Final report

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Novel integrated solution to produce high value natural flavour compounds from red meat

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Executive Summary

There is a worldwide demand for meat based flavourings, extracts and nutraceuticals and a global under supply of quality products. Major health issues such as Avian Flu and SARS threaten the value of multinational brands and Australia is uniquely positioned to supply the safe, clean and green products required. This is reinforced by Australia's world's best traceability system overseen by AQIS (Australian Quarantine Inspection Service). The food market offers an excellent opportunity for investment since, regardless of economic conditions, food remains a necessity and this ensures a constant demand for Australia's products. The cosmetic and pharmaceutical applications of such products are similarly an opportunity for investment given the aging population who require ongoing medication and are also increasingly concerned with maintaining a youthful appearance.

To address this opportunity Forefront Ingredients Ltd undertook a project with MLA to develop a modular meat and bone stock production technology designed to produce high quality products for the domestic and export markets. The process involved the extraction of protein material from both red meat and bones to produce valuable high quality flavourings and use by-products, such as sheep placenta, to produce cosmetic/nutraceutical ingredients.

In the course of the project, beef extract and sheep placenta products were manufactured on a pilot scale and then validated in the market with acceptance of the product by end customers. The final stage will be to confirm the scalability of the process in a full size modular plant. This project targeted meat flavourings for use in soups, seasonings and ready meals, and sheep placenta extract for nutraceutical, cosmetic and pharmaceutical products, dietary supplements and Chinese medicine.

Growth in the market is linked to increasing population levels and the growth of the middle class in many regions of the world and demand is increasing. Products such as sheep placenta of clearly defined origin, particularly given Australia's traceability system as overseen by the Australian Quarantine and Inspection Service (AQIS), also represents a clear opportunity. Furthermore Australia is an ideal location in which to manufacture this range of products as the country has historically been free of many of the major animal health issues that have the potential to contaminate inputs.

The price for the target products has increased significantly over the last 5 years due to undersupply in the marketplace caused by recent health concerns associated with traditional suppliers from the Americas and China. Australia is well placed to take advantage of this situation with high quality inputs free of these health issues, sold at competitive prices.

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1 Opportunity

There is a worldwide demand for meat based flavourings, extracts and nutraceuticals. Major health issues can threaten the value of multinational brands and Australia is uniquely positioned to supply the safe, clean and green products required. This is reinforced by Australia's world leading traceability system overseen by AQIS (Australian Quarantine Inspection Service) Forefront has developed a novel application of existing technologies which produces excellent quality products superior in many cases to existing products.

Food production is one of the challenges of this century and especially supply into the growing Asian middle class market. Food is also a good investment in any financial climate as people always need to eat, viz Warren Buffet's February 2013 purchase of Heinz.

Anti-aging products, whether western or traditional Chinese in nature, also address a growing market, particularly in Western economies, due to the aging baby boomer demographic.

1.1 Value adding opportunity

The opportunity was identified to develop a modular turn-key plant for value adding at the processor level. At least 13 modular units were envisaged which would be located on site at processor operations, producing flavour ingredients for the food industry. The target outcomes for the project were:

- Assemble and commission a prototype modular production line based upon the scale up pilot trials which would produce beef and sheep placenta extract suitable for the domestic and export markets.
- Design, build and commission a prototype beef bone reactor vessel which would produce beef bone extract suitable for the domestic and export markets.
- Produce product samples from the prototype modular production line that were suitable for the target customers
- Confirm the commercial viability of the prototype modular production line and production process

1.2 Initial focus

This project focused on three protein extracts which are used commercially in a variety of food products, dietary supplements and consumer cosmetics:

1. Meat extract, used as natural flavourings in food products.
2. Bone extract also used in food products as natural flavourings.
3. Sheep Placenta extract, highly sought after for its applications in dietary supplements, consumer cosmetics and pharmaceutical products.

1.3 **Raw Materials**

The project aimed to make use of cheaply available meat ingredients including underutilised by-products and transforming them into quality products that are in demand yet under supplied in the world market.

1.4 **Beef Extract and Flavourings**

The demand for beef flavours is expected to continue to increase as consumers look to natural flavourings as opposed to the cheaper imitation flavours. Lifestyle changes which encourage more eating-out and less cooking at home are also driving up demand for beef based seasonings.

1.5 **Sheep placenta powder**

Sheep placenta powder is valued as an ingredient in a number of products including:

- Dietary supplements & Chinese medicines: Consumers of these products believe that concentrated sheep placenta powder offers benefits such as anti-aging, vitality and wound healing;

- Pharmaceutical products: The manufacturers of these products utilise the proteins in the sheep placenta to manufacture products aiming to improve cellular metabolism, joint health, wound healing and cellular hydration; and

