



final report

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Review of meat spreads/fillings design and usages and occasions.

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Purpose: This research aimed to identify the key trends in sandwich spreads and preliminary opportunity spaces red meat could explore. Included is an overview of the key ingredient functionality, potential red meat selections and yield/cost formulations for meat spreads and fillings to assist next stage discussions with industry as part of MLA's 'insights2innovation' program adding to the current "Meat Snacks" theme.

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Executive summary

Currently in the Australian market, red meat solutions for lunch sandwiches are limited to sliced/shaved deli meats (pastrami, roast beef/lamb, corned meat) and ground meat such as burgers and mince jaffles for toasted sandwiches with ham and chicken loaf products more dominant along with jams and spreads (e.g. vegemite, peanut butter, honey). However in Europe for example, there are wide ranges of meat spreads available typically based on mayonnaise or egg fillings with meat whilst in Australia, tinned tuna and to a lesser extent chicken meat dominate retail shelves.

This research project aimed to identify the key trends in sandwich spreads and preliminary opportunity spaces red meat could explore. Included is an overview of the key ingredient functionality, potential red meat selections and yield/cost formulations for meat spreads and fillings to assist next stage discussions with industry as part of MLA's 'Insights2Innovation' program adding to the current "Meat Snacks" theme.

This project has identified an immediate opportunity and a commercial manufacturer interested in developing and commercialising a red meat combination sandwich filling/meat spread.

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Background

Meat spreads are traditionally a ready-to-eat, shelf stable meat based products. These products can be directly spread on sandwiches, toasts, crackers, roti, biscuits or used as filling for pastry. Meat spreads are suitable for breakfast, dinner occasions, or as convenience snacks. The colour of meat spreads range from brownish to light pink, but might also include slight green & orange due to presence of vegetables such as carrot & peppers/chili. The texture of meat spreads is thick paste-like and are sometimes fibrous. The taste/ flavour of meat spreads are most often salty, but can be spicy and umami due to the addition of non-meat based products. The aroma of meat spreads range from being mild to strong depending upon the protein used, however most retain some odour of meat product.

Meat spreads are highly popular due to their ready-to-eat and convenience nature, with “sandwich spreads” being particularly suitable for modern busy lifestyles. Meat based spread products are tasty and usually are consumed well by small children as well as the elderly.

US Market

American sandwich spread staples are slowly stagnating as Americans cook less, eat out more, and switch to bolder, spicier condiments, such as salsa. Market research from Packaged Facts¹, the sandwich spread market of which meat spreads are a minor sub-sector, is stagnate at \$3 billion and is likely to continue struggling due to a lack of product and packaging innovation.

Packaged Facts projects that sandwich condiment sales will continue a downward trend begun in 2004 with sales are expected to sink to just under \$2.9 billion. Mayonnaise still dominates with a share of 59%, followed by ketchup and mustard. All sectors have continued to fall off steadily without loss in market share. With only 36 new product introductions between June 2005 and June 2006, most of which were launched by smaller players in the market, there was little hope of driving substantial market growth.

However, there is an opportunity to promote the health benefits of some sandwich spreads specifically formulated to meet the needs of health-conscious consumers, such as lycopene-rich meat spreads or sauce and low-fat mayonnaise, will helped to arrest further market decline. Similarly, upscale, gourmet, and organic versions of the popular spreads will renew interest in the market as well.

More innovation is necessary to keep up with today’s more sophisticated consumer palates and desire for exciting and novel flavours.

Recommendations

The desktop review of the market opportunity for red meat based meat spreads and pastes undertake in this project demonstrate that there is a market opportunity for an Australian

¹ Packaged Facts, a division of MarketResearch.com, Accessed March 2017
<http://www.PackagedFacts.com>

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manufacturer to develop a meat spread product or combination spread, based on Australian beef or lamb for both domestic and export markets.

This report makes the following recommendations;

1. Identify a suitable food manufacturer or red meat processor with an interest in exploring the opportunity and the required capability.
2. Develop a shared understanding of the potential market and value of the opportunity
3. MLA partner with a suitable manufacturer to;
 - Develop possible business models and supply chains. This will include investigation of retail market interest
 - Develop bench-top concept products for consumer sensory evaluation and insights
 - Identify required manufacturing processes and equipment
 - Determine packaging form and function
 - Develop a brand and market positioning
 - Undertake manufacturing trial to finalise manufacturing process requirements
 - Finalise packaging and labeling to meet relevant food standards and regulations.
 - Secure Retail supplier agreement.

