final report

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Concept Development of a Meat Pie for Dysphagia Sufferers (TCF)

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Abstract

Background: Food choices for those with a chewing and swallowing problem (dysphagia) are limited. Textured Concept Foods (TCF) provides innovative, nutritious, tasty and recognisable foods to this population. The project aimed to create a puree meat pie.
Method: TCF liaised with Monash Food Innovation Centre (MFIC) to develop vacuum-formed moulds for pastry and realistic meat cubes and vegetables. MFIC developed the pastry and gravy for the meat pie. Consumer insights were conducted. Product was tested in manufacturing production kitchen for viability.
Results: The meat pie was nutritionally dense (1370kJ and 35.4g Protein). The pie base is gluten-free and dairy-free. The taste was acceptable to consumers. Mass production proved to be difficult due to the labour-intensive method. Heating of the pie was perfect at frozen within the test kitchen, 130°C for 35 minutes; however, was not successful in other oven environments. International Dysphagia Diet Standardisation Initiative tested as easy to chew texture not pureed under imperfect heating situations.

Conclusion: The Meat Pie project was successful in designing a texture modified meat pie. Further work is required for semi-mechanical or automation to reduce the labour-intensive production method and heating in a range of ovens. The pureed meat pie would be well-accepted in the dysphagia market.

Executive Summary

Why was this done/what was the problem?

Dysphagia is the condition where swallowing difficulties occur at various stages of the eating and drinking process (Malhi, 2016). Although only 8% of the world population suffers from chewing and swallowing problems, it affects 24% to 64% of the elderly population with a higher per cent (50-70%) in residents living in a residential aged care facility (RACF) (Malhi, 2016). A clinical dysphagia diagnosis of those living in a RACF is reported at a conservative 12.8% (Jukic Peladic et al., 2019) to 13.4% (Payne and Morley, 2018) while other research reports 68% are impacted by dysphagia (Madhavan et al., 2016).

The aged population is not the only population with dysphagia. USA figures suggest one in 25 adults experience a swallowing problem (www.asha.org), one problem surprisingly being gastroesophageal reflux disease (Eslick and Talley, 2008). Table 1 highlights the diseases and conditions which are affected by dysphagia.

Table 1. Dysphagia occurrence in populations other than dementia

Population / Disease	Per cent (%)
Adults over the age of 50 years	22%[A]
Elderly population receiving inpatient medical treatment	30%[A]
Residents in long term care	68%[A]
Elderly in independent living accommodation	13-38%[A] or 15-32%[D]
Neurogenic diseases (e.g. Parkinson's Disease, amyotrophic lateral sclerosis)	90%[A]
Multiple sclerosis	24-34%[A]
Traumatic brain injury	38-65%[A] or 27-30%[C]
Head and neck cancer with oropharyngeal dysphagia	50%[A]
Gastroesophageal Reflux disease (GERD)	14%[A] -16%[B]
Endotracheal intubation	3-64%[A]
Intellectual disabilities	5-8%[A]
Stroke	8.1-80%[C]
Community-acquired pneumonia	91.7%[C]

[A]www.asha.org

[B] Eslick and Talley (2008)

[C]Takizawa et al. (2016)

[D]Payne and Morley (2018)

Food and fluids are required to be modified for a person to achieve their nutritional requirements. Not all foods can be modified, and many foods are removed from a person's menu. Eliminated food examples are sausages, pastry, pies, corn, green beans, sliced cheese, toasties, and sandwiches. Many red meat items are avoided even when braised or slow-cooked as they form a fibrous bolus when chewing. Typically the foods are pureed using a blender machine. It is common for texture modified meals to look unappealing, be repetitive, unrecognisable, served as scoops on the plate, or blended and often have the same colour combination (Spates et al., 1996, Wright et al., 2005, Hotaling, 1992, Milte et al., 2017).

Re-shaped or moulded meals have shown to be well accepted now, which can increase energy intake (Korb et al., 2013, Ott et al., 2018, Sun, 1998, Ott et al., 2019). Importantly, meal experience is enhanced as there is a better attitude toward serving and feeding a moulded meal (Keller and Duizer, 2014, Matwiejczyk et al., 2018, Germain et al., 2006). The moulded meals present some challenges to the catering industry in aged care (Matwiejczyk et al., 2018, Willis, 2017). The issues of correct and safe consistency, knowledge and skills, additional time, and cost factors play a role in texture modified meals, so continue to be presented in the scooped manner (Matwiejczyk et al., 2018, Willis, 2017, Garcia et al., 2018, Coleman, 1995, Dahl et al., 2002, Korb et al., 2013, Ilhamto et al., 2014, Keller and Duizer, 2014). The new International Dysphagia Diet Initiative (IDDSI) has employed stricter rules around allowed and not allowed foods and also provided testing techniques to check on the appropriateness (Cichero et al., 2017).

Textured Concept Foods (TCF) is a company built on passion, the desire for quality of life, and nutritional dining with dignity as its core mission statement. To enable those with dysphagia to dine with dignity, TCF produces meals which resemble real food, is real food, is tasty and nutritious. TCF's vision is to innovate, to create the meal experience, especially with foods no longer allowed due to their properties of blending or which are difficult to blend with an appealing appearance. There are many moulds on the market that are currently used, but one food that has not been seen on the market or has a mould available is the meat pie.

The objectives of the meat pie project:

1. Build and test minimum viable product (MVP) concept – Aussie Meat Pie (beef, sauce and pastry) - with target market/stakeholders, targeting International Day of Older Persons menu item;
2. Develop product and process specifications and preliminary costings to produce
3. Model the potential value creation and capture for Australian red meat industry for scale-up of beef-lamb-goat based meals for dysphagia sufferers and recommended next steps

The aim of this project explored the creation of a pureed meat pie which would satisfy the correct consistency, taste, low allergen and nutrient-dense nutritional profile. Furthermore, this project investigated the viability of commercial production of the pie.

How was it done

Re-shaped meals need to have a mould designed for re-shaping the pureed product. TCF engaged with Monash Food Innovation Centre to assist with the industrial design of the moulds. An affiliate, The Business of Food, assembled a team of chefs to develop a recipe for the pastry and sauce. TCF provided the unmoulded beef, peas and carrots as these items are already in production.

The Business of Food team had a brief to fulfil: must be puree smooth, gluten-free if possible, dairy-free if possible, delicious and tasty, use as many techniques currently used in the kitchen to reduce additional labour, only use real foods and natural ingredients, have a protein content of >25g, and fulfil the legislation amount of meat in a pie to be called a “meat pie”.

The design process of the moulds looked at several pies from famous bakeries to nana’s homemade pies to commercial “four-and-twenty” pies. The meat looked at the striations of meat fibres when meat is cooked and modelled cutting techniques of freshly cut carrots into quarters as one would do at home.

The kitchen sessions produced several trials where flavours and ingredients were tested. The TCF team were included in the result of the testing days to discuss the taste, appearance and consistency. The industrial designer adjusted the moulds to assist with effective heating and removal from the mould. The lid was refashioned to an angle to reduce drying. The meat cubes were designed to fit 60g of meat in the pie, and the stacking and positioning calculated to support the lid upon heating. Filling the pie with the gravy, meat and vegetables was carefully calculated for best heating and stability results.

Consumer insights were performed in two aged care homes. The meat pies were heated in the kitchen and served to specific residents on a puree diet texture. Residents who received the pie had variable ability to communicate. Carers providing feeding assistance also provided insights. The pie was tested for heating capabilities in the kitchen, holding capacity, taste, appearance and desire to have this on their menu. The management team of the facility also engaged in an insights session and taste test. Results indicated poor heat stability of the product when placed in a thermal container, the colour of the pie had variable results, and cooks did not follow heating instructions; however, the taste was well accepted.

The mould samples were produced by Acron Plastics with a few minor changes for production viability. A heating session was performed in ComCater’s test kitchen under different heating conditions, and trial production was performed in TCF kitchen. The meat pie was assessed by a Speech pathologist against IDDSI testing criteria. A microbiological and nutritional test was performed by DTS Lab Assurance. Further nutritional profile and cost of pie were performed in Foodworks®10 (Xyris Software) by an Accredited Practising Dietitian.

