

All a Novel immunotherapies are powerful tools in the fight against cancer. Instead of killing cancer cells directly by conventional chemotherapy and/or radiation therapy, doctors are now modulating the immune system with the hope that the patient's immune cells will go after the cancer cells and destroy them. This strategy has started a new era in cancer treatment where arguably basic research has never been closer to the patient bedside.

One of the hallmarks of cancer is its ability to avoid the immune system attack, which allows it to grow and spread with no defense from the immune system. Immunotherapy works to defeat cancer's shield and improve the ability of the immune system to find and destroy cancer cells. Some forms of immunotherapy include transferring activated immune cells into one's body ("adoptive cell therapy") and treating patients with drugs that remove the brakes from T cells that have entered the tumour. Other forms of immunotherapy include therapeutic vaccines that intend to mount an anti-tumour response in the patient's body or investigational drugs that activate subpopulations of immune cells, such as macrophages, that are capable of eating cancer cells.

Why can using a patient's immune system be more effective than conventional drugs? The reason is the unstable genomes of cancer cells that allow them to constantly mutate, evolve and develop resistance to conventional treatments. However, the genomic instability of cancer cells creates high loads of mutations that produce mutant proteins. Some of these mutant proteins could be recognized as a new antigen (trigger) that could alert the immune system about a new potential danger in the body, similar to an infection with a virus or bacterium. This increases the chance that the immune system will recognize and destroy cancer cells. As the cancer changes and evolves, the immune system has the capability to adapt.

Up until four years ago, few patients with stage IV metastatic melanoma had a chance of surviving only few months despite all the available treatments. Now the combination of novel immunotherapy drugs such as Ipilimumab and Nivolumab has significantly increased the survival rates of these patients. Interestingly, once a patient responds positively to an immunotherapy drug, there is a good chance that the patient will stay cancer-free for many years to come. Even oncologists are

referring to patients responding to these treatments as "cured" of their disease. However, there are still major challenges ahead of us as scientists, clinicians and patients. With most patients not responding favourably to immunotherapy, scientists are now working to identify the key traits that make these treatments effective for specific patients. Another major challenge to immunotherapy is the management of treatment side effects. However, there has been significant progress in managing the adverse reactions of immunotherapy.

Last month in New York, the American Association of Cancer Research (AACR) held the largest cancer immunotherapy conference of the year. Clinicians, scientists, patient advocacy groups, pharmaceutical and biotechnology companies, regulatory agencies, philanthropists and other stakeholders attended the conference to share their latest findings in the field of cancer immunotherapy. Our group was the only group from London and one of few from Canada to attend the conference. With no Canadians among the invited speakers, American and European researchers dominated the stage. This leaves us with important questions: Is Canadian cancer

research headed in the right direction? Are we missing in action from where the future of cancer treatment lies? With the dawn of the immunotherapy era, many believe the end of many cancers as we know them has begun. We as a nation should be part of this revolution in science that directly translates into increased patient survival.

*Articles brought to you by Canadian Cancer Society RIOT volunteers and past articles can be found at [riotteam.blogspot.ca](http://riotteam.blogspot.ca)"*

