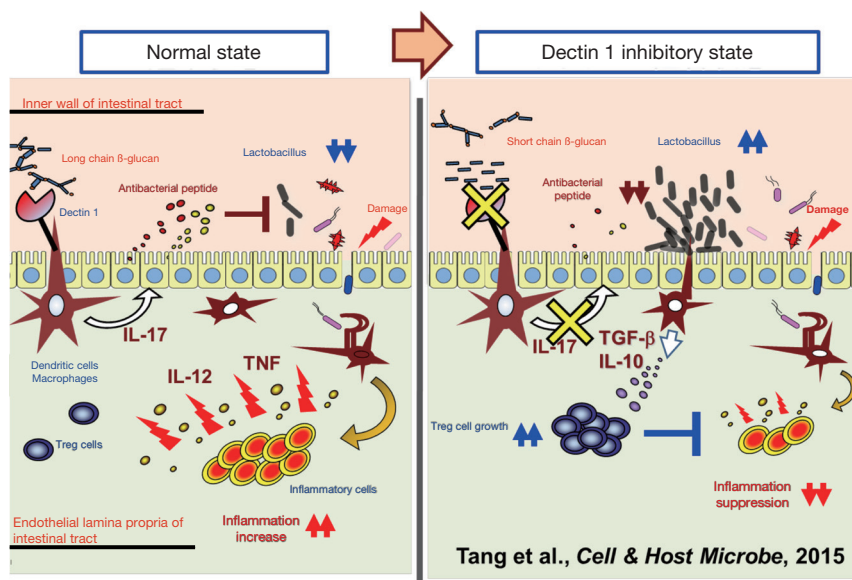


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## Purpose of Research

The number of patients with inflammatory intestinal diseases such as ulcerative colitis is annually increasing and has increase by two-fold over the last 20 years. In contrast, in recent years, improvements in the intestinal environment have been shown to be effective in preventing and treating allergies, autoimmune disease, cancer, and infection. We discovered that binding of short chain  $\beta$ -glucan to Dectin 1 in the intestinal tract suppresses the production of antibacterial peptides and as a result, increases Lactobacillus growth in the intestines and suppresses inflammatory intestinal disease. We are currently developing functional foods with these actions.

## Summary of Research



- Dectin 1, a protein present in the inner wall of the intestinal tract, promotes antibacterial peptide secretion after recognizing long chain  $\beta$ -glucan from the cell walls of fungi such as *Candida* and suppresses the growth of certain *Lactobacillus* spp.
- Dectin 1 knock-out mice have a lower tendency of having colitis, and we found that this was because of an increase in the number of certain *Lactobacillus* spp., which increase regulatory T (Treg) cells in the large intestine, leading to the suppression of inflammation.
- Short chain  $\beta$ -glucans, such as laminarin in kelp, inhibit the function of Dectin 1. Therefore, we found that the intake of short chain  $\beta$ -glucan increases the number of *Lactobacillus* and suppresses the onset of colitis.

However, an excessive increase in the intake of kelp may have adverse effects on the body. We developed a method to safely produce short chain  $\beta$ -glucan from yeast and showed that mice have a lower tendency of having colitis and food allergies when taking this short chain  $\beta$ -glucan.

### Suppression of inflammatory colitis by short chain $\beta$ -glucan

Dectin 1 in the inner wall cells of the intestinal tract promotes the secretion of antibacterial proteins and suppresses the growth of *Lactobacillus* spp. that are important for a healthy intestinal environment.

In contrast, short chain  $\beta$ -glucan binds to and suppresses Dectin 1, leading to an increase in the number of *Lactobacillus* and anti-inflammatory (Treg) cells, suppressing inflammation.

## Future Developments

- We are developing highly functional foods which improve the intestinal environment and prevent various inflammatory intestinal disease.
- Recently, improvements in the intestinal flora have been shown to be effective in preventing various disease. We are looking to collaborate with a food company that would develop such foods.

- Associated System: Ministry of Agriculture, Forestry and Fisheries, Science and Technology Research Promotion Program for Agriculture, Forestry, Fisheries and Food Industry
- Awards: Hideyo Noguchi Memorial Award for Medical Science (2015)  
Rheumatism Society Award (2009)
- Intellectual Property: Many applications and country transfers