What was achieved

A texture modified meat pie was achieved under specific heating conditions. The pie is suitable for Easy to Chew (level 7) should heating cause some dryness of the lid. The pie did not achieve level 4 puree IDDSI testing on the day due to the heating of the product. The pie was delicious and had a protein content of 35g per serve. The protein and energy content of the pie fits the nutritional requirements for meals and is considered a nutritionally-dense product. The size of the pie fits a typical pie casing. The cost of the raw ingredients of the pie was $1.76. The pie is very labour intensive. Depending on the efficiencies of any further semi-automation or mechanical assistance, the pie was suggested to be sold at $7.00 - $9.50 per pie to cover labour, packaging, and logistics.

What industry benefits will arise from the work/results of and implications of the project

The Puree Meat Pie Project has provided TCF with confidence to innovate beyond the typical moulds available. The response from consumers, speech pathologists, dietitians, RACF teams and cooks was extremely positive. Red meat is typically the first food that is avoided when chewing and swallowing problems arise. Cooking red meat for texture modified diets is challenging. Texture modified menus have less variety and preparation of appropriately soft and easy to eat red meat is challenging. The menu options for red meat for those with dysphagia is reduced despite the nutritional benefits of red meat.

The meat industry should be encouraged to work with those food manufacturers in the texture modified field. Together they can find solutions to introduce more red meat options on the dinner plate, explore new cooking methods and use of more quality cuts of meat which can increase the repertoire for people with dysphagia. The space to produce soft and bite-sized diet texture red meat dishes and more puree red meat dishes is infinite. There is a demand for safe, correct, nutritious, low allergen and delicious meals. There are a lack of skills and inadequate specialised equipment in many kitchens to produce these meals. IDDSI suitable cooked red meat dishes are limited by equipment, recipe, and price when cooked in a regular kitchen at home, in a hospital or RACF kitchen. There is a large market for a range of IDDSI diet texture beef, lamb and goat dishes.

The project moulds also enable TCF to expand their range using the meat cube moulds to make lamb, beef and goat meat pies as well as lamb or goat curries, goat cauliflower rice biryani, or hearty beef casserole. The pastry lid can be used as a base for meat-lovers or lamb and feta gourmet pizza. The Puree Meat Pie project has produced not only a meat pie but also other red meat products using the moulds produced. TCF can offer a greater range of red meat dishes that are interesting and offers some cultural diversity to the menu.

The “value add” to the addressable market is substantial. The meat pie recipe contains 30% red meat. Based on figures of 5,000 in year one, the value add is worth $41,000-$44,000. If the demand doubles each year, by year three the “value add” quadruples. The key to driving the market is appealing fillings, a nutritious meal packed into a manageable meal and bringing back the delight of eating the basic foods once enjoyed.

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1 Background

1.1 The need for Innovation

Dysphagia is the condition where swallowing difficulties occur at various stages of the eating and drinking process (Malhi, 2016). Although only 8% of the world population suffers from chewing and swallowing problems, it affects 24% to 64% of the elderly population with a higher per cent (50-70%) in residents living in a residential aged care facility (RACF) (Malhi, 2016). A clinical dysphagia diagnosis of those living in a RACF is reported at a conservative 12.8% (Jukic Peladic et al., 2019) to 13.4% (Payne and Morley, 2018), while other research reports 68% are impacted by dysphagia (Madhavan et al., 2016).

The aged population is not the only population with dysphagia. USA figures suggest one in 25 adults experience a swallowing problem (www.asha.org), one problem surprisingly being gastroesophageal reflux disease (Eslick and Talley, 2008). Table 1 highlights to diseases and conditions which are affected by dysphagia.

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Further to ageing impacting on the incidence of dysphagia, a dementia diagnosis doubles the risk of mortality due to aspiration pneumonia (Payne and Morley, 2018). Malnutrition and dehydration are also common in those with dysphagia (Malhi, 2016). On the other hand, dysphagia can manifest in the elderly when there are incorrect feeding and eating positions, inconsistent food consistencies, oral and dental problems, and behavioural and cognitive issues (Santos et al., 2018). Therefore, meals and drinks are modified to improve safety and ease of swallowing (Cichero et al., 2017, Steele et al., 2018). Modification of foods is generally referred to as a texture modified diet (TMD).

Residential aged care facilities (RACFs) residents receiving a texture modified diet (TMD) may have an increased prevalence of weight loss, pressure ulcers and risk of malnutrition (Jukic Peladic et al., 2019, Okabe et al., 2016). Texture modified diets (TMDs) may also reduce oral intake translating to reduced energy intake which can result in an energy deficit and weight loss (Bannerman and McDermott, 2011, Massoulard et al., 2011, Wright et al., 2005). Moreover, it is well known that TMD menus have a lower micro and macronutrient content and vary in energy and protein content (Dahl et al., 2002, Vucea et al., 2017). The end product of the meal can be diluted nutrients and larger portion sizes to attempt to provide the required nutrition (Willis, 2017). TMDs have less variety (Keller et al., 2014) and following the regular menu closely can result in incorrect and dangerous textures (Ilhamto et al., 2014, Wright et al., 2005). As a result, there is a smaller choice of food options which also results in fewer snack options offered over the day (Wright et al., 2005). Many foods are eliminated from the menu. Sausages, pastry, pies, corn, green beans, sliced cheese, toasties, sandwiches are a few items that need to be avoided. Many red meat items are avoided even when braised or slow-cooked as they form a fibrous bolus when chewing.

It is common for texture modified meals to look unappealing, be repetitive, unrecognisable, served as scoops on the plate, or blended and often have the same colour combination (Spates et al., 1996, Wright et al., 2005, Hotaling, 1992, Milte et al., 2017). Re-shaped or moulded meals have shown to be well accepted now, which can increase energy intake (Korb et al., 2013, Ott et al., 2018, Sun, 1998). Importantly, meal experience is enhanced as there is a better attitude toward serving and feeding a moulded meal (Keller et al., 2014, Matwiejczyk et al., 2018, Germain et al., 2006). The moulded meals present some challenges to the catering industry in aged care (Willis, 2017, Matwiejczyk et al., 2018). The issues of correct and safe consistency, knowledge and skills, additional time, and cost factors play a role in texture modified meals, and therefore, continue to be presented in the scooped manner (Matwiejczyk et al., 2018, Willis, 2017, Garcia et al., 2018, Coleman, 1995, Dahl et al., 2002, Korb et al., 2013, Ilhamto et al., 2014, Keller and Duizer, 2014).

1.2 Significance to Industry

The food technology and food science industry is ever-evolving with new developments producing interesting products for market such as a vegan market for meat alternatives. Texture modified foods have been left behind in this area looking at real food solutions. Japan and South Korea are the leaders in this area with commercial efforts in providing more gels and softened foods (Aguilera and Park, 2016). Aguilera and Park's paper describes the emerging microtechnologies of 3D printing, electrospinning (used to simulate meat), and electrospraying. There has been a large industry application for restructuring the foods into gels and emulsions. The space of formulating new foods and drinks has mainly been in the sport and health market. These technologies can be applied to TMD for dysphagia such as using aerated gels (characteristics for lightness, texture control and

calorie density) (Aguilera and Park, 2016). However, the commercialisation of texture modified "real" foods has had very little development.

While there are these technologies available, producing a meal that is pureed can be simple. Many RACFs prepare puree meals daily. However, they do not look good and do not have the correct nutritional profile leading to high rates of malnutrition for those on texture modified diets (Streicher et al., 2018, Anderson et al., 2016). The concept of iatrogenic malnutrition is described as industry or professionals contributing to the causes of malnutrition, such as the supply of inadequate and low nutrient puree meals knowing the residents' requirements are higher and not being met (Wendland et al., 2003). The food industry needs to step-up and produce nourishing nutritionally-dense texture modified meals, so there is no excuse for the lack of provision of safe and high-quality, nutritious puree meals. The art of making the meals appealing, as well as, nutritious, is gaining traction in the industry; consumers are demanding more from the foodservice. Hospitals do not have the resources to produce such meals and safety of TMD foods trumps cost. RACFs still have a way to go balancing their bottom line and commercial texture modified products.

