

## **INTRODUCTION**

The first person to ever utilize probiotics in health care is Metchnikoff in the 20<sup>th</sup> century, who applied probiotics in detoxification during aging. He postulated that spoilage organisms can cause accumulation of toxins in the intestinal tract, and this theory resulted in a surge of interest (1). A randomized, placebo, controlled human study with the consumption of *Bifidobacterium lactis* HN019 and *Lactobacillus rhamnosus* HN001 demonstrates increased immunity in the elderly (2). Other studies found that the *Lactobacillus* strain activates phagocytes, stimulate the secretion of IgA and neutrophils, and can reduce the secretion of inflammatory substances (3,4). Provision of probiotics in a fixed dosage can increase the performance of IgA in the intestinal tract (5).

There are many physiological functions of probiotics, and are listed as follows:

### **1. Production of short-chain fatty acids:**

Due to fermentation of carbohydrates by probiotics, short-chain fatty acids are produced to counter other organisms (6). Probiotics can lower the presentation of cytokines in the complex inflammatory process. Matter et al. listed an example: probiotics can increase the presentation of the Mucin-2 (MUC-2) gene in Caco-2, and reduce inflammation (7).

### **2. Suppression of Intestinal diseases**

Probiotics suppress production of intestinal mucous by enteropathogens, causing *Escherichia coli* to be attached outside the

body. *Enterococcus faecium* 62Y6 produces cytokine-like suppressive substances to resist growth of vaginal lactobacilli. Therefore, *Enterococcus faecium* 62Y6 probiotic can suppress bacteria which cause vaginal diseases (8). Probiotics VSL#3 stimulates the production of heat shock proteins (HSPs) from nuclear factor- $\kappa$ B (NF- $\kappa$ B) in the epithelial cells of the colon, by means of suppressing proteasomes. Thus, it acts to protect the intestinal epithelial cells (9).

### **3. Increase function of Human $\beta$ -defensin (H $\beta$ D-2)**

Probiotics can increase antigen decline and function of intestinal barriers, and induce and module pre-inflammatory immune effects (11).

### **4. Facilitate neonatal immuno-proteins**

Probiotics can prevent and treat hereditary allergic dermatitis. Das described how probiotics and Long-chain Polyunsaturated Fatty Acids (LC-PUFAs) relate to the balance of T-helper 1 and T-helper2 actions, and these two substances can reduce allergic and inflammatory reactions (12).

## **SUBJECTS AND METHODS**

### **Patients and study design**

38 residents from the nursing home of a certain hospital in Central Taiwan are the subjects of this study. They are generally stable in health, and the diet and medications do not change. The exclusion criteria include antibiotics use, corticosteroids use and hospital transfer. The

criteria for blood collection is five consecutive days of auricular temperature  $\leq 37.5^{\circ}\text{C}$ . When fever occurs, blood collection is delayed until the auricular temperature has once again reached  $\leq 37.5^{\circ}\text{C}$  for five consecutive days again. Usage of stool softeners is not included in the exclusion criteria. The duration of study lasted 3 months. Subjects were separated into the experimental group and the control group. The experimental group was given  $10^8$  CFU of complex lactobacilli (Zen-u Biotechnology Co., Ltd) 6 grams per day. The control group was given placebo 3 grams per day. Regular intake of fiber was maintained in both groups. In the experimental group, 2 grams of complex lactobacilli three times per day were consumed along with meals. Each gram of the combination product contains  $10^8$ CFU of Bacillus Natto, Acidophilus, and bifidobacteria. In the placebo group, regular diet was consumed along with a sugar-pill placebo, which was taken 1 gram 3 times per day for one month. Before and during the study, the type of stool softeners used, number of enema and diarrhea, number of bowel movements by handing, regularity (number) of defecations, amount of elimination, color of feces, and hardness of feces of both groups were recorded each week. After 1 month, the two groups were cross-over and tested.