The Hallmarks of Cancer : The Next Generation

Simply Explained

**Cancer** is a group of more than 100 diseases in which cells begin to grow out of control. Hanahan and Weinberg identified the following attributes of cancer:

1.**Self-sufficiency in growth signals**

“The accelerator is stuck on.” Cell growth doesn’t require external signals, such as hormones. The cancer cells accomplish this growth by producing the signals themselves, permanently activating the pathways or destroying the off-switch.

2.**Insensitivity to anti-growth signals**

“The brakes don’t work.” Cancer changes proteins called tumor suppressor genes so cell division does not stop if the cell has abnormalities. Healthy cells will stop dividing when a space is filled. Cancer cells do not.

3.**Evading apoptosis**

Cells are programmed to die when damaged (apoptosis). Cancer cells evade this process.

4.**Limitless replicative potential**

Healthy cells die after a certain number of divisions. Cancer cells are capable of indefinite growth and division.

5.**Sustained angiogenesis**

Cancer cells are able to create a blood supply (angiogenesis) and thus obtain the oxygen and nutrients they require.

6.**Tissue invasion and metastasis**

Cancer cells can break away from their origin and invade surrounding tissue. They then spread to other parts of the body by invading the circulatory system, leaving this system and then dividing at the new site.

7.**Deregulating metabolism**

Most cancer cells generate energy differently than healthy cells. The cells put more energy into cell growth, and this process also helps evade cell death.

8.**Evading the immune system**

Cancer cells are able to avoid triggering the body’s immune response to disease.

Hanahan, D; Weinberg, R.A. (2011) “Hallmarks of Cancer: The Next Generation” Cell144 (5): 646-674.