

A cancerous growth, often called a malignant tumor, is composed of millions or billions of cells. Cells whether cancerous or normal are very small, so small that individually they can't be seen by the naked eye, they are only visible under a microscope.

To give an idea, if we mince a cancerous tumor of the size of a finger tip, such a tumor contains about one billion cancer cells. Each one of those cells if given the right environment can grow to form a tumor as large as the size of a football.

Unlike normal cells, cancerous cells continue to grow uncontrollably. When we cut our skin, the surrounding healthy skin tissue is stimulated to grow, forming new cells to cover the cut. Once the cut is healed, the process stops, because the normal cells obey the rules of checks that control our body cells. In other words, the normal cells have normal genes that obediently listen to the normal signals they get from the rest of the body.

Another example are the cells in a growing embryo, which continue to grow until puberty. Afterwards, signals sent the cells command them to stop growing at the size determined by the genetic makeup of that individual.

Various organs grow at different rates, depending on the genetic makeup. A tall person has inherited genes that determine how long his or her bones are supposed to be. Likewise, there are genes that determine the color of the skin and hair. Genes on the X and Y chromosomes determine if the growing embryo is going to be a girl or a boy.

All cells in our body have exactly the same genes on the 46 pairs of chromosomes, but some genes become dormant in certain body organs. For example, when we cut part of the liver it will regenerate, because the gene controlling regeneration stays active in the liver cells. However, if we remove part of the brain or damage it by a stroke, the brain cells do not regenerate. Although they have the same genes as the skin and the liver, brain cells are inactivated permanently as soon as the brain is fully grown.

Cancer cells, on the other hand, are mavericks. They have lost the genes that make normal cells control their growth and division. The reason for this is mutation. In normal cells there are genes called tumor suppressor genes. Their function is to command the normal cell to stop dividing when needed. Cancer cells have lost those suppressor genes, so they continue to divide despite the constant signals telling them to stop doing so.

So what makes normal cells turn cancerous? Through mutation or call it, damage of the tumor suppressor genes. Gene mutation is simply a minor change in the chemical structure of the gene. A gene is composed of thousands of chemicals. Any trivial change in any of these chemicals can make the gene useless as if

nonexistent. This mutation happens only when cells are dividing. During cell division, the genetic makeup is copied, so every cell becomes two, and when they divide again they become four and so on. Mistakes do happen during this process of DNA replication. These mistakes can be random, because copying billions of molecules in an exact order is bound to create errors. Normal cells have the mismatch repair genes, which function to repair these errors.

Many cancers start because cells lose the mismatch repair gene function through mutations. When the cell turns cancerous, it acquires the survival advantage, since its division and multiplication goes unchecked. Cancer cells become almost immortal. Moreover they successfully compete with the surrounding normal cells growing at their expense. They are fit and represent a miniature of Darwin's theory of survival of the fittest.

Darwin proposed some species acquired competitive characteristics that made them survive, whereas those who lacked crucial characteristics vanished. He called that evolution through survival of the fittest. He hypothesized that more than a century ago, a time when no one knew what genes are.

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