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POSTER ABSTRACTS

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STUDENT POSTER ABSTRACTS

S1: The utilisation of cassava and banana flours in gluten free pasta: effects on physicochemical and glycaemic properties

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Research was conducted to investigate the utilization of cassava and banana flour and their effects on the physicochemical and glycaemic properties of gluten free (GF) pasta. GF pasta was prepared with different formulation: 100% cassava flour, 75% cassava flour : 25% banana flour, 50% cassava flour : 50% banana flour, 25% cassava flour : 75% banana flour, and 100% banana flour. Pasta made from 100% durum wheat semolina was used as a control. The utilization of banana and cassava flours showed significant physicochemical differences compared to semolina pasta. All GF pasta had higher dietary fibre content, lower protein content and most of them had darker colour compared to semolina pasta. The samples also exhibited decreased values in swelling index, water adsorption index and cooking loss. The experimental GF pasta had significant lower textural quality compared to the control. A higher percentage of banana flour led to better values of firmness and tension of GF pasta. The evaluation of in vitro starch digestibility showed that GF pasta with predominantly banana flour led to a lower predictive glycemic response. The results illustrated that cassava and banana flours can be considered as alternative materials to further develop GF pasta due to their nutrition advantages, especially in dietary fibre content and glycemic properties.
Keywords: Cassava, banana, gluten free pasta, dietary fibre, glycemic-index

S2: Optimisation of β-galactosidase production by *Lactobacilli delbrueckii* subsp. lactis 313 using response surface methodology

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β-galactosidase (β-D-galactoside galactohydrolase; EC 3.2.1.23) has been used on an industrial scale for the conversion of lactose to the prebiotic galacto-oligosaccharides (GOS). Optimisation of β-galactosidase production from a variety of microorganisms has been studied previously. The optimum fermentation conditions (e.g. incubation temperature, fermentation pH, agitation speed, inoculum volume, etc.) and ingredients in growth medium (e.g. nitrogen source, carbon source, mineral ions, etc.) necessary for β-galactosidase production are known for certain microorganisms, especially *Kluyveromyces lactis*. Lactic acid bacteria are also a good, safe, and food grade source of β-galactosidase, but the production of β-galactosidase by *Lactobacilli delbrueckii* subsp. lactis 313 (LDL 313) has not yet been studied even though LDL 313 has other food applications. The yield of β-galactosidase through fermentation by LDL 313 is critical to commercial application in the industrial production of GOS. In this study, culture conditions and fermentation in MRS broth are being optimised by response surface methodology (RSM). The key factors of fermentation are illustrated by Plackett-Burman method (PB) and central composite design in terms of incubation temperature (30° C-50°

C), starting pH (5.5-7.5), and carbon source (glucose, lactose, galactose, fructose, sucrose). Also, the effect of gaseous environment (presence/absence of O2) on β-galactosidase production in the fermentation of LDL 313 is being investigated. The aim is to optimise the yield of β-galactosidase from LDL 313 by RSM.
Keywords: *Lactobacilli delbrueckii* subsp lactis 313; response surface methodology; β-galactosidase production; galacto-oligosaccharides; prebiotics

S3: Effect of pH on magnesium distribution in skim milk
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Magnesium in milk and milk products is a major contributor of dietary magnesium. It is often overshadowed by calcium, so much less is known about its technical functionality in dairy products. Profiling the magnesium distribution is important for good bioavailability of magnesium-enriched dairy products because the bioavailability of magnesium-enriched dairy products depends on transfer to the micellar phase. In this study magnesium chloride (0 and 15 mM) was added to reconstituted skim milk with pH adjusted to from 5.50 to 7.20 at 20 ˚C, to investigate the distribution of magnesium in the serum and micellar phases. As the pH decreased (6.75 to 5.50) magnesium concentration in the serum phase increased. Magnesium was found to distribute both in serum and micellar phases as the pH increased (6.75 to 7.20). As magnesium was added to milk (0 to 40 mM), the pH of milk dropped from 6.75 to 6.20, so the added magnesium was increasingly found in the serum phase. Thus, pH plays a vital role for the distribution of magnesium between micellar and serum phase and as a consequence it needs to be considered when magnesium-enriched dairy products are designed.
Keywords: Distribution, magnesium chloride, pH, skim milk