The Author of this report has conducted discussions with various domestic manufacturers regarding the market opportunity, capability and willingness to explore the opportunity.

A final recommendation of this report is to progress discussions with several companies provided commercial in confidence to MLA to pursue whom have expressed interest in the opportunity and they have suitable manufacturing capability, including high pressure processing. They have the ability to position any new innovative Australian red meat based meat spread or combination spread as a fresh chilled, ready to use product.

Project objectives

The objectives for this project were as follows;

- 1. Evaluate current meat spreads – meat, ingredients, packaging and process design and intended use and market pricing including consideration for:**

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- Sauce selection – Egg, Mayonnaise, tomato, curry, oil, wine etc.
- Meat selection – beef, lamb, chicken, pork, tuna, duck, offal
- Texture – paste, meat fibres
- Packaging – tins, jars, tubs
- Usage - On bread, crackers; tapas/entrée, lunch

2. Develop preliminary specifications and performance criteria for 3 meat spreads concepts (all with red meat inclusion)

- Develop preliminary product and packaging specifications and performance,
- Prepare indicative costings
- Develop possible process flow chart
- Develop proposed “meal solution/occasion/usage” concepts

3. Describe key technology criteria for food safety and formulation of meat spreads/fillings – include overview of meat selection and enabling technology platforms in the above concepts and review of current market spreads

- Mixing and blending with sauces
- Desired texture
- Hot filling and post-pack pasteurisation (e.g. retort, high pressure processing) against modified atmosphere/active packaging options.
- Fundamental food chemistry criteria such as pH and water activity

Results and Discussion

Meat Spread Landscape

Meat spreads are traditionally a ready-to-eat, shelf stable product. The product can be directly spread on sandwiches, toasts, crackers, roti (Indian flat bread), biscuits & filling for pastry. Meat spreads are suitable for breakfast, dinner, occasions, or as convenience snacks. The colour of meat spreads range from brownish to light pink, but might also include slight green & orange due to presence of vegetables such as carrot & peppers/chili. The texture of meat spreads is thick paste-like and are sometimes fibrous. The taste/flavour of meat spreads are most often salty, but can be spicy and umami due to the addition of non-meat based products. The aroma of meat spreads range from being mild to strong depending upon the protein used, however most retain some odour of meat product.

Meat spreads are highly popular due to their ready-to-eat and convenience nature, with “sandwich spreads” being particularly suitable for modern busy lifestyles. Meat based spread products are tasty and usually are consumed well by small children as well as the elderly. The most common place of purchase of meat spreads is in person via local supermarket chains such as Coles, Woolworths or IGA in Australia. However, there is a growing trend for food purchases to be made on-line, as traditional “bricks and mortar” retailers move toward online platforms that either allow the consumer to “click and pick” or have the food products delivered to their home.

Almost all meat spread products currently available are canned products with reportedly pull-tab top “easy” openings. Cans are tin plated metal with an epoxy lining. There have been previous concerns about the use of epoxy in relation to unreacted BPA, a known endocrine disruptor in humans linked with infertility, obesity, diabetes and reproductive problems. Recent reports from a group of non-profits shows that up to 2/3 of cans on U.S. grocery stores shelves still contain BPA, despite this issue gaining widespread public attention over a decade ago. Furthermore, even in cans where BPA had been removed, there has been little information on the chemicals that have replaced BPA (<http://www.toxicfoodcans.org/>). On the other hand, the use of tin-plated cans as packaging media has benefits such as its ability to prevent oxygen ingress over extended periods, ease of sterilization, ease of transportation, and relatively low cost.

Meat spread products at least have ISO 22000: HACCP – Food Safety Management System and HALAL.

A related meat-based product is **meat slurry**, **reconstituted meat**, or **emulsified meat**. These are a liquefied meat product that contain fewer fats, pigments and less myoglobin than unprocessed dark meats. Meat slurry is more malleable than dark meats and eases the process of meat distribution in food products as pipelines may be used. Meat slurry is not designed to sell for general consumption; rather, it is used as a meat supplement in food products for humans, such as chicken nuggets, and food for domestic animals. Poultry is the most common meat slurry; however, beef and pork are also used.

