【Grant-in-Aid for Transformative Research Areas（A）】

# Reevaluation of self recognition by immune system to decipher its physiological advantages and pathological risk（Self-referential immune perception）


| | |
|---|---|
| Head Investigator | Osaka University, Research Institute for Microbial Diseases, Professor<br>YAMASAKI Sho　　Researcher Number:40312946 |
| Research Area Information | Number of Research Area : 22A304　Project Period (FY) : 2022-2026<br>Keywords: Immune sensors, self-recognition, homeostasis, immune diseases |


## Purpose and Background of the Research

### ●Outline of the Research

Upon the outbreak, immunology has become extremely prevalent to the general public. Vaccines were developed and delivered in just one year, and antibody-based immunotherapy has opened up new avenues for various diseases. Immunology is therefore one of the closest scientific fields to human diseases, and the basic research discoveries can be rapidly translated for clinical application. However, there still remain many unexplainable immune phenomena and diseases. To tackle these unsolved questions, we need a systematic approach based on new perspectives and technologies that provide a paradigm shift. Accordingly, we propose a new concept “self-referential immune perception” that reevaluates the principle of self-recognition by the immune system to decipher its physiological advantages and pathogenic risk for aiming a multidisciplinary breakthrough and its application for disease prediction (Fig. 1).

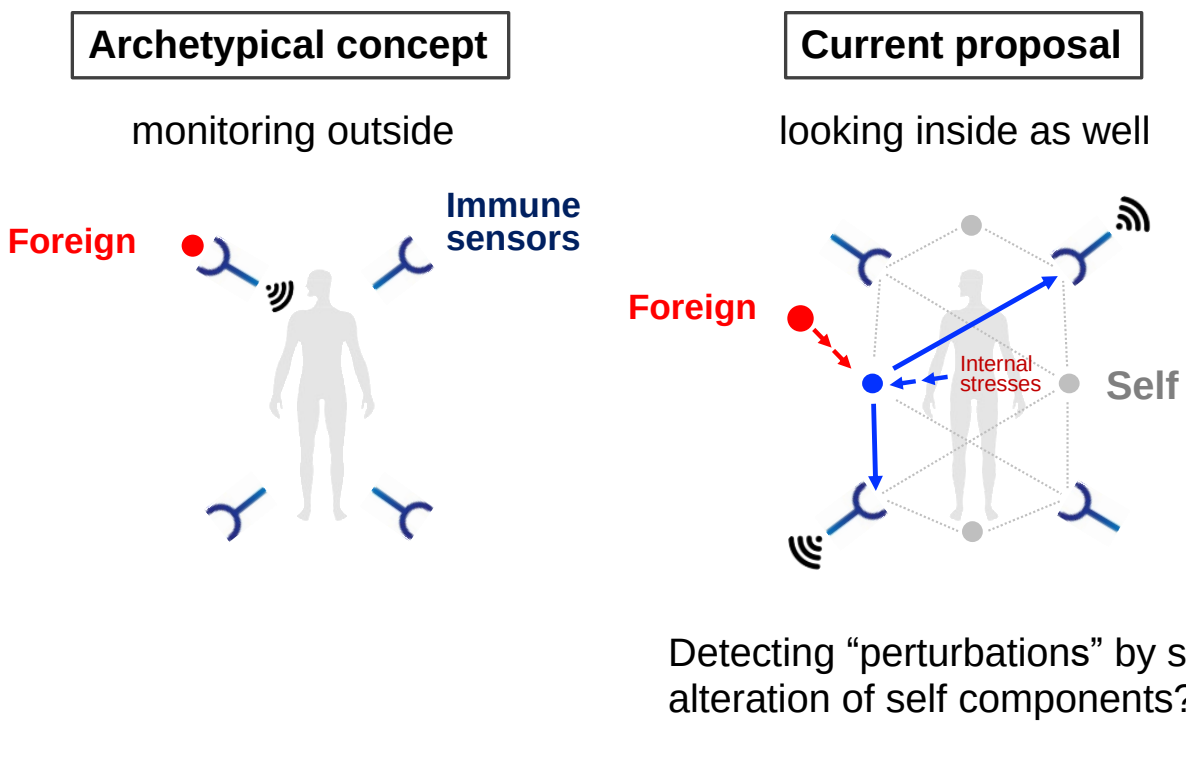


Figure 1. Schematic representation of our research concept

### ●Current issues and focus areas

To date, the beneficial immune response to “foreign” is well understood. In the case of self-recognition, the harmful aspects are being understood. In contrast, the beneficial contribution of self-recognition is largely unknown. We aim to clarify this by focusing on the self-oriented nature of the immune system (Fig. 2).

