

Evaluation of heat induced protein degradation and food functionality in retort-processed porcine meats. (#349)

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Introduction

Taste and texture of meat products are associated with the properties of protein included in the muscle. The protein makes the tissues of our body, such as muscles and organs. Ingested proteins are digested in the stomach and absorbed as peptides and amino acids through the intestine. These small molecules exert effects to support biological regulatory functions in our body. Of the 20 types of amino acids, nine essential amino acids cannot be synthesized in the human body, thus intake from diet is essential. Recently, peptides and amino acids containing them in meats have been reported to be effective in preventing dementia and depression, and research on the relationship between meat nutrition and human health has received much attention.

Despite the fact that meat is rich in such nutritional components, the current situation is that consumers have a negative image with respect to human health. Improved this image would lead to not only the revitalization of the meat market but also the maintenance and improvement of people's health. We have focused on lifestyle-related diseases. Life-style related diseases are regarded as a problem due to the extension of the healthy life span in association with changes in eating habits. In particular, the number of hypertensive patients has reached 1.13 billion in the world. The increasing health consciousness in the world also is required for functional effects of food as a complement to medical treatment.

From the above, it is expected that the prevention of hypertensive symptoms by the intake of meat could contribute to the establishment of a new nutritional therapy diet, leading to the maintenance and improvement of people's health.

In the present study, we focused on the proteolysis of meat caused by heating, and evaluated relationships between the degree of protein degradation different heating temperatures and the inhibitory activity of angiotensin I converting enzyme, which induces hypertensive symptoms. We used retort heating applied to various retort foods including meat products as the heat treatment method. Retort-processed foods are excellent with respect to preservation, and this benefit has been exploited in their use as food in space travel. Researchers have investigated the effect of retort-processing on food palatability, but they have not focused on the food functionality.

Methods

We extracted soluble fraction of whole muscle protein and myofibrillar protein from porcine loin, and prepared control-fraction (75 °C) and retort-fraction

(125 °C) in each preparation. The use of retort-processing enables high-temperature heating above 120 °C, and we investigated protein degradation and angiotensin I converting enzyme inhibitory activity by each heat-processing sample.

From each of these two preparations, we also obtained three fractions: one that digested with trichloroacetic acid, one digested with pepsin, and one which was untreated, resulting in a total of six samples. We determined the peptide and free amino acid concentrations in each of the six samples. We simultaneously confirmed changes in the protein profiles as a result of differences in heating temperature using SDS-PAGE. Furthermore, in all six samples, we determined ACE inhibitory activity, which was an *in vitro* indicator of the hypertension suppressive effect, as an evaluation of the functionality of each treated meat sample.

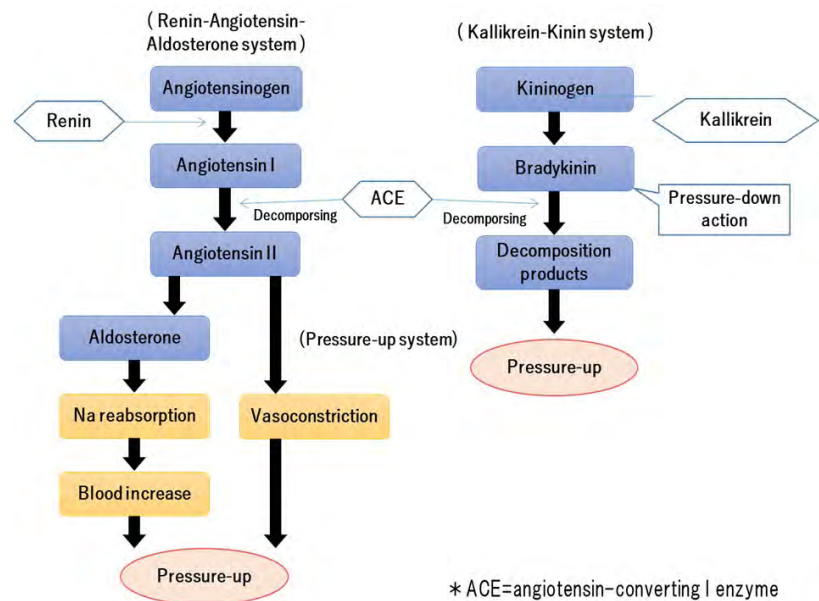
Results

The concentrations of both peptide and free amino acid significantly increased in the retort-fraction compared with the control-fraction. From SDS-PAGE, we confirmed that the macro molecular proteins in the retort fractions disappeared and low molecular proteins were appeared. It was suggested that the high molecular proteins were degraded to low molecular proteins by retort-processing. Retort-fraction showed higher activity than the control fractions. Significantly higher activity were obtained with the enzyme-digested sample, suggesting that the peptides having high ACE inhibitory activity were produced by digestion of the low molecular peptides which were digested in the digestive tract with retort-processing.

Conclusion

The results from this study, we suggested that the retort-heating promotes protein degradation by digestive enzymes, which would be beneficial for digestion through the digestive tract, and higher ACE inhibitory activity was obtained in the retort preparation compared to the normal temperature preparation.

Notes



Mechanism of hypertension

This figure shows a part of hypertension mechanism. Hypertension occurs by reaction of angiotensin I converting enzyme (ACE). ACE works on 2 substances. Blood pressure rises when ACE decomposes angiotensin I to angiotensin II. Also, ACE inactivates bradykinin and inhibits blood pressure-down effect.

Notes