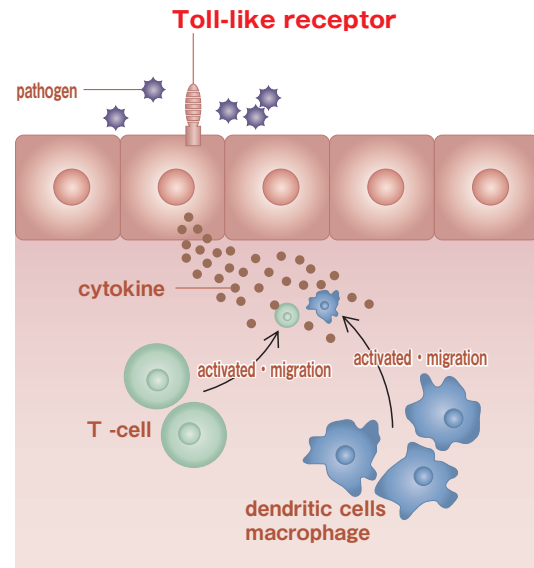


Could fruit fly immune receptors be relevant to humans?

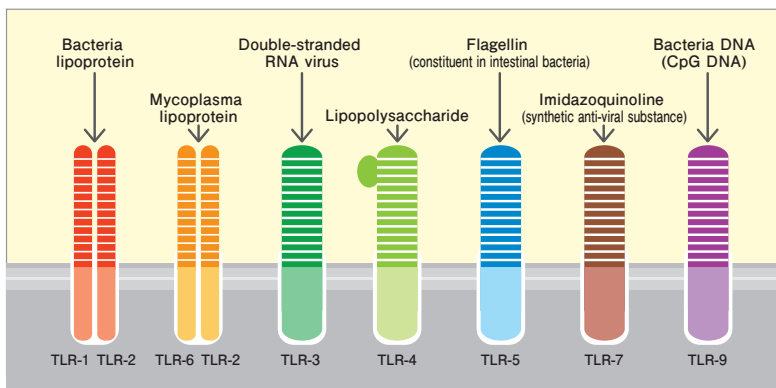
In 1996, the role of Toll receptors in the innate immunity of *Drosophila* fruit flies was discovered by French molecular biologist Jules Hoffmann's group at the Institut de Biologie Moléculaire et Cellulaire (IBMC). They reported that fruit flies lacking these Toll receptors had no innate immunity function, were overcome by fungus, and eventually died. Subsequently, Toll-like receptors were found to exist in all kinds of insects, with similar proteins also found to exist in the human body. Since these human proteins resemble the Toll receptors found in flies, they were given the name "Toll-like receptors." Professor Akira conducted repeated experiments on "knockout mice" * to find out what sort of action 12 kinds of Toll-like receptors have in the mammalian body. **He finally discovered that all of Toll-like receptors were responsible for recognizing different bacteria or viruses.**

Professor Akira had discovered that these Toll-like receptors **played an important role in linking innate immunity and adaptive immunity, which had previously been considered two completely separate systems;** this completely overturned conventional wisdom in the field of immunology. Far from being just a primitive immune response, innate immunity has now been recognized as playing an essential role within adaptive immunity.

Induction of immune reaction



Cells detect pathogens through the toll-like receptors and inflammatory proteins called cytokine are secreted, which recruits and activates T-cell, dendritic cells and macrophage, leading to a multiple of immune reactions



Toll-like receptor (TLR) family and known active ingredients Antiviral synthetic compound

Helping develop pharmaceutical treatments for hayfever, etc.

Professor Akira's discovery has already **proven useful in the research and development of pharmaceuticals targeting innate immunity:** for example, in the development of drugs to treat hayfever, which with 20 million sufferers across Japan has been described as Japan's national disease, as well as atopic eczema and more.

It has also found partial practical applications in medication for infectious diseases such as herpes, among others. In the scant 10+ years since Professor Akira's discovery, the field of immunology has evolved at great speed. **In future, clearer understanding of immune mechanisms is expected to enable treatments**

not only for diseases linked to abnormal immune responses, but also for intractable diseases such as cancer.

This research, which started with Toll receptors discovered in fruit flies, has garnered immense interest worldwide as research that could critically influence humanity's future.

Subsequent research has determined that toll receptors and toll-like receptors are structurally similar, but significantly different in function. There remains no doubt that a huge diversity of living creatures found on earth is protected by such advanced innate immunity systems.

*A gene knockout mouse of which a specific gene is artificially damaged so as not to function