S4: Probiotic growth enhanced in synbiotic yogurt with manuka honey containing fermentation metabolites
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The research aimed at evaluating the effect of manuka honey on growth and probiotic efficacy of DPC16 in a yogurt matrix. The potential prebiotic activity of some common manuka honey varieties, including DrKiwi AMF (15+ and 20+) which contain the probiotic fermentation metabolites (PFM), was evaluated by enumerating probiotic growth in the yogurts by total plate count (TPC) method. Short-chain fatty acids (SCFA) metabolites produced during the fermentation of MRS broth and yogurt were estimated by HPLC (reverse phase C-18) and NMR (1D and HSQC). Results show that adding DrKiwi AMF (15+ and 20+) manuka honey (5% w/v) to synbiotic yogurt achieved the highest probiotic survivability after three weeks of refrigerated storage, compared to the other manuka honey variants (UMF18+ and blend) and the control samples without any added sweetener. The research contributes to corroborating the viability of *L. reuteri* DPC16 in yogurt with manuka honey containing PFM from the same probiotic strain, and is thus being targeted to develop innovative products with desirable sensory and rheological properties.

Further research on synbiotic interactions between the probiotic strain and the prebiotic components in manuka honey in controlled fermentation set-ups may be required to explore the mechanisms of the growth promoting effect and the production of beneficial metabolites.
Keywords: Synbiotic, Honey, Yogurt, Fermentation Metabolites

S5: Monitoring viability of *Staphylococcus aureus* in near real-time using optical techniques

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Enumerating both live and dead bacteria is essential to prevent foodborne illness, determine antimicrobial efficacy, and is a general laboratory technique for microbiological research. Plate counting remains the gold standard for bacterial enumeration, yet is imprecise and takes upwards of 2-3 days. Plate counting cannot detect dead or non-culturable cells. Flow cytometry (FCM) uses scattered light and fluorescence to quickly and reliably reveal particular cell characteristics. FCM methods that use reference microbeads to measure the volume, concentration, and total cell count have been developed for the gram-negative rod Escherichia coli in low-cost flow cytometers. Fluorescent dyes SYTO9 and propidium iodide are used to differentially stain both live bacteria (killed with isopropanol) based on differences in membrane integrity. In this study the method has been applied to measure live and dead cell concentrations of the gram-positive coccus *Staphylococcus aureus* after antibiotic (ciprofloxacin, fusidic acid, ampicillin, and kanamycin) treatment to establish kill kinetics. *S. aureus* is a clinically important pathogen, responsible for skin and blood infections, as well as foodborne illness. FCM data is correlated with plate counts and spectral data obtained from the Optrode, a portable spectroscopic system that accurately measures fluorescence signals from stained bacteria. The methods developed will have applications in testing antibiotic susceptibility and efficacy of antimicrobial food processing methods, as well as in determining viability of bacteria obtained from swabs in the food industry.
Keywords: Microbiology, food testing, optics, microbial enumeration, antimicrobials

S6: Optical sensors to predict the quality of meat in real time

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The percentage of intermuscular fat, tenderness and juiciness (water content) of meat are the key parameters that determine the quality of meat for a customer. The existing methods to determine the quality of meat are often chemical or

mechanical, which are slow and destructive. Our work realizes an opportunity to develop a new fast, non-contact and non-destructive technique to check the quality of meat in real time. Optical coherence tomography (OCT) is a fast, optical, non-invasive, contact-less and high-resolution imaging technique suited to millimetre depths with micrometre resolution. The polarisation of the back-scattered light from the meat can be used to differentiate the lean meat content and the intermuscular fat due to their varying structure and optical properties. Muscle meat consists of contractile fibres supported by collagen. Collagen in meat is highly birefringent compared to fat. We present a polarisation sensitive OCT (PS-OCT) technique that can detect the intermuscular fat and the muscle content of the meat by analysing the polarisation and attenuation properties. We are studying lamb loins and comparing their fat content predicted by the near infrared (NIR) spectrum. Unlike conventional methods, our technique does not make any physical contact with the sample and gives the results in real time.
Keywords: meat quality, non-contact, optical coherence tomography, real time

S7: Factors affecting the diffusion of new traceability technologies in the food industry

