



# final report

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## Developing High Value Freeze Dried Australian Red Meat Products and Services

### Milestone # 6 – Final Report PUBLIC

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## Executive summary

This Research Program's objective is to identify 3 to 5 fold value adding opportunities for the red meat industry through the application of freeze drying technology.

Red meat products researched and reported on in previous milestones included blood, cubed beef, hides, oesophagi, bile acids and paunch.

The design led approach has highlighted waste hides and the extraction of collagen as the lead opportunity.

This extraction of collagen from hide is the key focus of more detailed investigation, research and development.

Australian meat producers are one of the largest suppliers of salted and wet-blue hides and salted skins to the world market. Australia annually produce 8 million cattle hides, 1 million calf skins and 32 million woolskins<sup>1</sup>. Australia is one of the only few countries that has open trade in hides and skins, however farmers still regard these skins and hides as by-products and 'waste' so often sell them for whatever the counterparty is willing to buy them for and is then often transformed into leather<sup>1</sup>.

With the assistance of the MLA and the Australian red meat industry, the technology developed by FDI is able to offer a significant value uplift for the waste hides currently being discarded. FDI is capable of being positioned at red meat processing facilities and/or regionally in close proximity to processors due to its energy efficiencies.

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<sup>1</sup> MLA

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# 1 Background

This Research Project was undertaken as a way of taking a cost centre (waste) and creating a profit centre (new products) for the red meat industry.

Freeze Dry Industries, via their freeze drying technology, have created an avenue for collagen to be produced from waste hides.

According to the MLA By-Product Report (June 2019), it states that since 2014 the hide market has been under downward pressure and it will continue to be so due to a number of global trends. The report indicates that the best large hides (from cattle over 350kg cwt) in Victoria are averaging just over \$20/hide, whilst the same category in NSW are averaging \$17/hide. In Queensland this number further drops to just under \$10/hide.

The report also states that nearly all hides from cattle under 350kg cwt are making less than \$10/hide, with *'many small or poor condition hides reportedly holding no market value'*.

There currently exist a category of hides that hold little to no value for red meat processors, and are in fact currently costing these producers to discard it. This clearly demonstrates a loss and showcases a very real opportunity to provide value to this by-product, especially the latter category of waste hides or off-cuts.

## 2 Project objectives

### 2.1 Identify 3 to 5 fold value-adding opportunities through the use of freeze drying in red meat industries.

#### 2.1.1 Collagen

The objective of this Project is to apply design led thinking and focus on identifying opportunities and growth options using Australian red meat combined with freeze drying technology. This freeze drying technology is to enable a return of three to five times the current value of low-value meat products.

Freeze Dry Industries key focus from their research has been established – Collagen from waste hides/skins.

Collagen has clearly established uses within the medical, nutraceutical, cosmetic and pet health supplement industries, clear markets and avenues for commercialisation.

## 3 Methodology

### 3.1 Discovery and Development

#### 3.1.1 Design Led Thinking

The project was conducted utilising a design lead approach.

The initial phase was Discovery and Development to partially validate the value proposition of varying red meat products.

Products tested in the phase included blood, cubed beef, hides, oesophagi, bile acids and paunch. The findings are summarised below.

##### Freeze dried Blood – fractionated blood proteins

Possible markets in pet food animal supplements, aquaculture, agar and biomedical industry uses, human food and supplements.

The benefit to the red meat industry was the 'waste' disposal.

The process proved to be challenging with the collection issue at the source of the blood – i.e. the abattoir. This process held many Quality Assurance challenges which could not be controlled in-house.

##### Freeze dried cooked beef cubes

High protein snack aimed at performance food industries and food service processors requiring lightweight meat suitable for rehydration.

The benefit to the red meat industry was exploring the growing trend for healthy and 'free from' ready-made snacks.

The process demonstrated there was not enough return on the raw input to be feasible.

##### Freeze dried oesophagi and cartilage

Powdered oesophagi and cartilage for use within the pet and human health industries. The benefit to the red meat industry was the 'waste' disposal.

Samples were collected and dried; the decision was made to focus on collagen from hides.

##### Freeze dried bovine bile

Looked at the collection and stockpile of bile for extraction of potential, new, high-value weight loss supplement/drug.

The benefit to the red meat industry was the 'waste' disposal.

The potential value proposition remains undetermined and did not pass the early desktop research stage.

##### Freeze dried hides

The extraction of collagen to be aimed at the markets of pet and human health.

The benefit to the red meat industry was the 'waste' disposal and the lower hide prices in existing markets.

