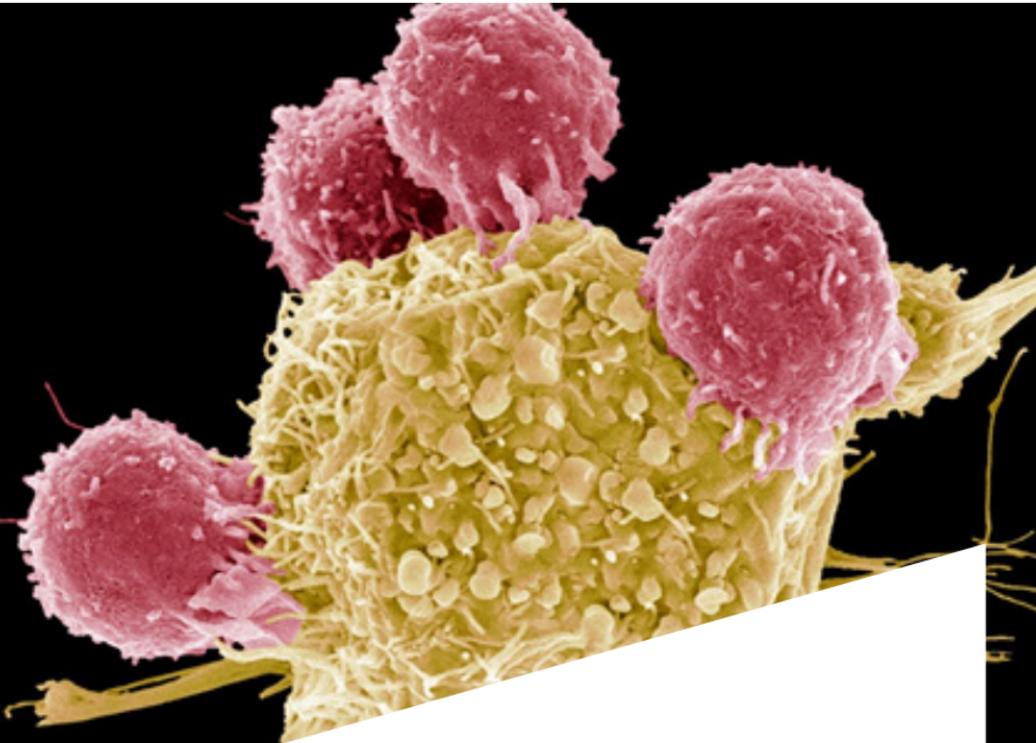




# SYNTHÈSE

LE JOURNAL ÉTUDIANT DE L'INRS

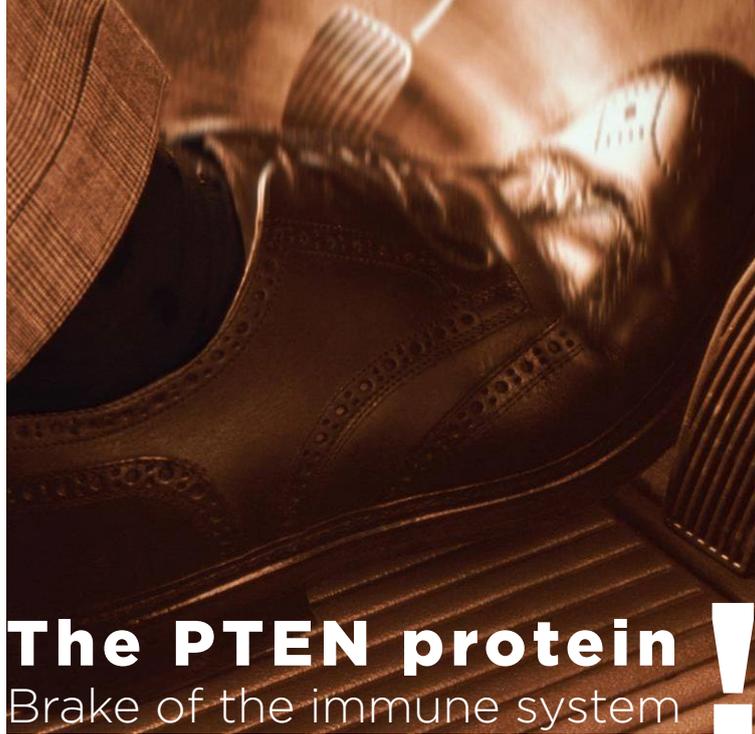
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## **Virus and cancer attack the Immunity police**

GABRIEL CHAMBERLAIN - PHD STUDENT

You can think of the immune cells in our body as police cars patrolling our body in search of intruders. If they find a virus or cancer, they quickly accelerate and catch up to them. However, some of these intruders evade our immunity police by sabotaging their accelerators and brakes.



## The PTEN protein

### Brake of the immune system

ALTERATIONS IN THE SPEED OF ACTION OF THE IMMUNITY POLICE BY VIRUSES OR CANCERS CAN LEAD TO SEVERAL PROBLEMS IN MAINTAINING HEALTH. FOR EXAMPLE, IT AFFECTS THEIR ABILITY TO FIGHT AGAINST INFECTIONS OR CANCERS. THERE ARE TWO KNOWN PROTEINS THAT REGULATE THE SPEED OF ACTION OF THE IMMUNITY POLICE: "THE ACCELERATOR" - PI3K, AND "THE BRAKE" - PTEN. HOWEVER, HOW THE VIRUSES OR CANCERS INTERFERE WITH THE FUNCTION OF THESE TWO IMPORTANT PROTEINS AND ALTER THEIR SPEED OF ACTION IS STILL UNDER INVESTIGATION.