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Food safety and traceability is an ongoing challenge for many companies. Food safety accidents regularly make news headlines around the world. Having a good traceability system across the entire food supply chain has the ability to prevent food fraud, give a quick response to food recalls, foodborne illness outbreaks, and most importantly, to build consumer trust. Also, trust builds insurance against market collapse after scandals. Therefore, to establish an efficient and transparent traceability system in the food industry, there is a need to learn more about the factors influencing the diffusion of new traceability technologies. Traceability technologies such as automated identification and data capture (AIDC) technologies (barcodes and radio frequency identification (RFID)) and blockchain technology have the ability to provide efficiency, accountability, transparency and establish provenance. Some technologies have the ability to capture data instantly and be accessible transparently to all parties. However, many stakeholders are reluctant to adopt new technologies. The proposed research will focus on determining the factors that limit and facilitate the adoption and implementation of traceability technologies within different channels, such as growers, packers, distributors, exporters, consumers and technology service providers. A guide as to how these hurdles may be overcome will be provided. Research outcomes are 1) identification of the implementation drivers and hurdles affecting the diffusion of food traceability technologies in the food industry, and 2) determination of the best approach to use when integrating or establishing more reliable and transparent traceability and food safety systems into the kiwifruit industry production and supply chain.
Keywords: Diffusion of innovation; RFID; Blockchain; Food traceability

S8: An empirical study of Chinese consumers' perceptions and acceptance towards smart packaging for beverage products

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To meet consumers' growing demands for quality, manufacturers and retailers require new packaging technologies to improve food quality, safety, handling, logistics and help reduce the loss of resources across the supply. By creating such advantages, New Zealand manufacturers and retailers can have an extra edge to compete in a huge and highly competitive market in China. However, certain technologies are not readily accepted by consumers because of the differences in interest or cultural factors. This research aims to explore the perceptions of the consumers toward possible advantages and disadvantages of several specific packaging technologies for beverage products. The technologies include "bag in bottle", "bag in box", active packaging (e.g. O2 scavenging, antimicrobial packaging) and intelligent packaging (e.g. indicators). It is vital to know how the consumers perceive risks about these new technologies, what types of concerns they have and how these relate the risks of the technologies. By providing evidence of consumers' cultural or social beliefs about unfamiliar and unknown technologies, NZ manufacturers and retailers can develop strategies to advertise and reassure consumers about the safety of their products in this key overseas market. The research will be conducted via an online survey and the primary focus will be on the technologies' functionalities, labelling information, extrinsic cues, communication and the influence of search attributes (country of origin, price, brand) on the consumers' technology acceptance.

Keywords: Consumers' preference, Risk perception, Smart packaging, Technology acceptance, Beverage packaging

S9: Effect of air blast freezing and frozen storage on *Escherichia coli* survival in Greenshell™ mussels

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The effect of air blast freezing and frozen storage on Escherichia coli in Greenshell™ mussels was studied. Greenshell™ mussels were inoculated with a cocktail of E. coli (10 strains) and their survival was monitored over 12 weeks. Two freezing temperature (-10˚C and -20˚C) and two inoculum levels: 104 colony forming units/g and 107 cfu/g were used. Enumeration of E. coli was carried out at regular intervals using two methods: the conventional most probable number (MPN) method and the SimPlate® method. The population of E. coli did not differ significantly after blast freezing (day 0). However, E. coli counts were reduced by 2 log units over 12 weeks of frozen storage, with more rapid inactivation occurring at -10˚C. These results suggest that different degrees of injury must have occurred in E. coli at the two temperatures. The SimPlate® method was less sensitive than the conventional MPN method. Additionally, to reduce the detection time a modified cost effective rapid screening method was developed. This method involved a modification of the conventional MPN method. The advantage of the modified rapid screening method

is that only a fraction of media is required and results can be obtained within 12 h compared to 24 h required by the standard MPN method.
Keywords: *Escherichia coli*, Greenshell™ mussels, air blast freezing, frozen storage.