The resulting extracted collagen is now the focus of ongoing research and refinement and the major subject of this report.

## 4 Key Findings

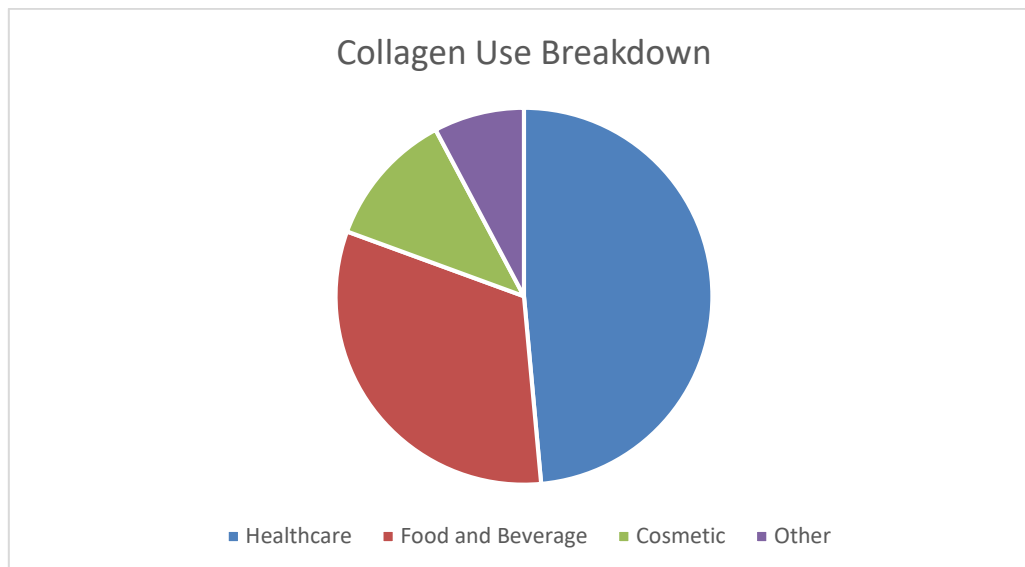
### 4.1 Collagen, Hydrolysed Collagen and Collagen Peptides

#### 4.1.1 Nutraceutical and Medical Markets

In recent times, bovine hide has been found to have a much higher value applications within nutritional, cosmetic, surgical and medical research products. In conjunction with the University of Southern Queensland, Freeze Dry Industries have identified and developed freeze drying technology which extracts natural organic collagen from a bovine hide.

The market size for Collagen was estimated at almost \$USD4 billion in 2017 with Bovine collagen accounting for 35% of the market due to an abundance of raw material and its lower cost compared to other sources such as marine and porcine<sup>2</sup>.

#### Collagen Uses:



Source: Independent USQ Report

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<sup>2</sup> USQ Report

**Cosmetic Products Derived from Collagen:**

| Company/Brand  | Product and Application                  | Collagen Source  | Retail Value (\$AUD/kg or \$AUD/L) |
|----------------|--|--|------------------------------------|
| Zyderm/Zyplast | Collagen Facial filler.                  | Bovine collagen  | \$40,000 - \$55,000                |
| Apot.Care      | Collagen and Elastin Pure Serum.         | Unspecified source   | \$5000                             |
| Sensanol       | Hydro Collagen Serum                     | Hydrolysed Collagen and Elastin unspecified source         | \$3620                             |
| Olay           | Regenerist micro-sculpting cream         | Contains amino peptide complex but may be synthetic        | \$1020                             |
| L'Oreal Paris  | Collagen Moisture Filler Day/Night Cream | Soluble Collagen, atelocollagen unspecified natural source | \$784                              |
| DHC            | Astaxanthin Collagen All-in-One gel.     | Collagen unspecified source                                | \$304                              |
| St Ives        | Renewing Collagen & Elastin Moisturizer  | Hydrolysed collagen unspecified source                     | \$39                               |

**Nutritional Products Derived from Collagen**

| Company/Brand  | Product and Application                             | Collagen Source                                       | Retail Value (\$AUD/kg or \$AUD/L) |
|----------------|---|---|------------------------------------|
| Hyaline        | Collagen Peptide                                    | Bovine Unspecified                                    | \$233                              |
| Nature's Way   | Beauty Collagen Tablets 60S                         | Hydrolysed Collagen                                   | \$250                              |
| Nature's Way   | Beauty Collagen Powder 120g                         | Hydrolysed Collagen (Verisol™)                        | \$249.92                           |
| Nature's Way   | Beauty Collagen Gummies 40S                         | Hydrolysed Collagen (Verisol™)                        | \$250                              |
| Modere Biocell | Liquid Collagen                                     | Non-bovine  | \$226                              |
| Nesproteins    | Grass fed and finished Collagen Protein Hydrolysate | Bovine unspecified. Other products are gelatin-based. | \$97.66                            |
| Nature's Way   | Beauty Collagen Shot                                |   | \$69.98                            |

**4.1.2 Key Technical Considerations**

The ultimate goal for this project is the extraction of hydrolysed collagen peptides for firstly pet foods then human grade consumer products.

