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Popular Article

Unlocking the Guardians of Immunity: Exploring the Types of Pattern Recognition Receptors (PRRs)

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Introduction

Imagine an intricate security system guarding your body against invaders. Just like how security cameras identify suspicious activity, your immune system relies on Pattern Recognition Receptors (PRRs) to detect potential threats and initiate a defense response. PRRs are specialized proteins that serve as sentinels, recognizing unique molecular patterns displayed by pathogens. Let's delve into the world of PRRs and understand how they keep us safe from infections.

1. Toll-like Receptors (TLRs): The Watchmen at the Gates

Toll-like receptors (TLRs) are among the most prominent PRRs. They reside on the surface of immune cells and detect a wide array of pathogens, including bacteria, viruses, and fungi. Each TLR has a specific domain designed to recognize distinct pathogen-associated molecular patterns (PAMPs). When a TLR encounters a foreign invader, it sets off a chain reaction, triggering an immune response to combat the intruders.

2. NOD-like Receptors (NLRs): Guardians Within

NOD-like receptors (NLRs) are another group of PRRs, stationed within the cytoplasm of immune cells. They play a crucial role in identifying harmful substances and activating the innate immune response. NLRs are particularly vigilant against bacterial infections and stress signals. Their activation leads to the production of cytokines, which mobilize immune cells to the site of infection.



3. RIG-I-like Receptors (RLRs): Vigilant against Viral Invaders

When viruses invade our cells, RIG-I-like receptors (RLRs) stand guard. These PRRs are specialized in detecting viral RNA, a key component of many viruses. When RLRs sense viral RNA, they alert the immune system, sparking an antiviral response. This helps prevent viral replication and spread.

4. C-type Lectin Receptors (CLRs): Masters of Fungal Detection

Fungal infections are expertly recognized by C-type Lectin Receptors (CLRs). These PRRs have a special affinity for carbohydrates found on fungal surfaces. Upon binding to fungal invaders, CLRs launch a cascade of events leading to the recruitment of immune cells and the initiation of an immune defense against the fungus.

5. DNA Sensing Pathways: Guardians of the Genome

Intruders can be unmasked by detecting their DNA signatures. PRRs involved in DNA sensing, such as cGAS-STING and AIM2, sense the presence of foreign DNA in the cytoplasm. This indicates viral infections or other threats, triggering the production of interferons and pro-inflammatory cytokines to fend off the invaders.

6. Scavenger Receptors: Cleanup Crew and Pathogen Identifiers

Scavenger receptors act as the cleanup crew of the immune system. They recognize a diverse range of pathogens and debris, including dead cells and lipids. By clearing away unwanted materials, scavenger receptors help maintain tissue homeostasis and prevent excessive inflammation.

Conclusion

Pattern Recognition Receptors (PRRs) are the vigilant defenders of our health. They recognize the molecular fingerprints of pathogens and promptly activate the immune system to neutralize threats. By engaging different types of PRRs, our immune system can detect a wide array of invaders, ensuring a swift and efficient defense.

Understanding the various types of PRRs opens up exciting opportunities for designing targeted therapies and innovative vaccines. Harnessing the power of these immune guardians can lead to groundbreaking advancements in immunology and medicine, allowing us to stay one step ahead in the perpetual battle against infections. As we continue to unlock the mysteries of our immune system, we march closer to a healthier and safer world for all.



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