Study on the Effects of Different Cooking Methods on Vitamins of Food

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Abstract: The loss of vitamins in food processing and cooking is receiving increasing attention. This paper introduces the history and current status of research on vitamin loss factors at home and abroad, and reviews different food processing methods: radiation auxiliary, freezing, rinsing, cutting, drowning, and common cooking methods: fried, steamed, boiled, microwave, and vitamins. The impact of the loss, the factors and mechanisms affecting vitamin loss are described.

1. Introduction

The processing and cooking of food is a key step in the evolution of human beings. It not only makes humans end the primitive way of eating and drinking blood, but also greatly improves the digestion and absorption rate of food, improves the nutritional status of the human body, and improves human physical strength. The further development of intelligence has created favorable conditions. Vitamins are a kind of nutrients necessary for maintaining human cell growth and normal metabolism. They are also the most easily degraded nutrients in cooking. The long-term deficiency or deficiency of any vitamin can cause metabolic disorders and pathological conditions. Understanding the quantity changes of vitamins in food storage, processing and cooking is of great academic value and practical significance for both nutritionists and the general public. People have long noticed the problem of vitamin loss in food processing and cooking, and conducted a series of studies. Early research focused on the thermal stability of various vitamins and its influencing factors. This research boom appeared in the European and American nutrition circles from 1971 to 1985, and a large number of literatures on the thermal degradation, photochemical decomposition and influencing factors of vitamins emerged. These findings are naturally reminiscent of the effects of dramatic physical and chemical changes in the cooking process on vitamins, sparking public interest and attention to scientific cooking methods. In order to provide the general public with simpler and more intuitive vitamin loss data, research on vitamin loss factor LF has received increasing attention.

2. Loss of vitamins in food processing

Foods undergo a series of initial processing before cooking to ensure the safety and nutritional value of food during transportation and distribution. The treatment methods vary according to the type of food and the purpose of processing. Radiation is mainly used for the sterilization and preservation of meat foods and the preservation of vegetables and fruits. For example, the preservation of onions, potatoes, apples, and strawberries with $60Co-\gamma$ radiation not only prolongs the preservation period, but also improves the quality of the product. Studies by Thomas et al. They have shown that the effect of radiation on vitamin B1 depends on the radiation temperature, radiation dose and radiance. Compared with traditional heat sterilization methods, it can reduce the loss of vitamin B1 and the degradation of vitamin B6, and has less effect on vitamin B2 and niacin.

Freezing is the most commonly used food storage method. The whole process of freezing includes three stages: pre-freezing, frozen storage and thawing. The loss of vitamins mainly includes chemical degradation during storage and loss of water-soluble vitamins during thawing. For example, vegetables will lose 37% to 56% of vitamin B6 after freezing, and the loss of pantothenic acid after meat is 21% to 70%. There are many reports on frozen foods abroad, especially the loss of vitamin C in vegetables and fruits and the loss of vitamin B1 in meat products.

Because vitamin C and vitamin B1 are the most soluble water-soluble vitamins, they are often used as indicators to measure the loss of other vitamins in foods. According to the literature, the loss rates of vitamin C in reed, lima bean, cabbage, cauliflower and spinach were 12%, 51%, 49%, 50% and 65, respectively, after storage at -18 °C for 6-12 months. %. It can be seen that the type of vegetables is an important parameter affecting the loss factor of vitamin C in freezing. The loss of vitamin C after freezing of fruits and their products is complex and related to many factors, such as species, variety, ratio of juice to solids, and packaging materials. However, whether it is vegetables or fruits, temperature is undoubtedly a very important factor: from -18 °C to -7 °C, the degradation rate of vitamin C in vegetables and fruits increased by 6% to 20% and 30% to 70%, respectively. Fennema studies on the loss of B vitamins in frozen meat products show that meat products are stored at -23 °C ~ -18 °C for 3 to 12 months, and the content of vitamin B1 varies from +34% to -42. Between %, the B2 content varies between +44% and -43%, and the niacin is +14% to -22%.

Rice loses some vitamins during the rinsing process. Chinese scholars have studied the retention of B vitamins after rice rinsing, and found that the loss rate of vitamin B1 is 60%, vitamin B5 is 47%, and the more times the panning is done, the more force is used during panning, the rice B The more vitamin loss the family has. Mainly because B vitamins are mainly found in rice bran on the surface of rice grains. The volume and shape of the food material after cutting also have an effect on the loss of vitamins. Jorg et al. reported that in the production of identical dehydrated potato foods, mashed potatoes only retained 9% of vitamin B1, vitamin C and folic acid retention rates were below 50%, while potato chips had vitamin B1 retention. It reached 63%, and both vitamin C and folic acid reached more than 50%. The reason may be that the more thoroughly the tissue is cut, the contact with air and the increased light-receiving area, which promotes the loss of vitamin C and B vitamins.

3. Loss of vitamins during food cooking

According to the definition given by the FDA's Center for Food Safety and Applied Nutrition, frying refers to cooking in oil that is hot enough to soak the ingredients. The Chinese definition is a cooking method in which a large amount of cooking oil is used as a heat transfer medium, and the oil temperature is high. The quality of the raw materials and the temperature of the oil can make the fried products have a variety of different textures. After the paste or sizing, a brittle protective layer is formed between the oil and the raw material, and the loss of protein and vitamins in the raw material is reduced, and the internal water is prevented from vaporizing, and the juice and umami contained in the raw material are retained. For vegetables, frying loses more vitamins than boiling, and fried meat loses B vitamins. According to the literature, the oil temperature is 163 °C when fried beef, when the internal temperature of the finished beef reaches 74 °C, the retention rate of vitamin B1 is (69.1 ± 4.3) %. Regarding the proportion of fried foods in the diet, there are two contradictory views in the international arena. One view is that fried foods should be avoided by eating high heat and high fat. Another view is that fried foods should have a certain proportion in the diet, on the grounds that the fried food has almost no effect on the protein and minerals in the raw materials; The formation of resistant starch, the dietary fiber content of fried potatoes increased; due to the high temperature and short-term frying, it is beneficial to the retention of heat-labile vitamins in raw materials; fried foods are also a good source of vitamin E.

