Introduction

Preliminary research carried out by Applied Preservation Technologies Inc. (APT) indicated that there was a growing market for products that could be produced from shell waste materials, including crab and shrimp waste from local processors. While there are several producers of the shell waste raw material in Newfoundland and Labrador, no company has made the next step of value-added processing into products including carotenoprotein and chitin/chitosan. Carotenoprotein is used to enhance flesh color in fish (salmon) and for sunburn and immune system protection in humans. Chitin/chitosan is also used in such products as pharmaceuticals, food additives, water treatment systems, and cosmetics. APT Inc. has the advanced technology to produce high-quality products in a more cost-effective manner than current industry players. Based on the intense competition in the pharmaceutical and nutraceutical industry in China, Norway, India and Japan, marketing research was critical.

Given this opportunity, APT, with funding from the Fisheries Diversification Program, focused on the extraction of chitin/chitosan and carotenoprotein from shrimp and crab shells. This would be followed by further production of enzymes, flavourants and gelatins from the same type of raw material. The ultimate goal of the project was to utilize 100% of available shell waste, add substantial value to the company and create additional employment.

Background

APT, a biotechnology company located in St. John’s, Newfoundland and Labrador, is involved in research and the potential commercial development of value added products from Shellfish waste. The company's growth has resulted from a partnering strategy involving private sector companies, research centers and government. The company also works in partnership with Grand Atlantic Seafoods Inc., a Newfoundland and Labrador
seafood company. In addition to being a part owner of the company, Grand Atlantic Seafoods Inc. has a large supply of raw material from two crab plants and one shrimp operation which it will use to potentially supply a value-added carotenoprotein and chitin/chitosan production plant.

**Methodology**

The marketing initiatives carried out by APT included sample production of chitin, chitosan and carotenoprotein, as well as optimal extraction process determination, sample shipment to customers, and market identification. The company participated in the New England Trade Mission and BIO 2001, a biotechnology conference and trade show in San Diego, California. Promotional material was developed, and research carried out on labeling, regulatory and reporting issues.

**Results**

APT has gained considerable knowledge as a result of marketing intelligence and trade show attendance through this project. Trade shows allowed the company to meet customers and discuss products, production processes and marketing requirements. A number of partnership arrangements with national producers were considered. A comprehensive promotional package assisted in creating product awareness of the benefits of carotenoprotein and chitin/chitosan products processed from Newfoundland and Labrador shell waste. This generated a high degree of interest, especially from a supply and quality perspective. Promotional materials including posters, business cards and brochures were quite effective.

A research company in Asia carried out the chitin extraction using a lab scale setting. The company conducted a literature search, lecture preparation and training notes for potential training of APT employees. The results of this work were positive.

The new extraction technique has the potential for providing a medical-grade chitin suitable for application in the biomedical market. The company has also investigated a second extraction method that does not use chemicals. In conjunction with Biopolymer Engineering Inc. (BEI), an extraction process, using a bacterial fermentation technique, was investigated. This process produced a good grade of chitin, and as a result, follow-up discussions and additional research took place. APT and BEI are currently working in partnership to establish a pre-commercial chitin extraction facility in Newfoundland and Labrador.

**Conclusion**

Product and market development of carotenoprotein and chitin/chitosan from shell waste were successful in the determination of optimal extraction technologies aimed at identifying the most suitable process that would maximize yield, quality and cost effectiveness. APT is now in a position to move on to the next phase of development. Pending the success of future research and market development, the company will build a commercial carotenoprotein and chitin/chitosan extraction plant in Newfoundland and Labrador. This will provide 30 to 40 new jobs, in addition to adding value to waste materials.