

# Immunomodulating effects of edible mushrooms

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## Goal is: Development of functional mushroom foods for maintaining our immune system.

Our current research interest is how food factors act as immunomodulator in our immune system. Many edible mushrooms have been expected to have a positive effect on our immune system and prevent from development of diseases. It has mainly been considered that they can stimulate specific immune cells towards a proinflammatory function. But, it is important to suppress abnormal action of immune cells as well. In this study period, we intend to examine immunomodulating effects of some mushrooms on both pro-inflammatory and anti-inflammatory properties.



*Pleurotus citrinopileatus*  
(Tamogi-take)



*Pholiota nameko*  
(Nameko-take)



*Lentinule edodes*  
(Shii-take)

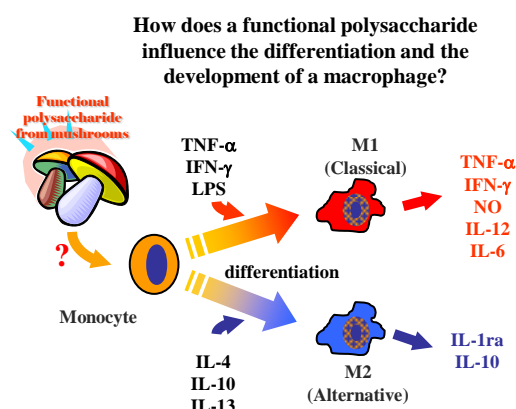


*Flammulina velutipes*  
(Enoki-take)

Popular edible mushrooms in JAPAN

## Aim of the study

It has been proposed that the mushroom's polysaccharide can stimulate immune cells towards a proinflammatory function. Our aim is to define effects of both the polysaccharide and non-polysaccharide fractions from mushrooms on immunomodulation of differentially polarized monocytes (dendritic cells and naïve, M1, M2 macrophages).



## Plans 2019/20

### How can mushrooms' compounds regulate our immune system?

- **Study of potentially anti-inflammatory effects of compounds from some mushrooms on monocyte/macrophage phenotype.**  
Define their suppressive effect on increase in inflammatory cytokines such as TNF- $\alpha$ , IL-6, and IL-12, and effects on surface marker expression (CD86, CD83, MHC).
- **Influence of some mushroom polysaccharides on phenotype/function of differentially polarized monocytes.**  
Monocyte-derived macrophages can be classified into several different phenotypes dependent on different microenvironmental factors. We will define whether mushroom compounds, especially polysaccharides, can affect differentiation of monocytes and function of the matured innate immune cells (DCs and macrophages)  
- determination of secreted cytokines from matured monocytes; pro-inflammatory cytokine for M1 type, anti-inflammatory cytokine for M2 type and several surface markers factors using FACS analysis, Q-PCR and ELISA
- **Can they prevent an inflammatory response in an immune system?**

## Results so far

- Minato, K., Laan, L., van Die, I. and Mizuno, M., *Pleurotus citrinopileatus* polysaccharide stimulates anti-inflammatory properties during monocyte-to-macrophage differentiation, *Int. J. Biol. Macromole.*, 122, 705-712; 2019
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- Minato K., Laan L., Ohara A., van Die I., *Pleurotus citrinopileatus* polysaccharide induces activation of human dendritic cells through multiple pathways, *Int. Immunopharmacol.*, 40, 156-163, 2016