There are also a wide variety of “**wurst**” products (originated from the Germany, meaning sausage) which are broadly described as a cylindrical meat product usually made from ground meat such as pork, beef, or veal. Liverwurst is made from pigs' or calves' livers and contain meat (notably veal), fat, and spices including ground black pepper, marjoram, allspice, thyme, ground mustard seed, or nutmeg.

Nduja is a particularly spicy, spreadable pork salumi from Italy. It is typically made with parts of the pig such as the shoulder and belly, as well as tripe, roasted tripe, roasted peppers and a mixture of spices. It is loosely based on the French **andouille** introduced in the 13th century by the Angevins. Nduja is stored in the refrigerator and is rested on a benchtop to soften before being used as a spread on bread or as an ingredient in pasta sauce.



Figure 1 - Nduja

Consumer Trends

Protein: the hunger busters

Globally, consumers are eating more protein. In 2015, between 25% and 33% more European consumers reported increasing their dietary protein intake compared to the same period in 2014 (Mintel, 2016).

Consumers are adding protein-rich food and drink products to their diets for a wide range of perceived health reasons, including muscle building/maintenance and to support muscle recovery. Foods and diets high in protein have also been shown to have satiety-enhancing properties and are implicated in weight management. Hence, consumers are more commonly using protein as a weight management tool (for both weight loss and weight maintenance), and to help satisfy their appetite and reduce snacking. Other reported reasons for consuming meat proteins include;

- To help build muscle and assist with muscle recovery
- To help lose weight
- To help maintain a healthy weight
- I am following a high protein diet
- I am eating more protein in place of carbohydrates
- To help me snack less and satisfy my appetite
- To help maintain muscle mass

Red meat is an integral source of protein (including essential amino acids), as well as vitamins (including B12), minerals (including iron and zinc), essential fatty acids. Protein derived from red meat represents an opportunity to consume nutrients that are involved in disease-protective and health-promoting mechanisms, including slowly released energy to assist with appetite control and long-term weight management.

Snackification.

It is widely recognised that the current global consumer food trends driving innovation in the food industry are *Convenience*, *Snackification*, desire for increased *Satiety* (fullness between meals) to assist with weight management, desire for *High quality protein*, and desire for *naturally functional foods ingredients*. Meat spreads and pastes are an opportunity for companies to meet these consumer trends.

Health and wellbeing are high priorities for Australian consumers. Part of this is a desire to eat healthier diets based on plant-based foods with some meat. In recent times, red meat has attracted negative “press” considering associations with cancer in the scientific literature. Hence health promoting meat-based food products would be of interest, especially if they are also convenient.

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The recent launch of canned chicken spread demonstrates the success of delivering on these trends, in particular snackification, high quality proteins and convenience.

Market Opportunity

The Australian snack food market is large and expected to continue to grow. The sector had \$2.1 billion revenue in 2010-11 and has grown to \$2.4 billion revenue in 2015-16 with an estimated 9-10% profit margin. The segment can be broken down as follows: Potato Chips 43%, Nutritious Snacks 15.8%, Nuts & Pretzels 15.5%, Extruded snacks 14.2% and corn chips 11.5% delivered through Wholesalers 42.6%, Supermarkets 33.1%, Convenience 10%, and Other 8.6% channels.

Growth in Australian snacking has been driven by a shift towards smaller and more frequent eating occasions:

- 53% of consumers are opting for smaller snacks²
- 90% of consumers snack multiple times throughout the day
- 47% of consumers say they really enjoy anything new and different or trying new kinds of ethnic cuisine
- Mirrored in global trends towards 'snackification'³

Jerky is often considered the most popular "meat snack", however in Australia, this market represents ~\$56.2m sales, making up only 2.34% of the Australian snack market.

² Snacking Opportunities, Building Better Snacks, The Hartman Group, Date: Oct 2015.

³ Mellentin, J. (2015) New Nutrition Business "10 Key trends in food, nutrition, & health 2016" Volume 21, Number 2/3.

