

## (iii) Kamaboko Health Functions ~Nutrition~

The main component of kamaboko is protein. Protein becomes a base for the makeup of the body such as muscle, and it is also a source of enzymes, hormones, and neurotransmitters which keeps the body normal. These are indispensable substances for the increase of immune strength. Furthermore, let's look at the healthy components included in kamaboko products.

### Components of Kamaboko Products (g/100 g) (crab flavored kamaboko sticks, kamaboko wrapped in a bamboo mat, steamed kamaboko, roasted kamaboko, grilled chikuwa)

Data: Standard Tables of Food Composition in Japan Seventh Edition/  
Standard Tables of Food Composition in Japan Fatty Acid Components  
Table Seventh Edition

Moisture	69.9~75.8
Protein	12~16.2
Carbohydrates	7.4~13.5
Fat	0.5~2.0
EPA	0.031~0.075
DHA	0.061~0.13
Energy	90~121(kcal)

### High Protein, Low Calorie Rich in Indispensable Amino Acids

In comparison to other protein sources, the feature of the protein of kamaboko products is that it is low in calories. Protein raises the temperature of the body by giving off heat. It is said that in order to give off this heat, it takes 40% of the calories ingested in one day, however, with kamaboko products, this can be achieved easily. In addition, the content of the indispensable amino acids in kamaboko products is the ideal balance. This is the reason why the proteins in kamaboko are considered good-quality proteins. Furthermore, when the proteins of kamaboko products are digested and decomposed, substances called "peptides," which are combinations of various amino acids, are created. The health functionalities of peptides, which are expected to be useful to prevent diabetes, cancer and dementia, are still being researched.

### The Fat of Seafood Has a Good Physiological Effect on the Body

When mentioning "fat," it is widely believed to cause lifestyle diseases, but the ratio of fat needed against the total amount of energy is more than 20% and less than 30% (25% for people over 30). It is a nutrient that is needed for concentration, memory, and maintaining hormone balance. In addition, the fat of kamaboko products has a good physiological effect. The main component is n-3 type fatty acid, which is healthy for the body. There is also the advantage of being able to expect health functions. In order to consume the appropriate amount of fat, let's wisely incorporate kamaboko products into staple foods, main dishes and side dishes.

### DHA and EPA Included in High Health Functionality n-3 Type Fatty Acids

Lately, we often hear the words DHA (docosahexaenoic acid) and EPA (eicosapentaenoic acid). Both are part of the n-3 type fatty acid group, which is said to have high health functionality. DHA is related to the brain and neurotransmitters and it increases concentration and the ability to learn, while EPA cleans the blood and prevents blood clots and heart disease. The amount of content of these components differs by the type of kamaboko product, and deep-fried kamaboko and tsumire fish ball made from red fish surimi, contain a relatively high level of these components. So it's recommended that you plan menus including multiple types of Kamaboko products, to enjoy various Kamaboko tastes, and to ingest DHA and EPA effectively at the same time, for your healthy life.



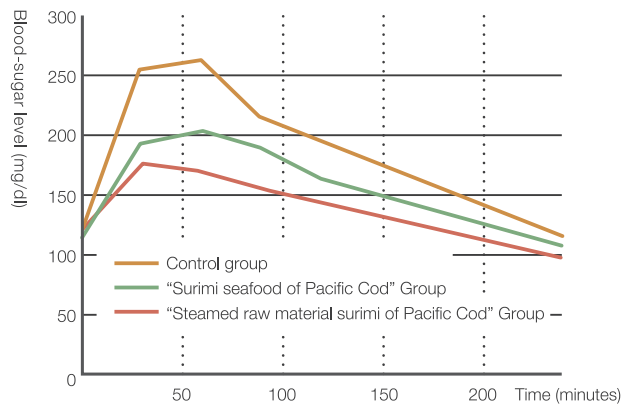
## (iii) Kamaboko Health Functions ~Health Maintenance~

As a result of research conducted on nutrients of kamaboko products and health functions, the suppressing effects of lifestyle diseases such as metabolic syndrome are becoming apparent. Here, based on animal experiments on diabetes, obesity and dementia, we introduce the superior functions of kamaboko products. There has been a certain amount of results with regard to health maintenance.