Pureeing meat and vegetables sound easy to do. Most believe it is a matter of putting it through a blender with some sauce. Meat can be particularly challenging due to the meat fibres. The cut of meat, fat content, gristle, and the moisture added can result in a sticky, fibrous and low-energy brown mess on a plate. Red meat is a good source of iron, zinc and vitamin B12. Red meat is the first food that is avoided when a person has chewing or swallowing problems.

The typical scoops of texture modified meat that is pureed are not pleasing to consume and not visually appealing. Torrence's work found that visually appealing pre-shaped foods improve consumption ($p<0.05$) (Torrence, 2011) and this was validated again in Farrer et al. research (Farrer et al., 2016). In fact, Farrer et al. study also found a reduction in wastage (Farrer et al., 2016). In addition, puree foods tend to have a lower nutritional density, so coupling the pre-shaped meals with enriched ingredients can maximise energy and nutrient-density with an improved intake (Ott et al., 2019, Bannerman and McDermott, 2011, Pritchard et al., 2014, Anderson et al., 2016). Food manufacturers, such as TCF, have a duty to innovate and provide foods we all love and enjoy. The eating experience is very important. The basic kitchen does not have the time or resources to create a large product range. TCF has the ability to produce a variety of red meat dishes that are typically poorly consumed or difficult to produce in RACFs, hospital kitchen, or the home. If the food industry can provide such meals, there will be fewer reasons for poor nutrition for people with dysphagia.

1.3 The aims

The aim of this project explored the creation of a pureed meat pie which would satisfy the correct consistency, taste, low allergen and nutrient-dense nutritional profile. Furthermore, this project investigated the viability of commercial production of the pie.

2 Project objectives

The overarching aim is to build and test a concept meat pie product which looks and tastes like the original form, is digestible and appealing to target market and uses Australian red meat. Key deliverables will be for TCF to:

- Provide an overview of the current 'in residence centres' and 'in home' food options (products/services) for suffers of dysphagia. Highlight red meat usages and occasions and restrictions from both food consumer and preparer (Define the Problem(s) to solve)
- Build and test minimum viable product (MVP) concept – Aussie Meat Pie (beef, sauce and pastry) - with target market/stakeholders, targeting International Day of Older Persons menu item;
- Develop product and process specifications and preliminary costings to produce;
- Model the potential value creation and capture for Australian red meat industry for scale-up of beef-lamb-goat based meals for dysphagia suffers and recommended next steps;
- Showcase the developed meat pie concept to MLA and present key research findings and lessons learned as a final report to MLA.

3 Methodology

3.1 Project Steps

- Contract execution meeting with MLA (Emily Walker, Michael Lee, Lisa Sossen and Joanna Slykerman). Presented Canvas Tool. 30 July 2019.
- Kick-off workshop on 25 June 2019 with Monash Food Innovation Centre (MFIC) to present project to Monash team and discuss recipe creation (pie specifications for nutrition, allergens and texture), mould production and Consumer Insights.
- TCF developed a report outlining preliminary findings and assumptions relating to desirability, viability and feasibility for the meat pie concept for Dysphagia sufferers, including review of current product/service offer for the target market, as well as progress description and presentation of the concept to date. Report provided to MLA 30 August 2019.
- Acron plastics received CAD drawing from MFIC. Some design issues from the mould manufacturer. Acron adjusted drawings with samples. 20 September 2019.
- Team meeting for mould innovation, recipe and consumer insights 26 September 2019Mould samples tested and needed adjustment.
- 16 October 2019 – A session with TCF team and MFIC to learn how to make the pie. Made 20 pies for TCF to continue to test in various settings and ovens.
- Unable to fulfil the October 2019 Launch date. Problems related to recipe development and scaling up in a production kitchen. Intention to conduct a launch on Anzac Day in March.
- On 25 November 2019, Arranged a heating session with the Rationale Kitchen Showroom (South Melbourne).
- In December 2019, Acron Plastics highlighted some design impracticalities "There are some impracticalities (e.g. undercuts – which would make demoulding difficult/impossible, unformable features) so there will be editing required, which we would prefer to do – it will be more efficient." (Email from Acron Plastics).
- Team Meeting with TCF and Monash Team 13 January 2020. Recipe development completed. TCF to ensure products can be sourced. Discussion on mould production and issues possibly encountered with production. Cost raw ingredients. Consider the cost of pie to customer.
- Unresolved issues on March launch as there is some delay in execution of the pie in the production kitchen.

- Acron plastics visited the Production kitchen in February 2020. On 16/3/2020 die-cut samples were provided to test. Discussion regarding the issues of removing the base from the plastic base and possibly using a silicone option was again explored.
- Moulds for meat pie should remain as vacuum form trays.
- TCF has been unable to achieve the soft launch due to production viability and heating issues. Further research into these challenges needs to be conducted to progress from here.

3.2 Method

3.2.1 Design process

MFIC was invited to design and develop the recipe for the puree meat pie. An industrial designer and recipe development team discussed the requirements for the puree meat pie. There was a schedule for design and review of moulds to ensure the design fitted the specification of a regular size pie that contained the correct amount of red meat to consider it a meat pie under the laws. The recipe team met with TCF project team to guide what allergens, protein and energy requirements. The recipe was then formulated during a four-hour kitchen session. TCF project team attended design and kitchen session outcome meetings to test the pie and provide feedback. The design process was reviewed after a consumer insights session. TCF provided feedback and improvement suggestions to the MFIC on completion of the project.

3.2.2 Consumer insights

TCF provided the consumer insights team with potential aged care facilities to attend. TCF team arranged the two days onsite visits and provided communication with the site management and catering department.

Play MR visited two aged care sites to test the pie with elderly consumers and staff. These sessions were to evaluate flavour and texture and general receptiveness to the product as well as test cooking methods and processes.

Kitchen staff were presented the pies to prepare according to instructions provided by Textured Concept Foods.

Residents were given the pie to taste in place of their usual lunch; their feedback was captured after the fact.

A staff focus group was conducted after lunch hour.

In each case, semi-structured interviews were conducted and responses noted.

Hospital sites were also approached to gauge consumer feedback; however, there were issues of staffing for the speech pathologist team to review the pie and patient trials were not possible.

A speech pathologist company was also invited to test the pie to provide specialist feedback; however, the timing and ability to have a speech pathologist join the onsite consumer insights team proved to be difficult. Also, the heating of the pie in a non-commercial kitchen environment was

tricky, which made it challenging to present the pie to the Dr Jill Lesic & Associates speech pathology consulting company at their staff meeting.

3.3 Production viability

TCF used the MFIC recipe and report to produce the pie in their production kitchen. Sample moulds were provided by Acron Plastics to practice the recipe for taste, ease of production, review of a production method for mass production, mould usage. The recipe and process from the report were difficult to follow, and a "standard" recipe template was created. Production kitchen worked on making the pie using the sample moulds. The process and problems with efficiencies were documented.

4 Results

4.1 Setting

TCF chose MFIC to conduct the design of moulds, recipe formulation and consumer insights. TCF used their production kitchen to test the viability of the product. No ethics was sort for this project. Permission for photographs was sort when photos were taken.

4.2 Design of Moulds

Lisa Sossen (TCF dietitian and project co-manager) met with MFIC industrial designer several times to determine the look of the pie, components to make the pie and look of the pie ingredients for the moulds. Comparisons with a home-cooked pie, a store-bought bakery pie and commercial pie appearance were considered. Size of the pie was determined to be a "regular size". Six components were decided to formulate the base, top and inside meat and vegetable components.

Acron plastics received the CAD drawings. It was determined that the drawings had some design faults for a de-moulding action. Acron plastics were able to redesign the moulds to production standards of ease of de-moulding. Two thickness of vacuum forming trays were trialled. The thinner plastic resulted in the plastic breaking off with the food. Several other designs for peas, carrots and meat were trialled as the options.

