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N,O-Carboxymethyl Chitosan: An Innovation in New Natural Preservative from Shrimp Shell  
Waste with a Nutritional Value and Health Orientation

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**ABSTRACT**

This research has been done to modify chitosan into its derivatives, i.e. N,O-Carboxymethyl Chitosan. The characterization of chitosan and N,O-Carboxymethyl Chitosan, which includes analysis using FTIR, SEM, and XRD, showed that the a natural preservative N,O-Carboxymethyl Chitosan had formed. Our data indicated that addition of N,O-Carboxymethyl Chitosan to samples of chicken meat could be regarded as a solution to increase fiber contents, resilience of food storage, and stability of nutrients (lowering levels of dry substances), lower ash contents, increase protein contents, keep fat contents, as well as increase levels of Nitrogen-Free Extract. Therefore, we conclude that the N,O-Carboxymethyl Chitosan can be used as a preservative which also orients towards nutritional values and health.

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Key Words: N,O-Carboxymethyl Chitosan, Preservatives, Chicken Meat, Food, Shrimp Shell

**Introduction**

Food is the most essential basic need for humans to sustain life and living. Food which functions as a source of nutrients such as carbohydrates, fats, proteins, vitamins and minerals serves as the main base for people to achieve health and well-being throughout the life cycle, starting from fetuses, infants, toddlers, children, adolescents, adults and the elderly need food in accordance with

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the nutritional requirements to survive, grow and develop as well as achieve working achievement [1] [2]. Proteins are one of the nutrients necessary for humans to grow, develop, and stay healthy. The cheapest sources of animal proteins are eggs and chicken meat [3].

Several important things to worry in relation to products of animal origin are the presence of contamination or microbial contamination, residues of veterinary medicines such as biological products, pharmaceuticals, premix, and chemicals as well as the use of certain preservatives that harm consumers [4]. The number of cases of food poisoning that currently occurs in the society indicates a mistake in the processing and the preservation of food consumed. The fundamental issues in food processing performed by the society is mainly due to a culture of food processing that is less oriented toward nutritional values. In addition limited knowledge and the economic pressure at the same time also making the problems on food fulfillment and food processing neglected. One way to overcome the problems of food processing is to develop compounds that can serve as a preservative and orient toward nutritional values and health.

One of substances that is known to be a food preservative is chitosan. Indonesia is a country rich in natural resources. The Indonesian fisheries sector is a sector with a good prospect. It can be seen from the increase in the export value of fishery products of the nation. As reported by the Ministry of Maritime Affairs and Fisheries, the export value of Indonesia fisheries based on the total commodities from January to November 2013 reached U.S. \$ 3.77 billion or increased approximately up to 7.0% from U.S. \$ 3.53 billion in 2012. During that period, shrimps became the main commodity of the Indonesian fisheries export with a value of U.S. \$ 1.280 million. Shrimp export increased by 25.46% from the previous year with the largest contribution value from frozen shrimps by U.S. \$ 1.121 million. Along with the increased shrimp production, the waste produced from the shrimp processing has also increased. The amount of waste generated, if not processed immediately, will cause environmental pollution. So far, the processing of shrimp waste is used only as a substance to make *kerupuk* (shrimp crackers), *terasi* (a condiment made from fermented shrimp paste), and supplements for animal feed. In fact, shrimp shell waste is very potential due to its chitin content that reaches approximately 99.1% [5]. Thus, the use of shrimp waste by processing it into chitin and its derivatives can be one alternative to solve environmental problem caused by shrimp industry.

Chitin, after further processing, will result in chitosan that can be used as a product preservative and stabilizer. Chitosan can be used as a preservative both for food and drinks due to its nature of inhibiting the growth of adverse microorganisms while at the same time coating the preserved product so that results in minimal interaction between the product and its environment [6].

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