

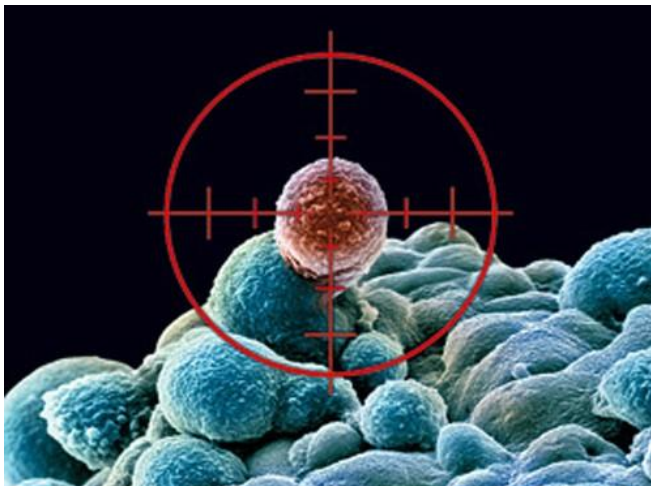
Natural Killer Cells: our internal special forces against Cancer Stem Cells

By Lyes Bouzid

Thomas Jefferson once said, “When injustice becomes law, resistance becomes duty.” When those words serve as the foundation for the writing of the Declaration of Independence, they are inspirational. However, it becomes a major health threat and economic burden when some cancer cells consider traditional anti-cancer therapies (chemotherapy and radiotherapy) as injustice and decide to resist and become cancer stem cells.

While most non-cancer stem cells are generally eliminated after standard cancer therapies, cancer stem cells can resist, survive, multiply and eventually repopulate a tumor. As a result, those rebellious cells are often responsible for cancer relapse and metastasis. Recent studies have shown that cancer stem cells represent a small proportion of the cells within a tumor and have been found in almost every human cancer type ¹.

Cancer is the second leading cause of death in the United States, and nearly 600,000 deaths are attributed to cancer each year ². Approximately 20% of the US gross domestic product is spent on health care, and the cost of cancer care accounts for 5% of total health care spending. In 2007, \$89 billion was spent for cancer care. However, the economic burden was estimated to reach nearly \$220 billion when death and lost productivity were taken into consideration. Those estimations have certainly increased in the last decade as the cost of treatment and number of cancer patients have greatly increased ³.



So, what can be done? Unfortunately, negotiating with the enemy is not really an option in science. To win this war we need highly trained and specialized agents to target and eliminate those cancer stem cells. Aristotle was right when he said “Nature does nothing uselessly” because our immune system has exactly what we need.

Those special forces are called natural killer cells (NK cells). Yes, that's really their name. Using those cells that are born to kill gave rise to the field of NK cell-based immunotherapy.

It has been shown that NK cells can specifically target cancer stem cells in tumors based on their phenotype (the way they look). Cancer stem cells have specific markers on their surface which allow NK cells to detect them. However, just like on a battlefield, they can evade the immune system by shedding those markers ⁴. As shocking as it sounds, even cells know how to use camouflage.

At this point you must wonder why we are not already injecting and using NK cells as a therapy. There are still some limitations, such as short NK cells lifespan, inadequate delivery to tumor sites and selection of NK cells that are strong enough to kill ⁵. We still need to know more about how NK cells operate and how we can train them to search and fight more efficiently.

Nevertheless, using NK cells in combination with current therapies to kill both cancer stem cells and “normal” cancer cells is extremely promising. This novel approach could potentially reduce cancer relapse and ultimately cancer mortality, as well as health care expenses and the increasing economic burden.

References

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