4.3 Recipe formulation

The Business of Food was contracted to MFIC, headed a team of two chefs, to develop a pie pastry which has a colour and taste of pastry as well as a low allergen profile. TCF provided the meat and vegetables as these were already made in the production kitchen. Several kitchen sessions revealed some success and some failures to the formulation. Lisa Sossen and Joanna Slykerman, project coordinators, attended the test sessions. It was determined that TCF staff would benefit from a session on production and make approx. Twenty pies for TCF to use as testing for heating and taste.

TCF tested the recipe in the production kitchen. There were challenges using the sample moulds.

Heating of the pie also proved to be a challenge. The pies in the test kitchen, heated at 130˚C at 30% humidity for 35 min was a perfect method. In reality, RACF ovens do not have such precise settings, and the pie was unable to be heated correctly. TCF found that the use of a tinfoil container was an excellent method to maintain the shape of the pie while still retaining the pie appearance. Testing in the Rationale Ovens test kitchen was helpful to determine how best to heat the product.

Australian Government legislation for meat pie states "***meat pie*** means a pie containing no less than 250 g/kg of meat flesh". The recipe for our meat pie provides 60g of meat in a 240g pie which provides the stated required volume (www.legislation.gov.au).

MEAT PIE FINAL		
NUTRITION INFORMATION Servings per package: 2 Serving size: 240g		
	Average Quantity per Serving	Average Quantity per 100g
Energy	1370kJ (328Cal)	572kJ (137Cal)
Protein	35.4g	14.7g
Fat, Total - Saturated	8.2g 2.4g	3.4g 1.0g
Carbohydrate - Sugars	25.0g 11.5g	10.4g 4.8g
Sodium	634mg	264mg

See Appendix 9.6 Flyer Meat pie.

4.4 Consumer Insights

Conducting the Consumer Insights proved problematic due to a number of reasons as outlined in the Discussions section of this document. However, the Insights collected were generally favourable, and the exercise clarified key areas for further development within this Project.

The 'concept' of the meat pie was well received by both staff and patients. Staff scored an average 8.4 out of 10 for the concept of the meat pie offering. Patients were generally excited to try it.

The product tasting generally received good feedback from residents with comments of a nice flavour overall and good texture. For taste, staff scored an average 5.7 out of 10, with the taste

considered good – noting that for regular diners trying texture modified dishes is often disconcerting as they cant help comparing to 'regular' dishes.

Testing the Process in an onsite kitchen: It became apparent that the pie product as presented was problematic in different site kitchen environments. Part of the reason for this was that catering staff, although provided with clear heating instructions, choose to improvise or self-manage. In doing this, the presentation of the final presented product was undermined; resulting in a collapsed pie that impacted diners' appreciation of the meal. This exercise did raise the issue that different ovens were used in different care settings, and that the pie needed to be stable enough to present well in a range of heating settings.

4.5 Heating in Test Kitchen

Heating was conducted in the MFIC kitchen. The oven in this kitchen has specific controls for humidity and temperature. The MFIC kitchen found that the pie placed on greaseproof paper, 30% humidity and 130°C for 35 minutes from frozen covered with a steel container was successful.

The pie was trialled in the TCF kitchen with little success. The oven in the production kitchen has basic settings which are close to typical ovens in aged care home kitchens and hospital kitchens. The Pie was also tested in a home oven at 150°C from frozen, placed on baking paper, in a Corningware® dish with a ramekin of water to create steam. The pie took 56min to reach temperature. There were some dried edges.

Lisa Sossen arranged a session in the Rationale Test Kitchen, Comcater 96-100 Tope Street, South Melbourne VIC 3205 on 25 November 2019. Eight pies were tested at various settings as well as the setting described by MFIC. Test 7 showed good results which was the exact conditions used in the MFIC test kitchen.

4.6 IDDSI Testing

Loqui Speech Pathology was asked to test the product. A speech pathologist attended the production factory, and Bernadette Dutton (Owner, Speech Pathologist) participated in the session via Zoom (Due to COVID-19 crisis).

Two pies were heated from Monash production and two pies were heated from TCF revised recipe. They were heated at 100°C for 15 min to reach 71°C under full steam and covered. The result was slight dryness on the top which separated the lid from the filling. The middle parts of the Monash recipe were cohesive. Some slight stickiness in the mouth which would require the pie to have a sauce added to consume. The conclusion of the session, indicated a tasty pie which could be used very nicely for the Regular Easy to Chew Level 7 IDDSI standard as this category would also not be able to consume a regular pie. More work would be needed for the heating of the pie to not have dried out portions. See Appendix 9.2 for Speech Pathologist report.

4.7 Microbiological testing

Microbiological and nutrition testing was conducted on 26/11/2019. See Appendix 9.3 for DTS report. A report provided on 10/12/2019 indicated there was a high coliform count (indicating the cleanliness of the Monash Kitchen). Nutrition testing indicated protein 13.9g/100g compared with FOODWORK10® result of 15.5g/100g, Energy 743kJ/100g compared with 571kJ/100g (Foodworks10®), Fat 3.2g/100f compared with 3.4g/100g (Foodworks10®), Carbohydrate 10.6/100g compared with 10.4g/100g (Foodworks10®), dietary fibre 2.9g/100g compared with 4.8g/100g (Foodworks10®) and Sodium 400mg/100g compared with 264mg/100g (Foodworks10®). The discrepancies are due to product choices that were used in the test kitchen to the products TCF kitchen can purchase (this is mainly the stock choice used in the test kitchen) and fibre in the database for the vegetable. Overall the lab results are similar to the Foodworks10® software used for label production.

4.8 Result of Trial Production

Gravy: Gravy was made to recipe. It was easy to follow and reached a gelatinous texture quickly. The recipe taste had a strong pepper taste. A second batch was made with half the amount of pepper.

Moulds: The moulds provided as a sample were single moulds in a tray format which was not representative of the final tray. This set up proved to be difficult to manage and work effectively. The moulds were opaque, which made it difficult to see if the pastry was sufficiently at the surface. Checking the pastry height resulted in lifting the insert causing further problems to the pastry. A second batch of moulds was provided by Acron. They provided them in two thicknesses. The thinner material resulted in the plastic breaking away from the base.

Heating: Trial in the Rationale kitchen proved the oven temperature, and setting is essential to having the pie heated to the correct temperature without forming dry edges. Trial defrosted on steam with cling wrap caused rubbery edges, Trial of defrosted pie on steam for eight min and steam bake for six minutes with covered steel pan resulted in crusty edges. Trial with defrosted pie on bake setting resulted in a crispy pie. The defrosted pie baked on steam setting covered with a steel pan for 11 -15 minutes resulted in the pie reaching 75°C, however, did have a slight dry edging.

Other comments:

The mould material had a slightly different feel and was smooth and shiny compared to the matt surface of the typical moulds used in the kitchen. It is unclear if this affected the demoulding of the product.

The mould tray material was 0.35mm or 0.06mm thick. The thinner material was not suitable as the moulds would break off the plastic. The thicker material was more difficult to manipulate to release the food. It is unclear whether the researcher needed to spray the moulds with more oil than usual in the smaller moulded items.

The new pea mould was a better look than the individual pea moulds as they did not represent the rounded shape. The rounded shape could be achieved with silicone moulds.

The newly fashioned meat cube looked good when demoulded. They demoulded better with the thicker moulds but still with a struggle and tapping the tray on the counter.

The newer carrot moulds (by Acron) were nicer looking and more to what TCF had in mind. The demoulding of the carrot was difficult due to the size and a silicone mould would be better for this item.

The inserts and base of the pie was difficult to mould as the plastic was opaque. The test kitchen moulds were clear which enabled the researcher to apply a downward even pressure and observe the pastry moving up the sides. The researcher found this difficult to observe for evenness. A clear insert would be a better option for quality control. The sample moulds did not have the channels for overflow so again this was a difficult operation to execute. Researchers also found the freezing of the pastry in excess of 30 min as per the test kitchen recommendations.