S10: An assessment of lipid oxidation in stepwise in-bag dry aged lean bull beef
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Dry aging of red meat produces a high quality product with a unique flavour. Beef is commonly dry aged out-of-bag in a chiller for 21-28 days at 0-2˚C and 60-85% relative humidity, with an air flow of 0.5-2.5 m/s. Increasing the air velocity may accelerate the desirable moisture loss speeding up the dry-aging process. Water permeable bags for dry-aging have recently been used to reduce microbial growth and contamination. In this study, lipid oxidation was assessed for lean bull beef dry aged in water permeable bags. The trial investigated 4 different air velocity regimes, on dry aging beef from one day after slaughter beef to 21 days. The control (n = 6) was at 0.5 m/s air velocity for 21 days, compared with 7 days at 0.5, 1.5 and 2.5 m/s air velocities (n = 8 each) followed by 14 days of wet aging. Traditional techniques for lipid oxidation analyses, thiobarbituric reactive substances (TBARS), GC-FID were coupled with novel nuclear magnetic resonance spectroscopy (NMR). Treatments ($p < 0.05$) affected the production of secondary oxidation products. The control and 2.5 m/s treatments showed the highest TBARS values (303 and 311 MDA µg/kg, respectively). Aging time had an effect across all treatments, most notably shown by a polyunsaturated fatty acid (PUFA) decline ($p < 0.05$). Aliphatic to diallylmethylene proton ratios increased with ageing time ($p < 0.05$). In conclusion, compared to 21 days dry-aging, the treatment of 7 days in-bag dry-aging followed by 14 days of wet aging can potentially provide a product with less lipid oxidation, equivalent eating quality, and less weight loss.
Keywords: Dry-aging, lipid oxidation, fatty acids

S11: The extraction and bioactivity of feijoa phenolic compounds
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Within the last decade, both the yield and the sales value of New Zealand grown feijoa have steadily increased. New Zealand is now one of the leading countries that grow and export feijoa fruit. Besides being consumed as fresh fruit, feijoas are frequently made into food products including juice, yogurt, honey and chocolate, etc. Although feijoa is attracting more and more attentions worldwide, the investigation of its bioactivities is still very limited. This research focused on both

the extraction method and the bioactivities of feijoa phenolic compounds, which could contribute to local feijoa processing industries.
The extraction method of feijoa phenolic compounds was optimized by orthogonal design. The antioxidant activity of feijoa extracts was tested by DPPH and FRAP assays. The anti-inflammation and antiproliferation activities were assessed using cell culture models, HEK-blue mutant cell lines and prostate cancer cell lines, respectively.
Our results have shown the optimised extraction conditions for feijoa phenolic compounds, and further revealed that feijoa possesses significant antioxidant, anti-inflammation and antiproliferation activities. This suggests that, with a suitable extraction method, feijoa could potentially be utilised in functional foods or naturally derived medicines.
Keywords: Feijoa, Extraction of phenolic compounds, Antioxidant, Anti-inflammation, Antiproliferation

S12: Kefir fermentation of beverage containing *Ziziphus jujube* Mill.
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Water kefir is a self-carbonated, low sugar beverage with a mildly sour taste fermented by a microbial multispecies of kefir containing lactic acid bacteria (LAB) and yeasts. Sucrose is normally used as a source of carbon to ferment water kefir beverage. There is need to reduce the amount of sugar due to consumer demand for foods containing low carbohydrates. The study investigated the potential of using syrup extracted from Ziziphus jujube Mill. (jujube) to partially replace sucrose for kefir fermentation. Ziziphus jujube Mill. contains high concentrations of non-reducing sugars, making it a potential source of carbon for kefir fermentation. Jujube syrup was extracted using the water-bath method. Two syrup concentrations (10%, 20%) and two fermentation temperatures (25˚C, 27˚C) were prepared. Various analyses (sugar, acidity, antioxidants, titratable acid, starter culture cells) and measurements (pH, colour, ˚Brix) were conducted during fermentation and storage (4˚C) of the fermented beverage using standard methods. The beverage was evaluated by consumer sensory evaluation using a 9-point hedonic scale. The beverage containing higher syrup concentration had higher total soluble solids (˚Brix), pH, and darker colour than the sample containing the lower syrup concentration. A higher syrup concentration also resulted in higher counts of LAB (7 log cfu/ml) and yeast (6 log cfu/ml) at the end of the fermentation. No significant differences ($p>0.05$) of the investigated parameters were observed between the beverages fermented at 25˚C and 27˚C, except a lower titratable acid was obtained at 27˚C. The beverage with higher syrup concentration was preferred by a consumer sensory panel.
Keywords:
Water kefir, *Ziziphus Jujube* Mill, fermented beverage

