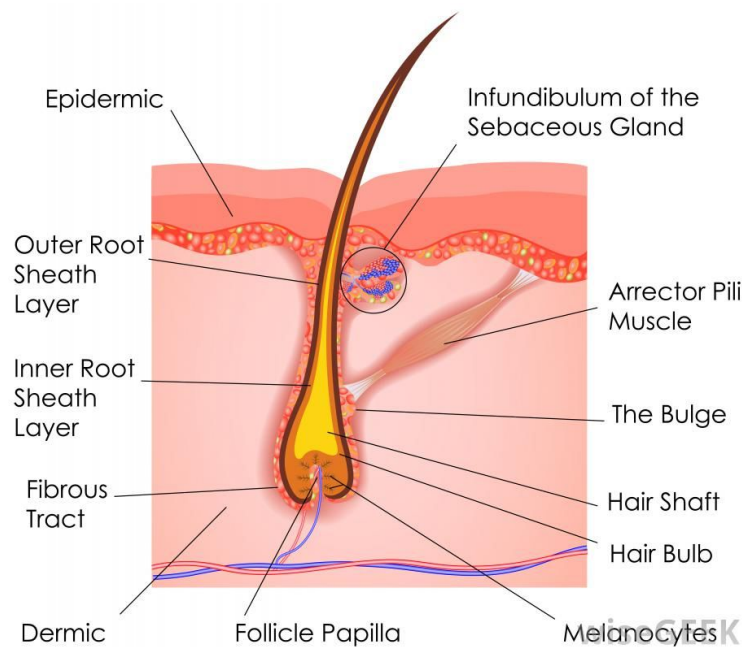


Figure 1: Hair Structure Diagram

Many people suffer from decreased hair production as a result of old age or treatments targeting rapidly dividing cells, such as chemotherapy. More details will follow about how a highly controlled cancer of cells in the hair follicle zone can be beneficial to humans.

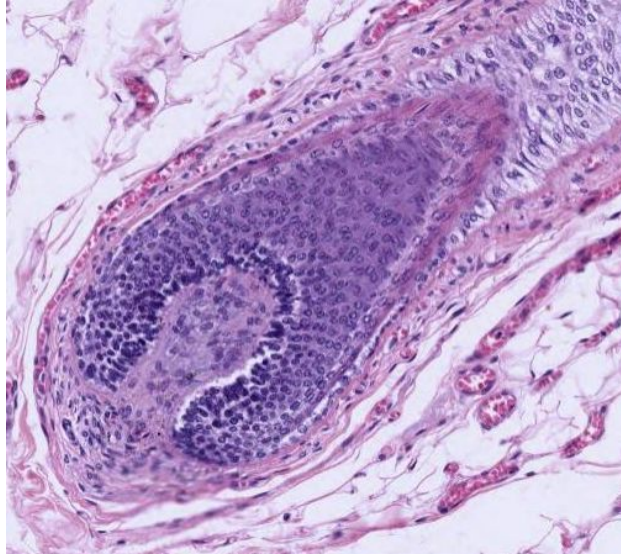


Figure 2: Hair Follicle in Situ

Summary of cell cycle

Knowledge and information regarding the cell cycle of the specific stem cells leading to growth around the hair follicle is still not completely understood by scientists today.

However, the hair growth cycle is understood widely. The chart below details the various stages of the hair cycle.