### Diabetes

#### It Prevents the Absorption of Sugar, and Suppresses the Rise in Blood Sugar

If untreated, diabetes can cause severe complications. As a result of research conducted on the impact of the digestion and absorption of sugar, cholesterol and fat, which are the causes of diabetes, with the ingestion of kamaboko products, the absorption of sucrose and glucose from the small intestines is suppressed, and it is now clear that it leads to the suppression of the rapid rise of blood sugar after meals. In addition, in a comparison experiment between raw minced fish and kamaboko products, there were no suppressing effects found with raw minced fish, and it has been discovered that the protein reforming due to the heating process of the manufacturing process of kamaboko products is related to the suppression of the rise in blood sugar.

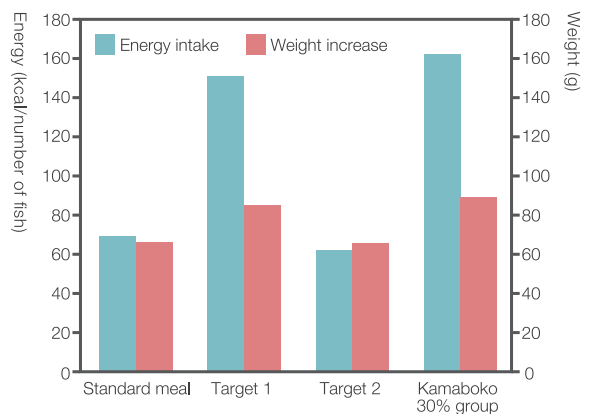


### Obesity

#### For suppression of body fat accumulation and weight loss

The animal testing data demonstrated that the peptide produced by enzymatic hydrolysis of Kamaboko products play an important role in suppression of cell differentiation to fat cells and fat accumulation. In addition, comparison research over a three-week period was conducted on obese rats ingesting kamaboko and konnyaku while continuing a high fat diet, and normal diet. The kamaboko group showed results of the least amount of body weight gain and energy intake, and it has been demonstrated that the expression of the gene related to energy metabolism of fat cells is directly related to the intake of kamaboko. Consequently, eating kamaboko products may prevent easy weight gain.

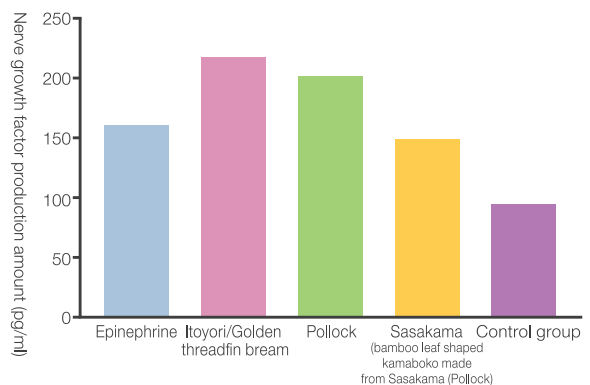
■ Weight change of rats in each of the diet tests



### Dementia

#### It is Good for the Brain and Nerve Growth Factor

It is known that patients with Alzheimer's disease eat much less fish than a healthy person. The basis for the belief that one will become smarter when eating plenty of fish comes from the idea of ingesting n-3 type fatty acid such as DHA. Then, we focused on the research of proteins and not DHA, and peptides showed a certain level of effects. In animal experiments, the amount of nerve growth factor effectively increased when animals ate feed with peptides added, and it is starting to be known that the intake of kamaboko products helps with the prevention of dementia.



In a comparison between feed with kamaboko added and feed without (target group), the feed with kamaboko added showed a higher level of nerve growth factor, and its vitalization power is close to or stronger than epinephrine (=adrenalin, vasoconstrictor).