Current Meat Spread/fillings Product Offerings

Australia

Company: General Mills (Australia)

Brand: Peck's (Diablitos Underwood Meat Spread in Venezuela)

Web: <http://generalmills.com.au>

Summary: Peck's meat spreads were introduced in England in 1891. Thirteen years later, the British-based Harry Peck & Co. began exporting its products to Australia. By 1938, Peck's set up in Australia and began making canned meat and fish products, having its strongest sales in the 1950s and 1960s when Peck's was touted as an affordable way to add protein to the diet. Today, Peck's products are made at a General Mills plant in Sydney. Most the meat proteins used in Peck's come from Australia and are white-meat based. Peck's do not currently manufacture a red meat based product.

Product Range: Anchovette, Chicken and ham, Devilled ham, Salmon and lobster

Texture: All pastes/spreads

Sauces: Nil

Ingredients:

Chicken and ham – unspecified components

Anchovette - Fish 67% (salmon, anchovies), water, wheat flour, salt, flavour, acidity regulator (330), colour (172).

Usage: Spread on crackers, burgers or sandwiches/toast, pizza bases

Packaging: Glass jar with metal lid, 125g

RRP: AUD \$2.70



United States

Company: Underwood Meat Spreads

Brand: Underwood Meat Spreads (USA)

Web: <http://www.underwoodspreads.com>

Summary: The Underwood Devil logo, which was registered in 1870, is believed to be the oldest registered trademark still in use for a pre-packaged food product in the United States. The Underwood red devil symbol was to identify the company's first product – devilled ham.

Product Range: Corned Beef, Devilled Ham, Liver Wurst, Roast Beef, Chicken Spread

Texture: Pastes/spreads

Sauces: Nil

Ingredients:

Corned Beef - Beef, water, salt, seasoning blend.

Roast Beef - Beef, water, salt, seasoning blend.

Usage: Spread on crackers, burgers or sandwiches

Packaging: 100% steel cans, 120g

RRP: USD 2.55



United Kingdom

Company: Mitsubishi Corporation

Brand: Princes

Web: <http://www.princes.co.uk>

Summary: Founded in 1880 by Simpson & Roberts, Princes has grown from being an importer of canned fish into a leading food and drink supplier with products ranging from fruit juice, canned meat, fish and fruit to microwave meals and sandwich spreads.

Product Range: Beef, Beef and ham, Tuna and mayonnaise, Sardine and tomato

Texture: Pastes/spreads

Ingredients: *Tuna and mayo* - Tuna (50%), Minced Cod (20%), **Mayonnaise** (16%) (Vegetable Oil, Egg Yolk, Spirit Vinegar, Salt, Sugar, Mustard), Water, **Potato Starch**, **Rusk** (Wheat Flour, Water, Salt, Raising Agent (E503)), **Soya Protein Concentrate**, Concentrated Lemon Juice, Salt, Ground Mustard, Ground White Pepper.

Sardine and tomato - Sardine (33%), Minced Salmon (15%), Mackerel (15%), Water, Minced Cod (8%), **Concentrated Tomato Paste** (4%), Potato Starch, Barley Malt Vinegar, **Soya Protein Concentrate**, **Rusk** (Wheat Flour, Water, Salt, Raising Agent (E503)), Sugar, Salt.

Beef and ham - Beef (33%), Water, Ham (27%) (Pork, Water, Salt, Preservatives (E252, E250),

Antioxidant (E301), Dextrose), Chicken (8%), **Soya Protein Concentrate**, **Potato Starch**, **Rusk** (Wheat Flour, Water, Salt, Raising Agent (E503)), Chicken Fat, Ground Mustard, Ground Black Pepper.

Beef (36%), Chicken (33%), Water, Soya Protein Concentrate, Potato Starch, Beef Stock (Beef Extract, Yeast Extract, Water, Chicory Fibre, Salt, Sugar, Cornflour, Onion, Spice), **Rusk** (Wheat Flour, Water, Salt, Raising Agent (E503)), Stabiliser (E472e), Salt, Yeast Extract, Ground Mustard, Barley Malt Extract, Ground White Pepper, Nutmeg Extract