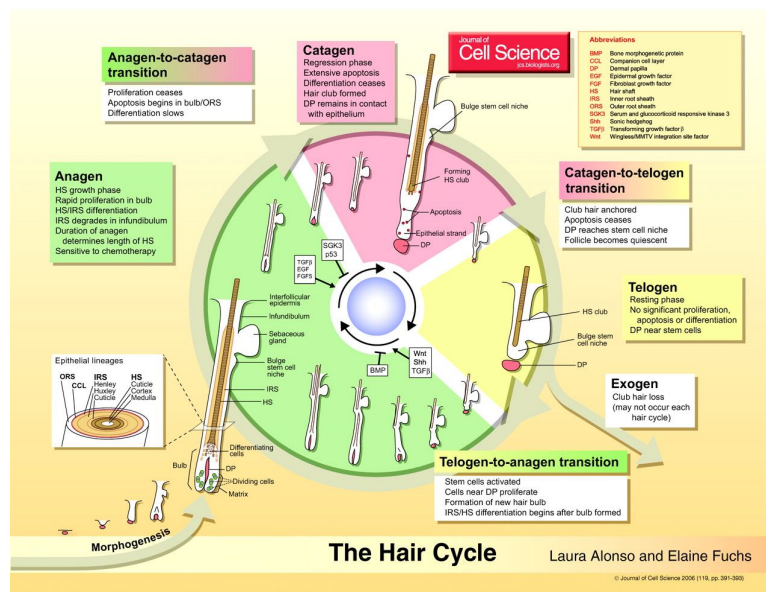


Figure 3: The Hair Cycle (Alonso and Fuchs)

Details about the cell's regulators are detailed below.

There are three main phases to the hair cycle: Anagen, catagen, and telogen. Anagen is the active growth phase of the hair follicles. During this time, the root of the hair is rapidly growing and dividing. The catagen phase is a transition occurring near the end of anagen phase, signalling the end of a hair's active growth. Telogen phase is the resting phase of the hair follicle. During this phase, hair begins to fall and disconnect from the root, resulting in hair loss. As much as 90% of one's hair is in anagen phase at any given time, while 10-12% and 1-2% may be in catagen and telogen.

Stem cell lines

Epithelial stem cells are responsible for ongoing hair production during the Anagen phase of the cell cycle. Stem cells are located at the junction of the arrector and the follicle. These stem cells are located in what is commonly known as the "bulge" outer layer surrounding a hair follicle. Arrector muscles found at the end of hair in mammals. Contraction of these muscles causes hair to stand on its end. Multipotent stem cells eventually differentiate into cells containing the marker for Keratin 15. From this point, they can differentiate into hair follicle cells and result in hair production.

Cell Cycle Disturbance

Like the cycle of cells in the human hair follicle, cyclins have also not been comprehensively researched either. However, a more general explanation of the cell cycle disturbance required to create this cancer can be written. Several cyclins regulating a cell's apoptosis and division abilities would need to be disabled or removed from the cell entirely. Doing so would require a genetic mutation or change in the cell's genetic material.

Another cyclin known as cyclin A in the human hair follicle zone could be disturbed. According to researchers, measuring the amount of fluorescence in this zone generated by cyclin A allows an individual to gauge the activity of the cell in general. thus, increasing the activity or intensity of cyclin A may possibly speed up or intensify the entire cell cycle.

Cancer explanation

A cancer of the cells in the hair follicle zone would be beneficial to people who suffer from hair loss. These may include aging people and those undergoing chemotherapy treatments that result in hair loss. Chemotherapy treatments designed to target rapidly dividing malignant

tumors may have an adverse effect on other rapidly dividing cell types, such as hair. This cancer will mostly be used in people who experience slow or nonexistent cell division in the hair follicle.

This cancer will have several benefits to humans. Chemotherapy patients will no longer have to deal with losing hair, a tough process emotionally and aesthetically for many people. Additionally, aging people can appear more young and rejuvenated by having hair that grows faster. This cancer can also be applied in several unconventional ways. For example, say humans wanted to develop fur around the entire body to adapt to colder climates such as that on Mars. This cancer could be placed in other parts of the body to allow for this process. Despite being called a cancer, this process will be highly controlled and regulated using several cyclins. Cyclins are important parts of the cell machinery in determining when different processes start and stop. In this cancer, a cyclin could be included to stop the division process after a specified amount of time. The program modelling a cancer includes a variable for the maximum number of iterations; more iterations will equate to more new cells being created.

Cancer Heredity

This cancer will be passed down from generation to generation through genetic mutations manifesting in different sex cells. Following the meiosis process, each new sex cell should contain modified genetic material coding for this cancer. It would be ideal for advancements in biotechnology to be able to turn on and turn off certain mutations and genetic variations in subsequent generations. This cancer would also function ideally in situations where it could be selectively contained and controlled by injection into different parts of the body.

References

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