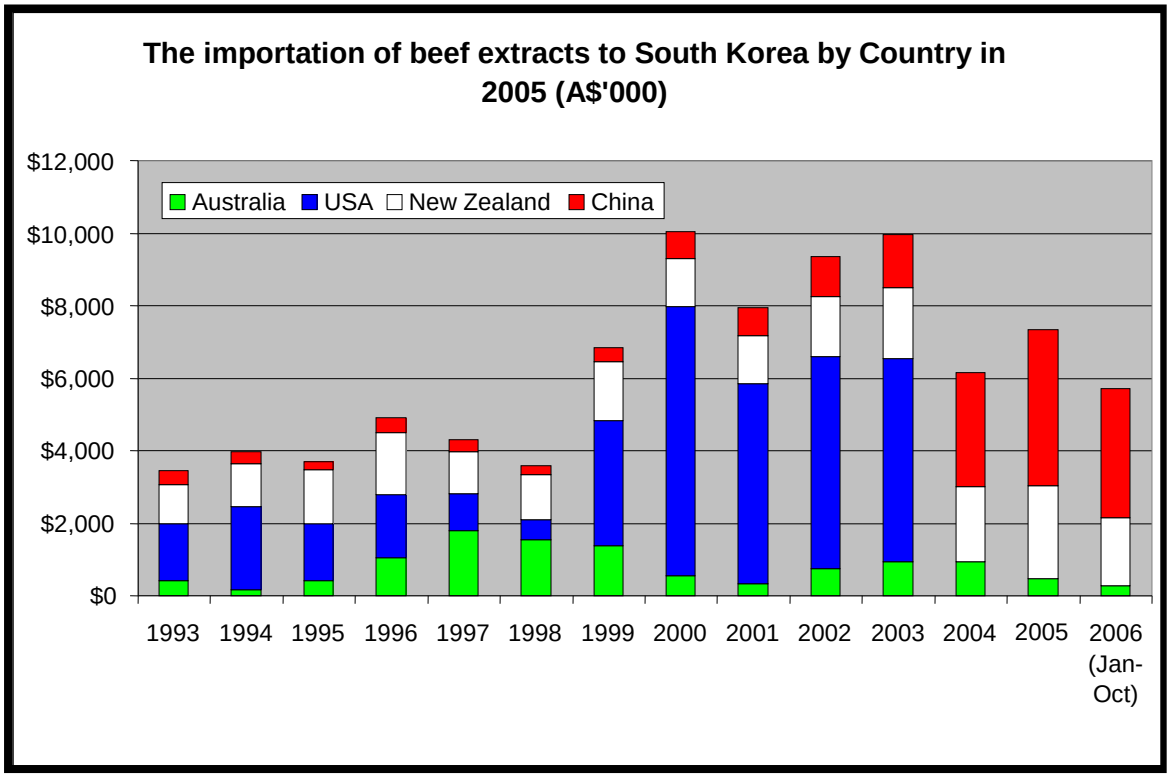
- Cosmetic products: The manufacturers of these products use sheep placenta extracts for their purported anti-aging properties.

The manufacturing process developed in this project produced a highly concentrated powder that contained very low levels of impurities or non-functional components resulting in a product higher in active constituents. Sheep placenta extract is a relatively high priced, high margin product.

2 The Market

2.1 Safe supplies

The US was traditionally the major supplier of meat extracts until their animal health issues associated with BSE resulted in many countries banning imports of US meat products.



AUSTRADE South Korea report 24 November 2006 (*the total import figures provided included beef (meat) extract, AUSTRADE believes that this accounts for 30% of the import figures)

BSE in Europe had a similar effect on the export market of European meat products. South American manufacturers have suffered from both animal health issues such as Foot and Mouth Disease as well as supply chain credibility issues with South American suppliers found to be adulterating products.

The result of these problems is that domestic and export customers are seeking to secure reliable, traceable, high quality supply chains at a set price on long term agreements.

3 Technical issues

Protein is generally inert in flavour terms, but as product is broken down into smaller and smaller molecules (hydrolysis) flavour active peptides are produced. Not all peptides have the same flavour though and a systematic evaluation of the impact of processing conditions on flavour profile had to be undertaken.

Over the course of this project a number of products were developed to elicit market feedback and it was demonstrated that a commercially viable product with a suitable flavour profile had been developed.

A significant technical hurdle arises when scaling up suspensions of solids in liquid such as are found in the hydrolysis of meat and bones. Mass transfer can become rate limiting and materials handling can become a logistic hurdle, so the project was designed to confirm scalability at several stages through its life. The largest scale run was in a 1,000 litre vessel. The project did not proceed to the final volume of 2,500 litre due to lack of funds.

4 Commercialisation and Adoption

The research partner, Forefront Ingredients, plans to continue seeking funds to complete this project and then commission its first full scale production line, which is planned to be located at a food facility in Queensland. Forefront intends to use this facility as the prototype for future modular production lines.

The price for the target products has increased significantly over the last 5 years due to undersupply in the marketplace caused by recent health concerns associated with traditional suppliers from the Americas and China. Australia is well placed to take advantage of this situation with high quality inputs free of these health issues sold at competitive prices.

5 Business

5.1 Business Model

The adoption plan for the technology assumed the following:

- The establishment of the first centralised facility at an existing food plant to demonstrate proof of concept and final modular unit design.
- The centralised plant would initially be used to establish the business, and manufacture higher end extracts such as sheep placenta extracts and develop other new red meat products;

Once the centralised plant had been established modular units were planned to be installed at red meat processors throughout Australia. Each unit would be offered under a tailored contractual basis depending upon the mutual needs of the processor and Forefront and addressing processor contributions such as feedstock, labour, utilities, floor space, prices and volume.

6 Project outcomes

- Processes were developed for producing beef extract and bone stock for use as food ingredients.
- Processes were demonstrated at 1,000L scale.
- A process was developed for the manufacture of dried placental extract.
- Market feedback on trial samples showed the products to be commercially viable.
- A modular plant was designed for beef and placenta extract production.

The project was, by mutual agreement, terminated due to difficulties sourcing partner funds for the final stage of the project. Interested readers should contact Forefront Ingredients directly or may contact MLA for assistance if required.