Usage: Spread on crackers, burgers or sandwiches/toast, pizza bases

Packaging: Glass jar with metal lid, 75g

RRP: AUD 2.92



Company: Bingham's

Brand: Bingham's British

Web: <http://www.bingham'sfood.co.uk/>

Summary: Charles Bingham started producing delicious fresh spreads and potted meats way back in 1914. The company is a traditional retailer based in Sheffield UK with products available at all major UK grocery stores. Product sales have historically grown at 10%pa. Bingham's marketing emphasizes quality ingredients, old recipes, and tradition: *"Our Butchers who hand trim the finest cuts of the best British beef and pork, which we use in our Potted Meats and Spreads. Our Cooks who ensure that the meat is slowly steam cooked to concentrate the meaty flavours and is only cooked in small batches. So they can guarantee that every product tastes as good as the last. Our Technical Team who say 'No to Offal!'"*

Product Range: Beef & Pork Spreads and whole cuts.

Texture: Pastes/spreads or fibrous meat portions

Ingredients: Beef, beef stock, spices, thickeners, and flavours.

Usage: Spread on crackers, burgers or sandwiches/toast, pizza bases

Packaging: Plastic container with plastic lid. 100g.

RRP: UK 1.10



READY TO EAT

BINGHAM'S BEST POTTED BEEF

INGREDIENTS: Beef (77%), Beef Stock, Water, Salt, Black Pepper, Dextrose, **Wheatstarch**, Maltodextrin, Yeast Extract, Spice Extracts (Cayenne, Nutmeg, Pepper), Natural Flavouring.

ALLERGY ADVICE: For allergens including cereals containing gluten, see ingredients in **bold**.

Company: Podravka (Croatia)
Brand: Podravka Sandwich Spread
Web: <http://www.podravka.com>

Summary: This food and beverage company was founded initially as a fruit factory in 1934, in Croatia. In 1947, the company was named Podravka. In 1949, Podravka started producing fruit jam and later [candy](#), [mustard](#), [ketchup](#), [fruit brandy](#), instant soup and [canned meat](#).

Product Range: Chicken liver, Pork liver, Tea-time paste

Other variations: Chicken and **peanut**, Chicken and **asparagus**, meat and **chives**, meat **Pasticada** (based on a Dalmation hot pot recipe) (from Podravka's gourmet range called Delikates)

Texture: All pastes

Sauces: Nil

Ingredients: Various

Usage: Spread on crackers, burgers or sandwiches/toast, pizza bases

Packaging: Metal can 50g or 100g with a ring-pull for opening

RRP: AUD 2.70 per 100g (sample shows 2x50g portions in a twin pack)



Asia

Company: Lady's Choice Philippines
Brand: Lady's Choice
Web: <http://www.ladyschoice.com.ph>

Summary: Since 1956, Lady's Choice has offered food products to Filipino families, including spreads/pastes, mayonnaise.

Product Range: Beef liver spread, Chicken spread, Ham Spread, Bacon spread, Chicken BBQ spread, Roast Beef spread

Texture: Paste/spread

Sauces: Nil

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Ingredients:

Beef liver spread - Beef Meat (24%), Water, Beef Fat, Beef Liver (17%), Beef Connective Tissue, Bread Crumb (With Gluten), Salt, Wheat Flour, Sugar, Spice, Tomato Concentrate, Modified Starch, Preservative (Sodium Nitrite).

Usage: Spread on crackers, burgers or sandwiches/toast, pizza bases

Packaging: Metal can 165g with a ring-pull for opening or glass jar with plastic lid

RRP: AUD 2.50



Meat-based Dipping Sauce/Jams

Company: Bacon Jam (Australia)

Web: <https://www.thebaconjams.com>

Summary: Bacon Jam is a small Australian family business, started in 2014. Bacon Jam is made from all-Australian ingredients (except for the maple syrup), and is sold across Australia and very soon internationally.

Product Range: Bacon Spread with Red Chile and Garlic, Bacon Spread All Original, Bacon Spread with Black Pepper, Bacon Sauce with Worcestershire

Texture: All pastes/spreads

Sauces: Nil

Ingredients:

Usage: Spread on crackers, burgers or sandwiches, toppings on cooked seafood, fillings

Packaging: 150g glass jar with metal lid

RRP: AUD \$6.95



Company: The Bacon Jams (USA)

Web: <https://www.thebaconjams.com>

Summary: Bruce Kramer and Chef Michael Oraschewsky produced a range of spreadable bacon (they called jams) for dishes in Kramer's restaurant. Customers loved them so much that Kramer and Oraschewsky teamed up to sell them on line (August 2013) – the genesis of their company "The Bacon Jams".