Top of mind in the production process will be numerous Quality Assurance factors. FDI need to consider food safety, microbials, bioavailability of the nutrients and the shelf life of the resulting products.

Once the above have been considered, Freeze Dry Industries sourced scientific evidence in the form of the University of Southern Queensland's report "Valorisation of freeze-dried bovine hide. A product quality examination and comparison". This report validated Freeze Dry Industries' assumptions and proved the extraction process as a means of producing collagen from the freeze dried hide.

Freeze Dry Industries are now undergoing more research to confirm exacting formulas and product development for the base collagen.

Once this has been finalised, FDI can adapt the base collagen to suit the pet, nutraceutical, pharmaceutical, cosmetic and medical markets.

#### **4.1.3 Consumer Desirable Features**

Collagen is a triple helix of alpha-chains of amino acids which build strong fibres used for the body's structure. Collagen is the human body's most important building block. It is the most abundant protein in our bodies, making up around 30% of total human protein content. It is the glue that holds our tissue together, ensuring the integrity, elasticity, and regeneration of our bodies' connective tissues, and thus maintaining our skin, cartilage, and bones.

Demand for the product is expected to surge due to growing end-use applications, changing consumer preferences and lifestyles, increasing disposable income, and rising awareness regarding health and personal care<sup>3</sup>.

The production of an organic collagen utilising red meat waste via a clean and green manufacturing process ticks several global megatrends.

The term 'nutraceuticals' was coined in the late 1980s to describe food products that have a medicinal benefit. This fast-growing sector includes functional foods (such as vitamin-enriched products), nutritional supplements, sport drinks and medically formulated foods<sup>4</sup>.

The annual global nutraceuticals market was expected to be worth US\$250 billion by 2018.<sup>5</sup>

CSIRO Futures Report "Food and Agribusiness. A Roadmap for unlocking value-adding growth opportunities for Australia" – highlighted current megatrends evident in global F&A that will have significant impact on the sector over the next 20 years.

A megatrend is defined as a substantial shift in social, economic, environmental, technological or geopolitical conditions that may reshape the way a sector operates in the long-run.<sup>6</sup>

Those relevant to this Project include:

- A Less Predictable Planet
  - Increasing consumer demand for environmental and social credentials
- Health on the Mind
  - Increasing social awareness for improved health and wellbeing

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<sup>3</sup> GrandView Research "Collagen Market Size, Share and Trends Analysis Report 2019 – 2025"

<sup>4</sup> KPMG International "Nutraceuticals: The Future of Intelligent Food".

<sup>5</sup> Euromonitor, 2010 figures

<sup>6</sup> Hajkowicz, S. (2015) *Global Megatrends – Seven Patterns for Change Shaping our Future*, CSIRO Publishing, Canberra.



- Rising importance of food safety
- Increasing demand for food products that target holistic (mind + body) health and wellbeing outcomes
- Choosy Customers
  - Rising wealth
  - Greater demand for convenience
  - Increasing demand for provenance information

Opportunity Themes:



*Products for Health and Wellbeing - driven by Health of the Mind and Choosy Customer Megatrends*

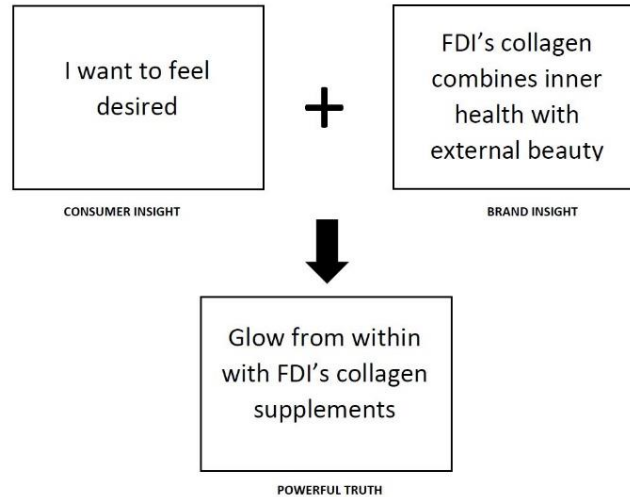
There is a growing consumers group within all developed regions that are becoming more nutritionally literate and are seeking high quality, fresh and healthy foods that improve general health and wellbeing.