S13: Identification of dominant lactic acid bacteria and yeasts in rice sourdough produced in New Zealand

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Most gluten-free products on the market are described as bland with poor mouth feel and are considered low quality in terms of texture due to lack of gluten, which has positive effects on the texture and appearance of cereal bakery products. The application of sourdough is a recent development in improving the quality of gluten-free bread due to its efficiency and low-cost. This study aimed to understand the fermentation of a gluten-free rice flour mix used to improve the quality of rice sourdough bread. Lactic acid bacteria (LAB) and yeasts were isolated from samples of rice mother sourdough (MSD), dough before proofing (DBP) and dough after proofing (DAP) using MRS and YGC agar, respectively. After incubation, colonies were counted and isolates of LAB and yeasts were identified using API test kits (API 50 CHL for LAB and API 32 C for yeasts) and sequencing using 16S metagenetics for LAB and ITS region for yeasts. Mean LAB counts in MSD, DBP and DAP were 8.6 log CFU/g, 7.9 log CFU/g and 8.5 log CFU/g, respectively while yeast counts were 5.4 log CFU/g, 6.4 log CFU/g, and 6.7 log CFU/g, respectively. LAB counts increased significantly during proofing but yeasts did not grow significantly ($p<0.05$). *Lactobacillus plantarum* and *Lactobacillus fermentarum* were the dominant LAB species and *Saccharomyces cerevisiae* was the dominant yeast in rice sourdough. Biochemical analyses were also performed on sourdough samples, and principle components analysis was conducted to determine correlations between quantity of microbiota and biochemical characteristics of sourdough samples.
Keywords: Rice sourdough, starter culture, *Lactobacillus plantarum, Lactobacillus fermentarum, Saccharomyces cerevisiae*

S14: Spray-drying of encapsulated *Lactobacillus reuteri* DPC16 in reconstituted skim milk powder

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Probiotics are mainly delivered to the gastrointestinal tract through food products with high water activity which poses challenges with handling, storage and survival of the microorganisms. Spray-drying offers opportunities to preserve the viability of probiotics. Spray-dried products have several advantages including handling, low water activity, and can be stored at ambient temperature for relatively long periods. The present study investigated different carrier materials for microencapsulation of probiotics using spray-drying. *Lactobacillus (L.) reuteri* DPC16 (DPC16) was encapsulated using the following materials in water (w/w): 10% skim milk powder, 10% maltodextrin, 10% gum Arabic, and 4:1 combined materials (2.5% skim milk

powder/ 2.5% gum Arabic/ 2.5% inulin /2.5% sucrose), followed by spray-drying at 160˚C/80˚C inlet/outlet temperatures, respectively. The spray-dried DPC16 treatments were vacuum packed in highly gas-impermeable film (PET/EVOJ/PE co-ex topweb FOC), and aluminium barrier bags, then stored at 25 and 55˚C for four weeks. Survival of the lactobacilli was determined on MRS agar with anaerobic incubation for 48 h. Immediately after spray drying, the encapsulated powder packed in the 4:1 combined material had the highest cell counts (98.15%), and gum Arabic had the lowest (89.2%). However, cells encapsulated in skim milk powder were the most stable during storage (55˚C). The skim milk powder/FOC packaging combination is a good starting point for preparing stable encapsulated *L. reuteri* DPC16 by spray-drying.
Keywords: Spray-drying, probiotics, microencapsulation, Lactobacillus reuteri DPC16

RESEARCH POSTER ABSTRACTS

P1: Kinetics of chemical reactions associated with pectin solubilisation in apple pomace during hydrothermal treatments.

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Apple pomace is the solid residue remaining after pressing apples for juice. It mainly contains cellulose, xyloglucan and pectin. Pectin is a complex polymer with several interactions with other cell wall components, and we are exploring mechanisms to release and modify this polysaccharide to help generate a smooth-texture fibre ingredient with ~100% yield from apple pomace. Hydrothermal treatment can depolymerise and solubilise pectin through non-enzymatic reactions (acid hydrolysis and β-elimination). In this study, the kinetics of these reactions were investigated between 90 and 140˚C (at 10˚C intervals, for up to 360 min) by determining reducing end group (REG) and unsaturated uronide formation. The concentration of REGs increased with increased holding time at each temperature. However, prolonged heating resulted in decreasing REGs. Unsaturated uronide formation and pectin solubilisation showed a similar trend. The reduction in REG and unsaturated uronide levels indicate further degradation, and this is accompanied by increasing amounts of other components such as organic acids and 5-hydroxymethyl furfural.

