Editorial

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Editorial note on hallmarks of cancer cells.

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Development of Cancer occurs over time with the accumulation of mutations and genetic changes in cells. The characteristic features a normal cell gets as it transforms into a precancerous cell and finally into a cancer cell are called the “Hallmarks of Cancer”. These are the distinguishing features that make cancer cells different from normal cells. These are the features that distinguish cancer cells form normal healthy cells.

• **Sustaining Proliferative Signaling: Self-sufficient cell division:** The basic trait of a cancer cell lies in its ability to sustain chronic proliferation. Healthy tissues controls the production and release of growth promoting signals thereby instructing the entry of cells into the growth and division cycle ensuring a suitable count on cell number thereby maintaining proper structure and function of the tissue. Whereas the cancer cells tend to deregulate the growth signals and they themselves control their own proliferation by enhancing the growth signals or by over activating signal receptors.

• **Evading Growth Suppressors (Insensitivity to signals to stop cell division):** Just as there are signals to stimulate cell proliferation, there are also the signals that inhibit cell growth and proliferation. Cancer cells possess the ability to ignore those inhibitory messages. This is usually the result of genetic alterations or mutations in the genes known as tumor suppressor genes. The retinoblastoma (RB)-associated and TP53 proteins that are encoded by two prototypical tumor suppressor genes act as the central nodes to govern a cell’s decision to proliferate, or to activate growth arrest or apoptosis.

• **Evading the Immune System:** According to Weinberg’s long-standing theory of immune surveillance, the cells and tissues are constantly monitored by an ever-alert immune system, and this immune surveillance plays a role in recognizing and eliminating the majority of incipient cancer cells and therefore nascent tumors.

•Enabling Replicative Immortality: Limitless reproductive potential

For the formation of tumor it requires uncontrolled cell division and replication for unlimited number of times. In case of normal cell division a small portion of telomere is lost for each and every replication, gradually the telomere loss reaches a critical point and cell loses its ability to divide. In this way healthy cells have controlled division and replication. But the activation of enzyme telomerase maintains telomeres and grants the cells to replicate indefinitely. Activated telomerase is found in more than 90% of cancer cells, while the normal cells do not show the activity of telomerase.

•Invasion and Metastasis: Ability to invade other organs

Unlike normal cells cancer cells, can metastasize i.e, break through tissue barriers and spread from one organ to another.

•Inducing Angiogenesis: Creating their own blood supply: For a tumor growth and survival it requires great supply of blood to ensure availability of oxygen and nutrients to the increasing number of cells. A tumor stimulates the formation of new blood vessels through a process called angiogenesis.

•Evading apoptosis: Resisting cell death: normally when the cells become old or are damaged they are programmed to die in a suicidal process called cell apoptosis. This is to for limiting the number of cells in the body. Cancer cells are dangerous as they avoid this normal cell death cycle and accumulate in the body.

•Reprogramming Energy Metabolism: Ability to survive with little oxygen:

Even after the process of angiogenesis, the cells at the interior of the tumor are oxygen and nutrient deficit.in case of normal cells it is detrimental as they make use of stored glucose to obtain energy by aerobic metabolism. The cancer has the ability to carry out anaerobic metabolism to allow the oxygen deficient cells to grow