*Sustainable Solutions – driven by Smarter Food Chains and Choosy Customer Megatrends*

Environmentally and socially responsible manufacturing process and products, and the recovery of novel, value-added products from waste streams.

Freeze Dry Industries process for producing collagen is an extremely Clean and Green, environmentally friendly process. It is a natural, 100% Australian, no chemicals or additives used product. FDI use no brining or alkaline additives.

Freeze Dry Industries have designed their BST – Brutally Simple Thinking – with the nutraceutical collagen customer in mind. Used in advertising, this is the simple, relevant and motivating Highest Order benefit. A fundamental drive of people is to feel happy and healthy; a common belief that one supports the other. Freeze Dry Industries intends to tap into this core human drive to market the collagen.



## 5 Discussion

### 5.1 Recommendations

Freeze Dry Industries are currently conducting more research in regards to further refinement and filtering of the product. A clear production process needs to be clarified then an active stage of product development. Once products have been articulated and developed, a thorough market testing regime can begin.

### 5.2 Project Objectives Met

This Research Project had an objective of: *Identify 3 to 5 fold value-adding opportunities through the use of freeze drying in red meat industries.*

Freeze Dry Industries have successfully narrowed in on one incredibly exciting and viable value adding opportunity for the red meat industry. Via freeze drying technology, FDI can transform the industry's waste hides into a highly valuable and functional ingredients. The indicative value multiplier displays this uplift at an increase of 10 - 20 fold.

#### 5.2.1 Unanswered questions; additional research, what could have been improved.

Freeze Dry Industries still need to conduct research on additional refinement of the collagen product. The question of the production process to create such a filtered product remains unanswered and is still the focus of much research.

## 5.2.2 Practical Implications for Industry

The practical implications for the industry are three fold.

1. Australian meat producers are one of the largest suppliers of salted and wet-blue hides to the world market. This process is extremely environmental damaging. Freeze Dry Industries have articulated a clean and green process to process the hides. Their process is not environmentally degrading and does not release brine into the local eco-system.
2. The hides that don't get processed for further use otherwise become landfill at a cost to the producer. Freeze Dry Industries process turns this cost centre into a profit centre for the Industry.
3. Through freeze drying technology, the Industry can now be a vital tool in the production of collagen. This will allow the farmer and producer to be an imperative cog in the wheel of new industries entirely – namely the nutraceutical, cosmeceutical and ultimately medical industries.

## 6 Conclusions/recommendations

### 6.1 Research & Development

The next stage of the Collagen project is further refinement, formula creation and production processes. Once the above is confirmed for the base collagen, further development can begin on the Grading of the collagen – i.e. pet health, human consumption, medical grade. Freeze Dry Industries envisage the path to medical grade collagen will be many months.

Freeze Dry Industries recommendation would be to engage the easiest market to enter initially – the pet health market. Once the product and sales have been proven, then look at advancing the collagen purity to the next stage – human health. The last phase (given the likely time and resource needed) will be the medical grade collagen. Freeze Dry Industries will take this 3 step approach to product and market development.

In conjunction with MLA, FDI will seek to engage all relevant stakeholders with the roll out and adoption of these strategies.

## 7 Key messages

1. Identify waste and low value raw inputs
2. Analyse the pathways for capture
3. Validate the inherent value
4. Test consumers/demand
5. Map the production process
6. CBA the challenges
7. Identify resource partners
8. Validate the Business Model for Go/No Go.

Different behaviours adopted by key processors will be surrounding the collection of the hides.

Rather than discard, there will need to be a QA approved collection system.

With the support from the Industry, the key producers will very quickly be able to start generating income from what was an existing cost centre.

This in turn should create positive social benefits for the Industry through the creation of more jobs and more income, particularly in regional areas where jobs are hard to come by.

## **8 Bibliography**

1. MLA "Co-products Compendium 2009"
2. USQ Report "Valorisation of freeze-dried bovine hide. A product quality examination and comparison"
3. Grandview Research "Collagen Market Size, Share and Trends Analysis Report 2019 – 2025"
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5. Euromonitor, 2010 figures
6. CSIRO "Global Megatrends – Seven Patterns for Change Shaping our Future"