The pie top was easy to mould and demould. In the variable ovens, this pie top did dry out on the sides making it unsuitable for pureed Level 4 but suitable for easy to chew Level 7.

The foil container was definitely important to maintain the shape on heating especially in a variable oven.

4.9 Discussion/outcome of meat pie trial production

A meat pie is a meal item generally removed from the menu for all diet textures except regular Level 7 (IDDSI). All other levels would not be allowed to consume a meat pie. Innovation in the texture modified diet space seeks to explore the idea of creating a food enjoyed by many people which cannot be consumed under different circumstances.

The meat pie was the perfect addition to TCF product range. The pleasure of having a pie and a product nutritionally dense is a rarity. The recipe required skills of accurate measurement, using the ingredients in the correct amount and mixing correctly for physical dispersion. The machinery used to make the pie is available in the production kitchen. The moulding proved to be more time-consuming, labour intensive. The freezing times were long, and there are many parts to the pie needing freezing. For HACCP safety, the coordination of the pie parts would all need to be done in accordance with the HACCP Food Safety Plan. The moulds were challenging to use as they were not the final trays. A device for pressing the inserts in evenly would be helpful, and one that is semi-automated would eliminate much of the time-consuming work.

The Meat Pie project heats well under stringent and specific conditions and fulfils all requirements of the project, nutritionally, and IDDSI conditions. The area where further work needs to be done is the production efficiencies with some form of semi-automation and heating in a variety of conditions which would fit across all healthcare sector kitchens.

4.10 Budget

We have determined that the moulds for commercial production should not be manufactured at this point. TCF with considerable discussion felt that while vacuum form trays were the most economical option; they did not perform well in terms of agility to release the mould and observation of the

pastry tamper-like motion. TCF currently uses vacuum form trays for some items. These trays appear to have a slightly better ease to demould but do have a short shelf-life with current use. It would be prudent should further opportunities present to invest in silicone moulds for the smaller more intricate items and a see-through insert for quality control.

4.11 Sales opportunities

Our canvas tool identified revenue avenues: selling the pie at a reasonable price, home, hospital and aged care market. The home market will most probably pay $10.50 for a meal. A “meal deal” with a pie and chips would be something the home market would pay. TCF is of the understanding this is a typical accepted price. TCF has explored the home and disability market with other home food delivery companies, the National Disability Insurance Scheme (NDIS). The price to hospitals and aged care will need to be revisited as this would be the total cost of all their food for the day. If the cost efficiencies in the kitchen cannot be made with semi-automation, this price will be hard to sell to this market, unless for a special occasion.

Our revenue model looked at higher sales to drive production efficiencies. While this model may work for most of the less complicated items TCF produces, TCF now recognises the need for some further automation to improve efficiencies for a more complicated product.

5 Discussion

5.1 Meat Pie Production from Kitchen to Plate

5.1.1 Introduction

A production manufacturing kitchen must run efficiently. There is a careful balance of cost of goods (COGs) and labour coupled with fixed costs. Food manufacturing, where automation is applied, reduces labour costs, increases production levels and thereby produces a product that can be sold to the market at an affordable price.

5.1.2 Reshaped meals and cost

TCF was the first commercial company to provide the foodservice industry with reshaped foods in Australia. TCF identified the need to have a recognisable product to consume on a texture modified diet. This idea has been researched since (Hotaling, 1992) paper outlined guidelines for presenting “cuisine puree”. Further to this, Guensburg’s article in 1993 discussed the need for a reshaped meal to enhance the meal experience and enhance the intake delivering food “that the patients will actually eat” (Guensburg, 1993). The article discussed their need to be creative for menu options but also reports on the labour-intensive and time-consuming nature of some of their meals (lasagne and spaghetti and meatballs). Some of these more time-consuming meals were the meals most popular. The dilemma is how to continue to provide these well enjoyed and consumed products in a cost-effective manner.

Concluding thoughts: The pie was suggested to be sold at $7.00 - $9.50 per pie to cover labour and packaging. The issue is “would the market pay that for a pie?”. The home market may purchase this

as a meal but in RACFs where meals cost $6.50- $7.80 a day for all meals, this price may be too dear for this market.

5.1.3 Viability of production

5.1.4 Overall Outcome of the Meat Pie

The Meat Pie project has shown that the ability to create a puree meat pie is possible. A mouldable and structured pie was created under specific heating conditions. The filling was using the current TCF products with a delicious and flavourful gravy layered precisely to enable the pie to maintain its shape. The pie required six trays. The assembly of the pie has proven to be labour-intensive on a large scale basis with some issues to resolve on heating the pie on more than just one specific setting which many aged care homes and hospitals may not have. The use of the tin foil container added some further stability to the shape upon heating.

Concluding thoughts: The pie is an excellent product which may be viable for the home market and for possible special occasion days in the RACFs.

5.1.4.1 Labour and Production

The current model of production by hand is time-consuming and labour intensive. An article by Dudlicek recalls the story of Carvel products, their expansion, cost efficiencies and move towards automation from a hand-made product (Dudlicek, 2005). This article discusses that the essence of hand-made cannot be replaced by automation for authenticity. Their solution to maintaining their hand-made products was controlling the flow of production over increasing production space and using semi-automation or "mechanically-assisted" machinery in production.

The consideration of developing semi-mechanical machinery or devices to assist with production time may be the answer to producing the pie in bulk. . The effort of extracting the pie bases from the moulds may need further development. The environment may need a temperature-control to prevent the base from softening during filling. TCF would now need to explore the question of whether the labour-intensive, time-consuming items would be popular, worth making for quality of life within the realm of profitability or cost neutrality.

Concluding thoughts: The pie is a time consuming and labour intensive activity which is not viable unless some form of automation is applied.

5.1.4.2 Heating The Meat Pie

The other major issue we found was heating the product in a variety of ovens. There are a variety of stabilisers available. Xanthan gum is a high ester pectin, similar to other products on the market such as gellan gum, Carboxymethyl cellulose (CMC) and carrageenan (Sharma et al., 2017). Xanthan gum is also associated with creaminess, lubrication and a reduction in granularity. Sharma et al. study did not document the heating attributes of each of the hydrocolloids (Sharma et al., 2017). It is known that xanthan gum has the heating capacity of 10-80°C to remain stable (www.visitchem.com).

Concluding thoughts: Further work is required to have the pie heat in various ovens and conditions conducive to the typical home, RACF or hospital kitchen. Current heating is quite specific, and results are not suitable for a puree diet texture. It is ideal for an easy to chew diet.

5.1.5 Marketing and Consumers

The marketing exercise undertaken by PlayMR found collecting consumer feedback under the conditions challenging. The taste was acceptable to the residents; however, the appearance was not well received with colour and shape. The pie was heated not using the desired conditions, causing the pie to expand to a flatter and larger size. The heating also resulted in some slightly chewy edges for some. The pie was not served in an appealing manner which could have also affected results. The participants were not always able to express their opinion of the pie, and some were not hungry, so they did not consume the pie; however, management personnel did find the concept and taste appealing. The idea was well accepted.

A soft launch was initially discussed using a short video. Ideas included gearing up to watch the test cricket. The idea that everyone could enjoy a meat pie no matter what texture was required. Another idea was an aged care home dining room conversation and the presentation of the pie, causing a stir amongst patrons. The issues of production on a large scale resulted in soft launch postponement to April. The COVID-19 crisis added an extra layer of complexity for production and manufacturing processes had to change to ensure staff safety, “hoarding or stock-piling” of TCF product and ongoing decision making on moulds.

Production of the Meat Pie would need TCF to resolve the bulk production with some form of semi-automation for a more efficiently produced pie and the heating issues to ensure the pie remains puree.

Concluding thoughts: The marketing company was ill-equipped for the task in this setting. The RACF was a new setting which they found challenging and had no experience of arranging the day and extracting information from the consumers. Consumer insights may need to be conducted in an unconventional setting. Presentation of the served product could have been improved. TCF team has many ideas of how to market the pie as they are more aware of the market.