Product Range: Bacon Spread with Red Chile and Garlic, Bacon Spread All Original, Bacon Spread with Black Pepper

Texture: All pastes/spreads

Sauces: Nil

Ingredients:

Bacon, onion, garlic, brown sugar, Vinegar (apple cider, balsamic, or sherry), maple syrup. Other ingredients can include coffee and tabasco sauce.

Usage: Spread on crackers, burgers or sandwiches, toppings on cooked seafood, filling in pastries

Packaging: 241g glass jar with metal lid

RRP: USD 15.00



Market Opportunities

- **Drive for nostalgia in some food products.** These were foods or brands that were consumed during times of depression or 'good old days' or noteworthy life events. There has been a movement towards eating what our ancestors ate. A good example of this is the popularity of "Pecks" paste varieties in Australian homes during the 1950's and 1960s. During times of economic challenge these food items became a staple, even popular. Not in fashion foods, but foods that have a history may represent an opportunity.
- **Portion control.** Most spreads are in the 80-120g product weight range. There may be an opportunity to further reduce the red meat portion size, but also supplement with other ingredients such as vegetables, grains, seeds and nuts.
- Look for opportunities in **chilled rather than shelf stable.** Emphasize Australia's clean, green, and healthy living philosophy with product offering that match. The general population is educated sufficiently to be suspicious of red meat containing products that purport to be shelf stable and not require refrigeration.
- **Packaging.** Opportunities exist to utilize packaging innovations in new ways in packaging meat spread products. Squeeze tubes, single serve tubs, multi-component packaging, and edible packaging as examples offer packaging formats which may be novel in the context of red meat products.
- **Food Innovations at a reasonable cost** – New low temperature (<24 C) food processing technologies or active/intelligent and smart packaging technologies offer potential innovation for meat spreads, but the benefits must be balanced against proven performance and costs.
- **Population and diversity trends.** Look for opportunities that meet the needs of Australia's aging, but health conscious population. The ability to eat adequate food to maintain a healthy nutritional status and to prevent malnutrition increases with age. This is not only because of greater disease prevalence but also because of negative effects of polypharmacy, poor dentition, and difficulties with swallowing that ultimately reduce appetite. Meat is usually a reliable source of highly absorbable protein, however the texture of meat and the need to chew it well presents limitations for many elderly people. Therapeutic diets compose texture modification of foods and especially of meats to achieve a minced, pureed or very soft consistency. Another aspect is that smell can reduce the desire to consume.

Product Ideas

1. Red Meat Rounds

Concept

Individually wrapped discs or “rounds” of meat-based spread that could be eaten whole as a snack. In this case, another core food groups would be included within the “round” as a composite ingredient. Candidate ingredients include grains (quinoa, sorghum, millet, rice, barley), seeds or nuts. A formulation would need to be developed where grains are cooked separately and added to the spread. The spread would be red-meat based (e.g. beef, veal, goat) using non-premium cuts and seasoned and flavoured with herbs and/or vegetables (e.g. chives, asparagus, garlic, mushrooms).

Other applications for this product include toppings (e.g. bread, crackers, pizza bases, wraps/tortillas), fillings (e.g. pastry cases, hors d'oeuvres) and stuffings (e.g. chicken and turkey cavities) making it suitable for individual consumption and commercial food service or catering settings. For any application, the “rounds” could be made to the recipe of popular dishes (e.g. Podravka - Dalmatian flavoured paste or stroganoff), again ideal for toppings or fillings (e.g. vol au vents).



Figure X – Red Meat Round concept as an individual snack

Performance Considerations:

As a snack – Recipe requires a higher proportion of composite ingredient (min 50% grains, seeds or nuts). In this way, the product would resemble more of a grain cake with meat. Texture would need to be less spreadable and have a grain texture and be heterogeneous. The product needs to have fully developed flavours and be complete as a standalone snack. Consumed direct from refrigerator, the product does not require heating and is a convenient high protein healthy snack.

As a filling/topping/stuffing – The recipe could contain a very high proportion of meat and may not require a grain/nut/seed component. The purpose of this application is for the product to be consumed in combination with another product such as bread, crackers, pastry casing, or other proteins. The texture would be more spreadable, but should contain seasoning and vegetables as described above.