The proteins PTEN and PI3K are very important for the action of the immune system. They work by maintaining a balance in the speed of action of the immune cells. Consequently, when there is too much PTEN ("the brake" protein), the immune cells become slow in their action and are much less responsive. They are no longer able to defend the body correctly! This decrease in the effectiveness of the immune system is called **immunosuppression**.

## When cancer sabotages the Immune system

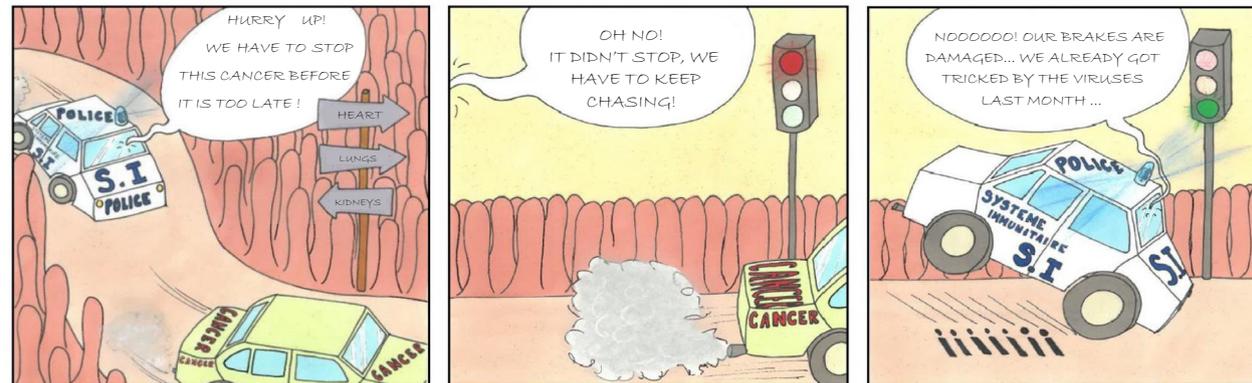
Normally, there are molecular messengers present in the cell's environment, that act as "traffic lights", and control the PI3K accelerator or the PTEN brake. This guides the immune cell to either "circulate" or "stop". However, some cancer cells produce molecular messengers that cause the phenomenon of immunosuppression.

These messengers produced by cancer cells act on the neighbouring immune cells by increasing the effect of PTEN. Due to this, the immune system slows down, even stops, while the actual traffic light is green! These immune cells, slower than usual, are not able to fight against cancer, giving them a freeway to spread (1). Thus, interfering with PTEN is the trick employed by cancer cells to beat the immune system..

## A viral trap that also affects the brakes of immunity

Cancers are not the only ones that meddle with the brakes of the immune system, several viruses also have their own traps that lead to immunosuppression. A strain of herpes virus can cause an excess of PTEN in immune cells - lymphocytes B, and thereby slow down their action (2). How the herpes virus increases PTEN in the lymphocytes remains a mystery, but there is a strong chance that a modulation of the "traffic lights" is implied here too.

**"Sabotaging PTEN is a trick of cancer cells and viruses to beat the immune system!"**



**My project**  
in a  
nutshell

Normally our immune system attacks viruses and cancers without our knowledge. It is only when one of them beats the immune system that the disease manifests itself. It is then, the extent of immunosuppression that makes these intruders dangerous.

In the laboratory, we seek to understand this phenomenon of immunosuppression. We want to determine how viruses and cancer cells modulate PTEN. My project aims to analyse the molecular messengers produced by viral infections and cancers that affect the cell's pedals. My goal is to link the different signalling molecules to their actions on "the brakes" of the immune cells. A better understanding of these mechanisms will help in developing methods that will reactivate our immune cells and slow the progression of harmful cells and therefore diseases.

# Did you know



-Many cancer cells stop producing their own PTEN to remove their brakes and multiply excessively

-Our immune system produces cellular messengers that act as “traffic lights” that modulate its own PTEN and prevent accidental killing of our healthy cells



## What's new?



### Gabriel Chamberlain

PHD STUDENT IN ALAIN LAMARRE'S LABORATORY.

Twenty-nine years ago, I was just a single cell. Despite all the cell divisions and differentiations that I experienced, I never forgot my origin. How can one not be fascinated by cell biology? In Professor Lamarre's laboratory, I have the pleasure of studying the spectacular choreography of our immune cells in their fight against viruses and cancers.

### BioMed and Pharmaquam

It is with great pleasure that both BioMed and Pharmaquam research groups invited their members to the Symposium du réseau de l'Université du Québec sur la Recherche Biomédicale et Biopharmaceutique, that took place on May 10th and 11th 2018 at the Hôtel & Spa Mont Gabriel in Sainte-Adèle.

Feel free to take a look at the pictures from the Symposium by consulting the BioMed website ([biomed.uqam.ca](http://biomed.uqam.ca)).

### REFERENCES

- (1) Sharma *et al.* (2015) DOI: 10.1126/sciadv.1500845
- (2) Getahun *et al.* (2017) DOI: 10.1084/jem.20160972

### PARTNERS



### FUNDING



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## Glossary



**Molecular messengers:** Molecules produced by a cell to affect other cells, eg hormones, chemokines, cytokines, etc.

**Lymphocyte B:** an immune cell that can produce antibodies; molecules that harm bacteria and viruses

**PTEN:** Phosphatase and TENsin homologue is the brake of cell activity.

**PI3K:** Phospholinositide 3-Kinase is the accelerator of cell activity.