5.2 Implications for industry: Potential value creation and capture for red meat industry

The food industry is encouraged to innovate and explore new ways to present food for people with dysphagia. Price point appears to be a problem unless there are production efficiencies. With minimal profit margins, a complicated product such as the puree meat pie will need significant backing from government or private investors for some form of automation. Song et al. (2016) encourage the food industry to target the population with dysphagia to explore a well-balanced multisensory compensatory framework for foods due to the reduction of masticatory and chemosensory decrease in the aged population (Song et al., 2016). See Appendix 9.7 Canvas Tool for Potential Market.

The pie, however, is only one product option, and the puree diet texture is only a small percentage of the market. The soft and bite-size texture increases the opportunity for supply of red meat to the market. IDDSI has included soft and bite-sized as a new diet texture which is poorly implemented in practice. The puree market also has less variety and limited moulds available. There is considerable potential to provide more variety.

Consumers are demanding more variety, they miss the foods they cannot have, and the new Quality Standards for Aged Care focusses on consumer choice (including cultural), variety and quality of meals. The cost of the meat pie at present would only suit a home market as higher prices per meal are acceptable. For the hospital and aged care market, the cost of the pie is the spend of one person's total daily intake for the day.

To model the potential value creation for the Australian red meat industry, we should look at what TCF is currently producing. Currently, TCF produces 11 beef dishes and five lamb dishes. These can be expanded. The value of the project, and further assistance from MLA for increased beef and lamb with the development of new products, can almost double the product lines. The market positively entertains the idea of more variety than the same styles of moulded meat and menus need to reflect cultural foods and variety. As such, there are no commercial companies in Australia producing such a variety of red meat options and flavours. There are alternative dishes which are less labour intensive than the meat pie which would be viable product to sell to the hospital and aged care markets.

The "value add" to the addressable market with the sale of a beef pie at $9.00 and lamb pie at $9.50 would provide between $41,000 and $44,000 to the addressable market in year one for 5,000 pies. If demand doubles every year, the value add quadruples by year three.

5.3 What worked and did not work

The project ran very smoothly at the beginning, and TCF ran into some "hiccups" when it came to heating and bulk production. The MFIC process needed several changes to schedules to understand the final result. MFIC found that this project did not follow their usual development schedule. For this reason, they underestimated the amount of product and recipe design and testing.

TCF would have needed more recipe development with heating to finalise this area. TCF used the remainder of the budget to learn the process and make as many pies as possible for TCF to test. This was extremely helpful to understand the complexity of the pie process and also understand the recipe steps.

The consumer insights lacked the knowledge of the industry and lacked the ability to set up their own session. TCF spent many hours assisting and organising the onsite visits.

Heating the product was very challenging. Despite using the retherm setting with a similar humidity (40%) at 130°C for 35 min from frozen or 11-16 min from thawed.

Finally, the sample moulds displayed some issues with demoulding and ability to see the pastry being moulded in the base. The material was not completely suitable being slightly tough on the "demoulders" hands to demould and was breaking with this action.

5.4 Improvement of delivery of project

TCF was disappointed it could not complete the final stage of soft launch and marketing due to issues of generalised heating and labour/production of the pie in a busy kitchen. The time needed to review and improve the pie recipe and heating were underestimated especially in the second

milestone point. Additional time to continue to refine the process was required. We recognise we need further professional input to achieve our outcomes.

5.5 Unanswered questions

How can we heat the pie in different ovens?

How can we make the pie production more efficient and labour-saving?

What semi-automation can be used to ensure a quality product is produced?

How can we ensure the puree meat pie is the correct level 4, according to IDDSI?

What would the hospital, RACFs and home buyers pay for a pie?

What other options can be sold with the pie as a meal deal? Puree thick chips? Peas?

Would a minced and moist beef pie be an additional suitable and well-accepted product?

5.6 Considerations for Meat Pie Project – future

The meat pie has posed some critical questions to consider. Currently, TCF is embarking on prepared plated meals (PPMs). The consumer audience is the home user who may be elderly or have dysphagia, have come through a National Disability Insurance Scheme (NDIS) program for texture modified meals, or resides in aged care homes only requiring limited meals and hospitals offering an a la carte service.

TCF is continuing to focus on its proteins and vegetable production. Over the year we offer specials such as Easter Eggs or Christmas Treats. The option of introducing the meat pie at specific times of the year is still open for discussion. Consider a footy game grand final special, for example. The hurdle that must be overcome is heating to safety. Cost-benefit or cost-neutral production figures would need to be achieved before putting such a product on the menu.

The moulds for the meat pie can enable us to increase our red meat options such as curry, casseroles, open pies with potato toppings and meat pizzas. TCF has an R&D team reviewing product innovation and market introduction.

TCF is undergoing a rebranding process and upgrade of their website in response to consumer feedback. The Puree Meat Pie Project was successful in the sense of the capability of the idea. TCF intends to use the newly created blog to report on projects which include the meat pie and Meat and Livestock Association support on this project. The exposure and consumer feedback may well indicate the need to further explore the Puree Meat Pie Project if the demand presents.

5.6.1 Project Objectives – Summary

Objectives:

1. Provide an overview of the current 'in residence centres' and 'in home' food options (products/services) for suffers of dysphagia. Highlight red meat usages and occasions and restrictions from both food consumer and preparer (Define the Problem(s) to solve)
2. Build and test minimum viable product (MVP) concept – Aussie Meat Pie (beef, sauce and pastry) - with target market/stakeholders, targeting International Day of Older Persons menu item;
3. Develop product and process specifications and preliminary costings to produce;
4. Model the potential value creation and capture for Australian red meat industry for scale-up of beef-lamb-goat based meals for dysphagia suffers and recommended next steps;
5. Showcase the developed meat pie concept to MLA and present key research findings and lessons learned as a final report to MLA.

Objective 1: **This objective was met.** TCF has provided a summary of the few players within the industry that currently seek to service the texture modified market. TCF has extensively documented the issues of red meat with those with dysphagia from chewing the meat to preparation issues and reduction of intake with dysphagia. TCF has documented the process of texture modified diets concerning red meat and highlighted the issues industry and the ordinary kitchens have with preparation and price.

Objective 2: **This objective was met except for the targeted day.** TCF has built and tested a viable texture modified meat pie. The product is viable for easy to chew diet textures in the current imperfect heating conditions and puree meat pie in perfect heating conditions. The targeted date of International Older Persons Day was not achieved due to mould design and heating issues. The market and stakeholders entertained the idea favourable for such a product.

Objective 3: **This objective was partially met.** The production of the product met some difficulties in mass production. The mould specifications and process have been developed, but are only suitable for a small production scale. Costings indicated the labour contributed to the majority of the cost.

Objective 4: **This objective has been met.** The report highlights the value of increasing the innovation of red meat dishes in the texture modified food market and outlines a range of ways industry can further explore this potential. This study explored the development of one item for one particular IDDSI requirement, however, there are other dysphagia dietary standards that are also crying out for innovation and present opportunities for much greater variety of texture modified meat products.

Objective 5: **This objective has been met.** The report is a detailed account of the process, specifications and trial production efforts. The key research findings highlight the positive response of having a new product such as a meat pie on the market, the complexity of producing a product with many parts, the labour-inefficiencies on a greater scale, and the heating issues under variable oven and microwave conditions. The report highlights the need for further research and development of improved efficiencies and needs for greater heating testing platforms before the puree meat pie can go to market. For potential promotional ideas see Appendix 9.5.

6 Conclusions/recommendations

6.1 Practical insights, applications, and adoption activities

- The puree meat pie was well-received as an idea, especially from the speech pathologists. In fact, in the IDDSI testing, although it failed the Puree Level 4 test (due to heating issues), they were excited to suggest this for another texture modified level.
- The puree meat pie can deliver a satisfactory amount of red meat to a population with a small appetite.
- The production is complicated to construct, but with further ideas, semi-automation could make this product viable commercially.
- The variety of fillings are enormous. The pie base can be used with a potato topping or as a quiche such as a beef sausage and egg quiche (could be a breakfast or light meal).
- To achieve value from the meat pie project at this point, the meat cubes that were developed as the pie filling could be used for other purposes. Casseroles and curries would work well with the meat cube shape and are less labour intensive. TCF would need to create the flavours to pour over the cubes, finds appropriate moulds to hold the casserole/curry as a unit, test the market and find the packaging to work with the new dish.
- A niche population can now enjoy a meat pie.