Baking is a cooking method that uses heat radiation and convection of hot air to transfer heat. The specific method used in grilling has a great influence on the vitamin content in food. For example, if the raw materials are directly baked on an open flame, the fire is dispersed and the baking time is long, so that vitamin A, vitamin B and vitamin C are greatly lost, and the electric oven is used to grill the food, because the dry heat is not dissolved and heated. Uniform, so the loss of water-soluble vitamins is greatly reduced. According to the literature, the retention rate of vitamin C, vitamin B1, vitamin B2, niacin, vitamin B6 and folic acid was above 90% when the potatoes were grilled in an electric oven at 204 °C for 1 hour. Kenneth and Chyis studied the loss of vitamin B1 caused by the electric oven and microwave grilled chicken, respectively. The fatness of the chicken and the barbecue temperature all affected the loss of vitamin B1. By comparison, they

found that under the same conditions, the use of microwave grilling is more beneficial to the retention of vitamin B1 than electric stoves. The reason may be that the heat transferred by the microwave is caused by the inside and the surface, the temperature is high, and the time is short. Previous studies have shown that when food is grilled in different ways, the loss of water-soluble vitamins in turn is microwave <electric furnace < open flame direct barbecue. There is little literature on fat-soluble vitamins and the conclusion is undecided.

Microwaves, like roasting, use heat radiation to transfer heat. The difference is that the order of heat transfer is from the inside and the inside. There are many foreign literatures about microwave cooking. Chung et al. compared the loss of vitamins in peas caused by microwave and traditional cooking methods. Studies have shown that microwave cooking loses 20.2% of vitamin B1 and 40.8% of vitamin B2. However, it is significantly less than the loss of vitamin B1 and vitamin B2 caused by traditional cooking methods. These losses may be caused by a combination of loss and chemical damage. This is consistent with the theory put forward by Kahn and Livingston that microwaves, compared to traditional cooking methods, have shorter cooking times to compensate for the higher cooking temperatures that cause vitamin damage and reduce vitamin loss. However, there was no significant difference in the loss of vitamin C between the two, and the effect on β -carotene was not significant. Kenneth and Chyis found no significant differences in the effects of different power microwave ovens on vitamin B1 loss in 800W and 1600W microwave oven grilled foods.

Prosperous heating for too long, usually the most important reason for destroying food nutrients. Therefore, the cooking method should be used as much as possible. In this way, the heating time of the dishes can be shortened, and the loss rate of nutrients in the raw materials can be reduced. For example, pork is rich in vitamin B1. For example, pork is cut into silk and stir-fried. The loss rate of vitamin B1 is about 13%. When cut into pieces, it is stewed with a simmer and the loss rate is about 65%. In addition, in the case of cooking in one of the cooking methods, the influence of the size of the dicing, the manner of heating, and the time on the loss of nutrients are also different. In general, the loss of nutrients is relatively low when the fire is rapidly fried. The total vitamin loss is about 30-40%, and the loss of carotene is less than 25%. For example, if the vegetables are first scalded in boiling water, and then squeezed out of the vegetable juice, the vitamin loss rate can be as high as 80%; when using the cooking method, the vitamin preservation rate can reach 80% or more; if steamed, the vitamin C is preserved. The rate is about 75%, with less steam heating (typically 10 minutes) with less loss. In addition, the more salt added during cooking, the greater the loss of vitamin C, so I often urge people to eat less salt, especially in patients with hypertension and cardiovascular and cerebrovascular diseases. The amount of eclipse is best controlled at 5 Below gram. After the juice is opened, the vitamin C content will drop rapidly and will be lost after 14 days.

Deep-fried food needs to be hanged, but don't eat more fried foods. It is really fragrant, but because of the high oil temperature during the cooking, the protein, fat, carbohydrates and vitamins that are hot and easily oxidized in the food will be destroyed. The nutritional value is reduced. Hanging paste frying is a good way to protect nutrients and increase the taste. Before cooking, use starch and eggs to sizing the food, forming a high temperature protective layer on the surface of the food so that the raw materials are not in direct contact with the hot oil. Reducing the loss of nutrients, the oil can not be immersed in the food, the umami is not easy to spill, and the taste will be smoother and more delicious. However, even in this case, the fried foods can not be eaten. High-temperature fried starch foods contain a large amount of acrylamide (carcinogens), which have many harms to the human body. The Ministry of Health recommends: try to avoid long-term or high-temperature fried starchy foods; promote reasonable nutrition, balance the diet, change the eating habits of fried and high-fat foods, and reduce the health hazards caused by acrylamide.

4. Conclusion

China's research on the rate of vitamin loss in food after cooking is relatively lagging. The lack of vitamin loss factor data in the published 4th edition of the food ingredient list has made it

difficult to evaluate the national dietary survey and the national nutrient intake level. Although a small number of literatures have dealt with the problem of vitamin loss, and given the vitamin retention rate of some foods, due to lack of financial support and effective data collection system, the previous research has small scale, scattered data, lack of unified standards, etc. Features.

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