Target Consumer Group:

Individual premium retail sale and food service – hospital, residential aged care, correctional services

Target Price: \$X-Y (make up based on cost of other similar/comparable products)

Meat Selection: Non-premium cuts.

Potential Food Manufacturing Partners: Search a list of Food SMEs that could make the product and list here with websites

Packaging:

As a snack – Individual premium metal foil wraps

2. Steak Jam

Concept

Steak jam could be prepared in an analogous way to bacon jam and have similar applications. “Surf and turf” without the need for a complete steak. The beef flavour could be used in conjunction with Seafood. Spread on crackers, burgers or sandwiches, toppings on pizza, dipping sauce or pastry fillings. As a condiment, in conjunction with roasted vegetables. Etc. Costing - \$6.50-10 AUD.

3. Meat tea

Concept

Could be a dehydrated spread or granules that become hydrated once immersed in hot water. This could be consumed as a tea or as a soup seasoning.

New Products based on packaging innovations

1. Squeezable meat spread



2. Protein Pops

The packaging could be easily removed and the mass placed into the liquid or the packaging itself could dissolve in the liquid. Need to be able to dilute into water as a tea or soup. See example of packaging in dishwasher.



Meat paste could be flavoured or other essential nutrients or flavours could be included to enhance desirability and effectiveness. For example, the protein pop could contain an anti-oxidant ball, calcium sachet, or DHA based compartment as supplements.

Beef casserole, beef burgundy, beef bolognaise “protein pops” that are stored in a refrigerator.

Combination spreads

Moira Mac's is a manufacturer of ready to eat fresh cooked chicken meat products. The business was established in 1983 as a deli then in 2011 purchased high pressure process technology to ensure control of food safety risks while maintaining a premium quality fresh cooked product.

Following discussion with Dean Russell, Managing Director of Moira Mac's, Dean has a future strategy to develop new innovative combination spreads for savoury applications and usage. As Moira Mac's is a chicken based manufacturing facility all the new production development is based upon chicken.

In discussions Dean has indicated a willingness to partner with MLA to develop a range of red meat based spreads incorporating complimentary ingredients such as avocado and mayonnaise. This new innovative product range would also be processed with HPP technology to extend the chilled shelf life without compromising flavour and texture.



Key Technology Platforms

Spoilage

Spoilage occurs when a food product decays, decomposes, or deteriorates such that it is no longer edible, or is less desirable to the consumer. Spoilage often results in unpleasant changes to the odour, colour, flavour, texture, and other properties of the product and often changes the nutritional properties of the food.

Historically, salting, drying, smoking, fermentation and canning have been the traditional methods used to prevent meat spoilage and extend its shelf life. However, to retain

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appearance, composition, flavour, and nutritive value, new methods such as cooling, freezing and chemical preservation have also been used.

More recently, active, intelligent and smart (AI&S) packaging innovations and low temperature (non-thermal) treatments have offered interesting innovations to extend fresh meat shelf life and ensure that the product characteristics are minimally affected prior to consumption by the customer. These areas of packaging and food treatment offer the best opportunities for both product differentiation and enhanced product characteristics such as improved flavour/taste and increased product life.

Packaging - Market Size

Innovations in active, intelligent and smart (AI&S) packaging solutions have the potential to be a key enabler in “meat spread” opportunities. Technologies in this area is rapidly evolving due to increased demand for fresh products, greater health awareness and safety concerns, and more intensive supply chain requirements.

The global market for AI&S packaging has been reported at USD \$11.7 billion and is expected to grow to \$24.7 billion by 2021. The United States is the largest consumer of AI&S packaging and is expected to achieve a \$3.6B market value in 2021 (S. J. Lee and Rahman 2014). The global snack food industry is currently USD \$380 billion, according to Global Industry Analysts (GIA).

Packaging – Target Market

The preferred “users” of packaging sensors for product spoilage are the distributors and inventory management teams at retail sites rather than end customers. Innovations will make it easier and faster for these personnel to identify defective packages and remove them from inventory or distribution before consumers select them. Ideally, distributors do not want customers to encounter spoiled products. Furthermore, the risk of false negatives and potential consumer confusion, spoilage sensors will be designed to be less consumer-facing.