6.2 Recommendations for further research and development

- Further work and funding for automation or semi-automation for improved efficiencies. The cost of production and ability for a manufacturing kitchen to produce the pie will need further consideration.
- Consider a manual or semi-automatic pastry tamper to make the pie base.
- Consider further recipe development is needed as the heating of the product is possibly affected by the some of the ingredients. It may be necessary to continue to work on the recipe of the pastry for a recipe that can be heated in more than one controlled heat setting.
- Further research is required to work on improved moulds (Silcone and clear polypropylene).
- Further research is required for heating the product. Recipe adjustment may be necessary together with additional food technologist input to refine the ingredients to one that can be heated in a regular oven or microwave.

7 Key messages

7.1 Dysphagia can reduce red meat intake

Red meat tends to be the first food that is avoided as chewing and swallowing become more difficult. Cooking techniques are essential to maintain a soft texture. Meat fibres, even when cooked slow and long, continue to be difficult for those with chewing problems as they form a bolus of dry fibres. Sous vide and other products are occasionally used in the kitchen to achieve the “buttery”

and “melt in the mouth” taste and texture; however, processing these meats can also lead to a poor outcome of texture modified product.

As more and more of the general ageing population will require texture modified meals, red meat producers want to ensure their products remain on these diners menus. The meat industry could work directly with texture modified food producers to explore new product options – similar to this meat pie concept - to master the IDDSI standards on all levels for cooked red meat products.

By maintaining red meat on the menu for texture modified diners, we can ensure greater natural nutritional uptake. Red meat is a good source of protein and other vitamins and minerals. When red meat is removed, artificial oral nutritional supplements are often the solution to maintain appropriate nutrition levels.

7.2 Quality and cut of red meat

TCF has found that using only one cut of meat is viable in producing the safe and correct texture. Gristle and fat content, as well as grit levels, affect the end product. Given that texture modified food needs to be heavily processed; it may be worth exploring if there is the opportunity to use different cuts of meat in different ways, or off-cuts, particularly for the production of such meals?

Is there existing machinery used for other purposes that can assist in ensuring the appropriate texture of the meat can be met, or different ways of rearing the livestock or treating the meat to develop the texture required? Can the meat industry explore the cuts or types of meat and their cooking methods to produce texture modified meals from Easy to Chew to soft and bite-sized to minced and moist and pureed? The market for all texture modified products is much greater than just the puree texture market. One category is soft and bite-sized (Level 6). Refer to Appendix 9.4 Soft and bite-sized products have been requested by numerous hospitals and aged care facilities, as this is the most difficult and challenging texture to attain according to the IDDSI standards. Food manufacturing companies in the texture modified realm would benefit from the collaboration of working with the meat industry to keep red meat on the menu.

7.3 Price sensitivity

The RACFs bottom line ultimately determines the use of texture modified products or any other red meat products on the menu. Many menus will eliminate specific cuts of meat as they are expensive or poorly chewed. Dietitians are faced with food focus groups requesting the basic chop or steak on the menu. They do not want the meat braised or casseroled all the time. The dissatisfaction of menus come from the choice of “low grade” meat options on the menu.

The meat industry could consider reviewing pricing for the RACF and specialised food industries for better pricing so residents in aged care facilities can still have the cuts of meat they long for and industry can pass on the savings to their customers.

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9 Appendix

9.1 Heating Session 25 November 2019

Rationale kitchen in South Melbourne session to test pies in different oven settings. Aim to understand how the pie is cooked using different ovens in the realistic setting of an aged care home. Steam setting was an issue on some ovens as they were older. Using the “Retherm Setting” is best. Combi Ovens can have specific settings. Combi Steam.

Fig 35. The tested pies

Fig 36. Pie in oven

Fig 38. Combi steam oven – older version – use retherm setting.

Fig 39.Ovens can indicate the setting and humidity.

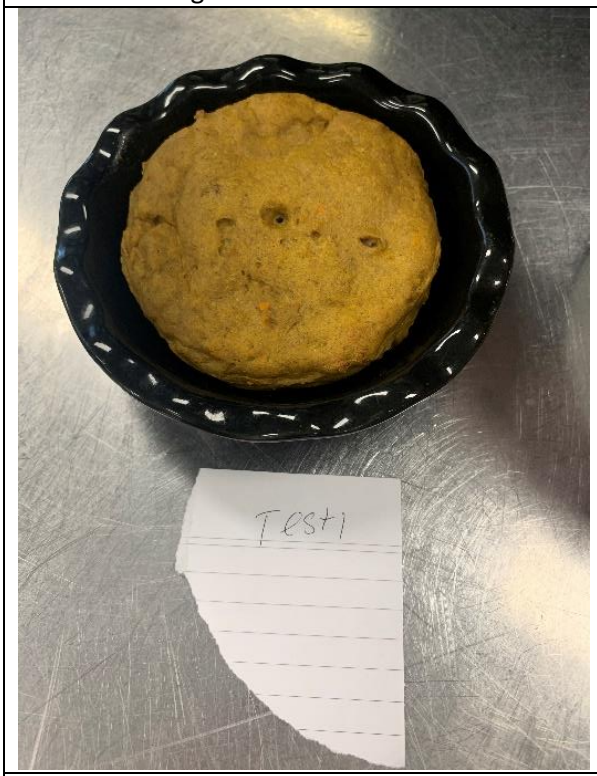


Fig 40. Test 1
106°C 30% humidity 11 min. Not hot enough
50°C, had started semi-frozen, Crust developed

Fig 41. Test 2
140°C 60% humidity
Crusty

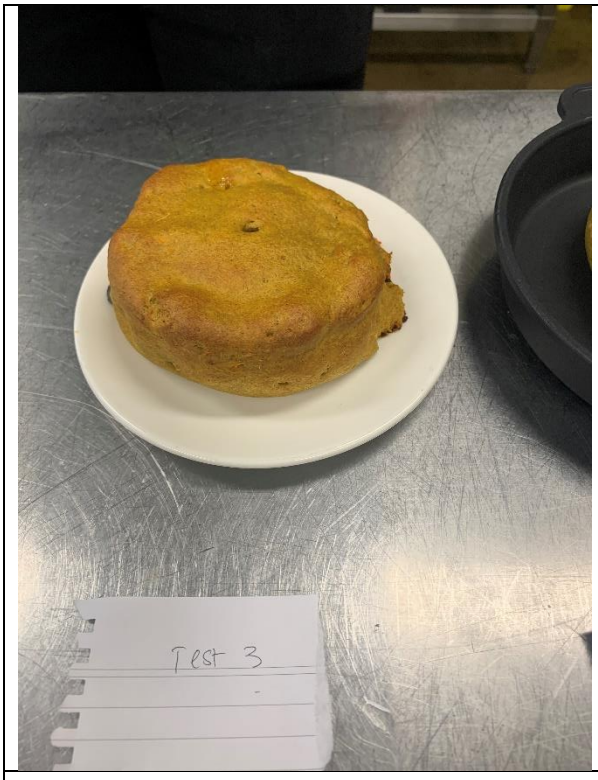


Fig 42. Test 3
Semi frozen 140°C 60% humidity, no cover, heated on plate 25 min. Crispy and distorted shape

Fig 43. Test 4
104°C 60% humidity, semi frozen Left covered during cooking
Flattened after cooking.