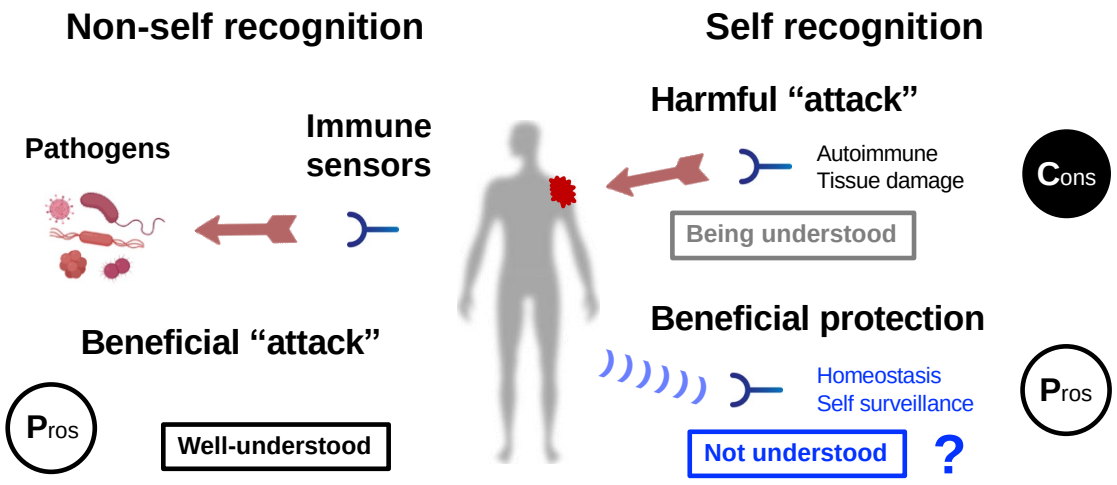


Figure 2. Current issues and focus areas

## Expected Research Achievements

In this research area, we will promote three major projects to understand the principle of self-recognition by the immune systems.
1) Using a platform that integrates advanced analytical systems and sensitive bioassays, we will conduct "prospective" strategic identification of self components recognized by immune sensors to understand self-interactome network.
2) We aim to unravel the merits of self-recognition from its breakdown affecting homeostasis. Inborn mutations involved in fundamental cellular functions often cause abnormalities in the immune system. By exploring the molecular basis, we will clarify the molecular network of “self surveillance” by the immune system.
3) By loading quantitative data of periodic self-components, we will pattern responsive sensors and predict biological responses. We aim to predict disease trends from the time-series variation, which we believe will contribute to the public health (Fig. 3)

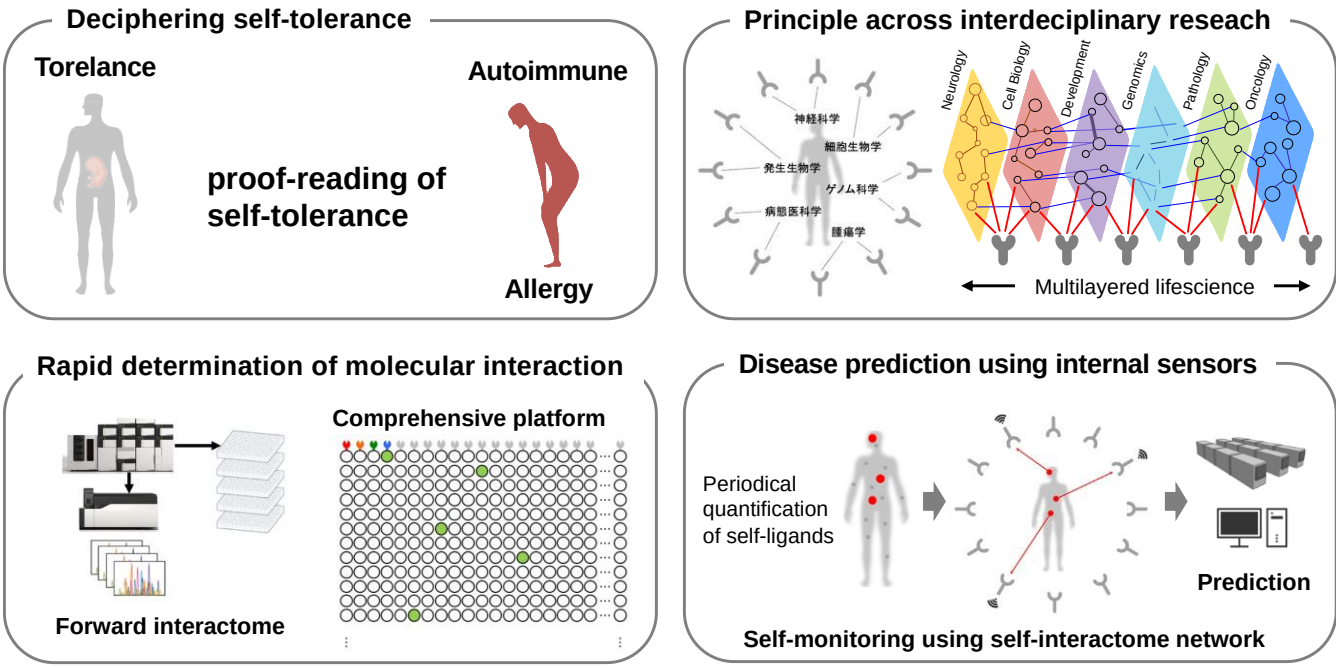


Figure 3. Expected research achievements and future perspective

| | |
|---|---|
| Homepage Address, etc. | https://self-ref-imm-percept.biken.osaka-u.ac.jp |