Packaging - Sustainable Packaging, an Increasing Trend

Polymers are the most ubiquitous packaging materials, due to their range of desirable properties: transparency, low cost, ability to be thermally sealed, good mechanical properties, and controllable oxygen impermeability. These materials do an excellent job at protecting the food they contain from the physical environment, thereby extending product shelf life. The most common polymers used in the packaging industry are polyethylene terephthalate (PET), polyethylene (PE), polyvinyl chloride (PVC), polypropylene (PP), polystyrene (PS), and polyamide. Unfortunately, most polymers used for food packaging are not totally recyclable or biodegradable. They are petrochemical-based and as such have environmental and human costs, including the consumption of finite fossil fuels, energy intensive manufacturing processes, and the potential diffusion of additives into foods.

Sustainable food packaging should extend product shelf-life, reduce product damage, decrease the product’s environmental footprint during its life-cycle, and/or communicate information about the safety of the food product. These criteria must but met within a package that can deliver an attractive serving portion to the consumer.

Non-Thermal Processing – High pressure Processing (HPP) and Pulsed Electric Field (PEF) are two non-thermal processing techniques to provide a new meat spread product an extended chilled shelf life.

Micro-organisms decrease the shelf-life of food and nothing kills microorganisms as effectively as heat. In addition, heated pasteurization technologies can cost significantly less, about 85% less, than non-thermal technologies. For example, a high-pressure processing (HPP) machine can cost roughly USD 6 Million while a competing commercial grade, heated processing device only costs about USD 1 Million. Unfortunately, heating can also damage

the appearance, taste, feel and nutritional aspects of food, sometimes to the extent that it decreases consumer demand.

Non-thermal (less than 24C) processing technology can leave food near its natural state while reducing the number of micro-organisms, yet not to the reduction level that thermal processing technology can achieve. In addition, it requires much greater costs – both with regards to equipment purchase and operating costs. Operating costs are high due to system complexity and process flow.

Some non-thermal technologies are much more complex than simply heating up water and running packaged goods through it. For example, HPP requires a robust pressure chamber that can withstand hundreds of megapascals (MPa) of pressure. Furthermore, some technologies require batch processing while thermal technologies can use continuous processing to increase throughput thereby making the process more efficient.

pH and Temperature

The proper temperature and pH are critical for the growth of micro-organisms. The optimum pH for growth of most bacterial species is 6-7, but lactic acid bacteria have optimum growth at pH 5.5-5.8 and can grow in foods at pH 4. Bacteria are also classified according to the optimum temperature for growth:

Bacteria	Minimum (°C)	Optimum (°C)	Range (°C)
Psychrophiles	-10 to 5	12-18	-10 to 20
Psychrotrophs	0 to 5	20-30	0-30
Mesophiles	5-10	30-40	10-45
Thermophiles	20-40	55-65	45-75
Hyperthermophile	80	90-100	65-120

The optimum pH for growth for most yeasts is 4.5-5.5 and grow in foods with pH as low as 1.5. Others have a wide pH tolerance and can grow at pH values between 3 and 10. Most yeast species are mesophiles.

Water Activity and Bacterial Growth

Water in food that is not bound to food molecules can support the growth of bacteria, yeast, and mould. The term water activity (a_w) refers to this unbound water. The water activity of a food is different to its moisture content. Although moist foods are likely to have greater water activity than are dry foods, this is not always the case. The a_w of a food is the ratio between the vapor pressure of the food itself, and the vapor pressure of distilled water under identical conditions. An a_w of 0.70 means the vapor pressure is 70% of that of pure water. Most foods, including red meat, have an a_w above 0.95, which provides sufficient moisture to support the growth of bacteria, yeasts, and mould. The amount of available moisture can be controlled to inhibit the growth of microorganisms.

Predicting Food Spoilage

Water activity has its most useful application in predicting the growth of bacteria, yeast, and mould. It is necessary to control a food's pH or the level of water activity or a suitable combination of the two. This can effectively increase the product's stability and make it possible to predict its shelf life under known ambient storage conditions.

Food can be made safe to store by lowering the water activity to a point that will not allow pathogens such as *Clostridium botulinum* and *Staphylococcus aureus* to grow in it.

V.RMH.0061 Review of meat spreads/fillings design and usages and occasions.