Acta Scientific Pharmaceutical Sciences (ISSN: 2581-5423)

Volume 4 Issue 1 January 2020

View Point

A Little Cancer Story

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Received: December 05, 2019; **Published:** December 06, 2019

DOI: 10.31080/ASPS.2020.04.0455

The oldest credible evidence of cancer in mammals consists of tumor masses historic times.

Cancer is a very old fascinating disease indeed, that biologically and teleonomic ally speaking, represents the more complex process for the molecular cellular engine of any animal tissue.

As a human being, you can undergo a bacterial infection, and this is not related to your own cells as Cancer is. Even when the cancer disease begins asa "one cell" process, posteriorly in its evolution, it becomes "a tissue one".

And this last is the Cancer paradigm.

Prokaryotic organisms such as bacteria, never evolve in Cancer, they are unicellular, with a lesser extent of DNA complexity as compared with the eukaryotic DNA ones and they don´t build-up tissues with the future different organ's formation.

The eukaryotic but unicellular organisms such a unicellular parasites and fungus, that comport an enormous higher degree of DNA structure complexity as compared with their prokaryotic counterparts, don´t evolve neither in Cancer. Their biological permanence is as unicellular ones, in some case with higher features of organization, such as in the case of some fungus (hyphae formation), but the animal conformed eukaryotic tissues, are never present.

So, the disease is only related to pluricellular organisms with the highest DNA organization levels as distributed in every cell, tissue and extracellular matrix.

Each of the four present tissue types and their derivatives, "have a Cancer counterpart" with cellular differentiation as one of the main phenotypic features of it. Related to this, in just a few words, the fact that B lymphocytes become mature comporting chromosomal rearrangements to secrete different types of immunoglobins, makes us think, that cell differentiation is a reversible process in which different parts of the genome are programmed to be expressed in the different cellular types (cell identity reprogrammed was achieved in the mid of the last century).

In some way, Cancer can be considered as a failure in cellular differentiation, the tissue cell after having been exposed for a long-time to a DNA- modifying agent, must evolve into a different cellular state in order to work. Now it has a "different differentiation" and this is the new genotype and phenotype in order to work and survive to the different environment and tissue pressures.

Each structural and biochemical aspect of Cancer is "beginning" to be fully dissected nowadays, and understanding that when we explore for more, complex biochemical genotypic and phenotypic aspects, appear to light.

Considering the whole Cancer genome, there are features acquired as somatic alterations and some germline ones. At first, the genetic driver mutations appeared, being some genes and/or the protein-derived from them, the guiders in the oncogenesis conduction of that cell (e.g. RAS family mainly, BRAF mutations). Mutations processes are a constant figure and DNA-repair processes and aging are done with a high rate of defects during the tumoral evolution.

This is followed by different landscapes in the tumor life-cycle: chromosomal alterations mainly represented by aneuploidy (abnormal non balanced chromosomal translocations, deletions, segment inversions, etc.). Cancer neoantigens in constant formation, are clue to immunological tumor response, and this process is part of the picture, due to the constant somatic DNAmutations during the tumoral evolution.

Finally we come again to a cell and tissue differentiation aspect: tumor heterogeneity. Cancer once developed, has intratumorally heterogeneity, this means cells in different states of differentiation, with "different colors", leading this to tumor-drug-resistance. Metastases, the main hallmark of malignancy, is tumor heterogeneity-related : one "elected malignant cell" within a tumor population, leads to the whole complex metastatic cascade.

Current Medical maneuvers kill some cells but not all, with the remaining ones being the master peril of their phenotype, evolving to tumor resistance and leading to the patient dead.

Finally, some curable tumors, need "the kill of all" (Lymphomas, testicular cancer, etc.), others need "the kill of the most, with the less toxicity" (Breast, colorectal) and finally others, need "the kill of the less", with a "long cell cycle tumor maintenance" of the most (renal, melanoma, NSCLC and most heavy pre-treated advanced cancers.).

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