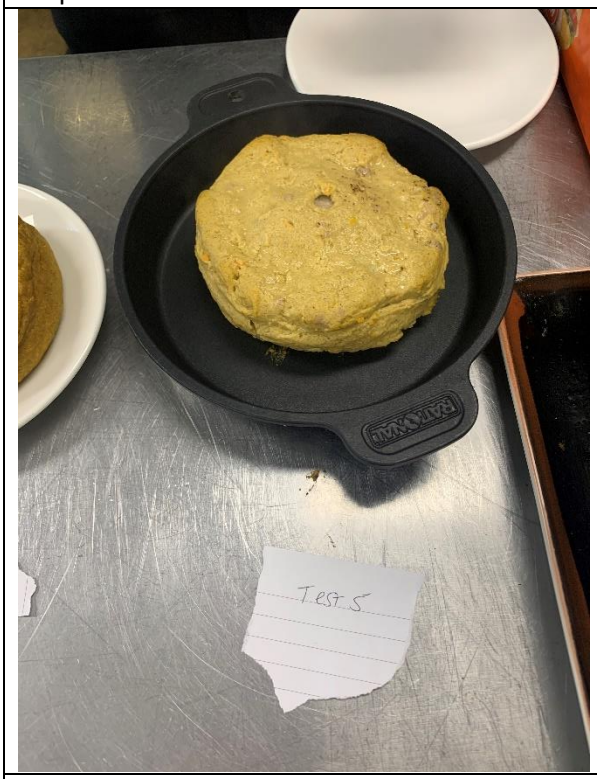


Fig 44. Test 5
Covered 90% humidity 120°C

Fig 45. Test 6
Not covered 90% humidity 120°C
Dry on the outside

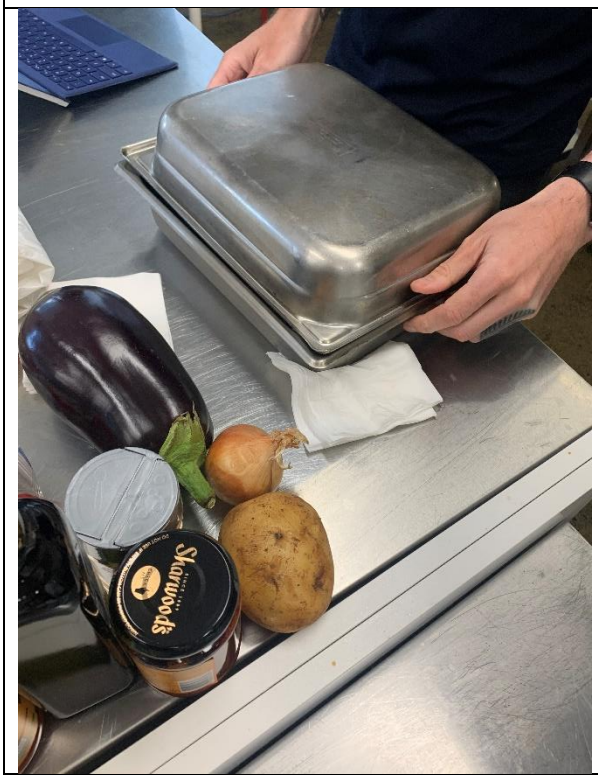
Colour not good, much better in the consistency, chewy bits and dry, good fork test inside	
	
Fig 46. Test 7 As per Monash guidelines 30% Humidity 130°C for 30 min semi-frozen state, covered with a lid not glad wrap. Placed on wax paper Perfect consistency with cohesive fork pressure test.	Fig 47. Test 7 placed pie in stainless steel container
	

Fig 48. Test 7 Cover pie with lid so enough steam can enter and escape.	Fig 49. Cooked pie. No dry edges. All part are mashed with fork together as per IDDSI guidelines.

Fig 50. Test 8
Full steam 100°C
25-45min semi thawed, covered
Colour dull, distorted after cooking.

9.2 IDDSI Testing 23 April 2020

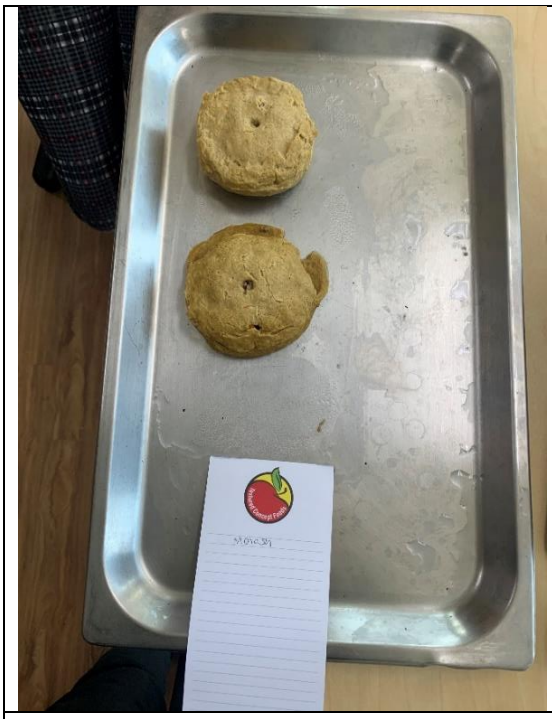


Fig 82. Monash Pies.
Not placed in foil containers for cooking.
Heated 100°C for 15min (71°C).
Fell apart, dry on the top.

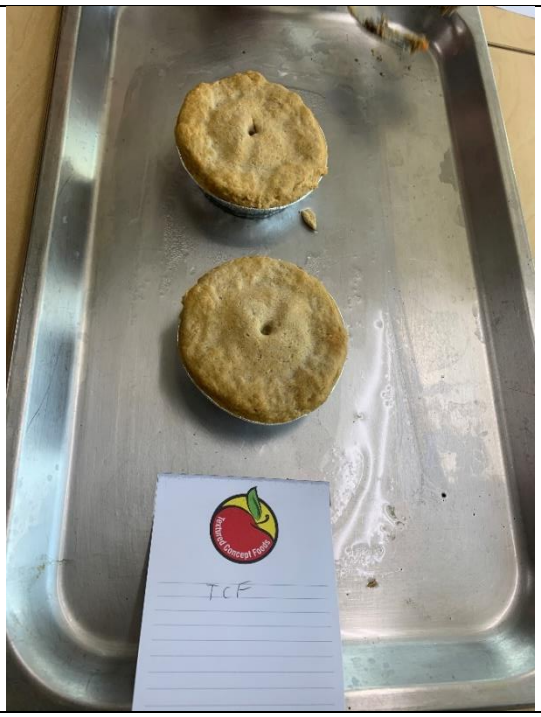


Fig 83. Updated Recipe TCF, use lid, in foil container, no Gluten free flour added.
Placed in Foil Containers.
Heated 100°C for 15min (71°C).
Maintained shape, dry and spongy topping.

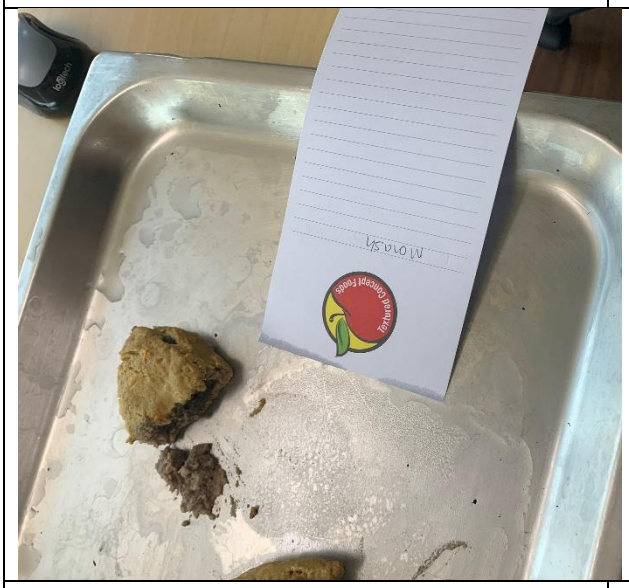


Fig 84. Monash Pie
Holds its shape but dry topping broke apart from the filling. Heating issue.

Loqui Speech Pathology provided a report. See attached document.

9.3 Microbiological and Nutrition lab test

See Attachment document

9.4 International Dysphagia Diet Standardisation Initiative (IDDSI)

See attached document (www.iddsi.org)

9.5 Showcase: The Puree Meat Pie Project

See attached document

9.6 Flyer for Meat Pie

9.7 Canvas Tool