Keywords: Pomace, hydrothermal, reducing end group, solubilisation.

P2: Cost-effective approach for fused deposition modelling

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3D printing is a layer-by-layer manufacturing process that creates an opportunity to mass customize designs as well as to apply the products in biodegradable applications. Fused deposition modelling (FDM) is one technique to fabricate biodegradable polymers in layers. However, one problem is the high cost and low strength of FDM materials. FDM-grade polylactic acid (PLA) is a biodegradable material that costs NZD 90/kg, which is high considering the limited strength, ductility and overall quality of the print. Injection moulding (IM) grade PLA has a potential to achieve good properties at a much lower cost of NZD 10/kg, but its use is not common in FDM. In this research, it was found that IM-grade PLA lacks the high degree of crystallization responsible for good mechanical properties. This

research proposes fabrication in a heated ambient atmosphere to achieve high crystallization with IM grade-PLA, based on 10% improvement in strength with FDM-grade PLA used to print at 45˚C ambient.
Keywords: Biodegradable materials, fused deposition modelling (FDM), 3D printing, polylactic acid.

P3: Lipid profiles from different anatomical parts of mutton birds over different harvest seasons

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Sooty Shearwater (*Puffinus griseus*) chicks, also known as mutton birds, are harvested annually by Maori for consumption under ancestral customary rights. Salted mutton bird carcasses from 2015, 2016 and 2017 and unsalted-frozen carcasses from 2015 were dissected into skin, breast meat (BM) and leg meat (LM), and the lipid profile, omega-3 fatty acid positional distribution, and thermal properties of the lipids were determined. Samples were analysed for proximate composition while fatty acids, and vitamins A and E were analysed using GC and HPLC. The positional distributions of fatty acids were observed by 13C-NMR. Thermal properties (melting, crystallisation, and decomposition temperatures and oxidation stability) of the lipids were analysed using differential scanning calorimetry (DSC) and thermogravimetric analysis (TGA).
For moisture content, salting decreases moisture content in meat due to diffusion of water out of the meat. Mutton birds overall had higher ash and protein content, and lower moisture and lipid content in breast and leg muscles than other meat sources such as beef and chicken. Mutton birds may be a good source of vitamin A but not vitamin E. MUFA content was higher than SFA and PUFA contents and influenced the physical properties of the lipids. The overall DHA (C22:6) peaks for skin, BM and LM were similar. The results of fatty acid contents of mutton bird in GC agreed with 13C-NMR data, with DHA preferentially located at sn-2. DSC and TGA thermograms were in accordance with fatty acid content of mutton birds, because thermal decomposition, melting and crystallisation initiates earlier at higher PUFA content.
Keywords: Mutton bird lipids, omega-3, Skin tissue, Breast meat, Leg meat

P4: Analysis of Mutton Bird stomach oil

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New Zealand mutton bird (Puffinus griseus), also known as sooty shearwater, is a marine bird that nests in the Southern Mutton Bird Islands of New Zealand. Selected indigenous Maori families have ancestral customary rights to harvest young birds annually for food, oil and feathers. The stomach oil of the juvenile birds (MBSO) is collected from the proventriculus, representing the prey that the parent birds feed to the chicks. The diet of the adult mutton bird includes small fishes and marine zooplankton (mainly krill) that are rich in omega-3 fatty acids. This research characterized the lipid profile, omega-3 fatty acid positional distribution, and thermal properties of the MBSO. Separation of lipid classes was accomplished by thin layer chromatography. Fatty acid profiles were detected by analysing FAMEs using GC. Positional distribution of the major long-chain polyunsaturated fatty acids (LC-PUFA) in MBSO were investigated by 13C-NMR. Melting, crystallisation, decomposition characteristics and oxidation stability were estimated by isothermal analysis conducted using DSC and thermal gravitational analysis.

Wax esters (WE, 47%-67%) and triacylglycerols (TAG, 19%-42%) were the most abundant lipid classes in the MBSO where major n-3 fatty acids EPA and DHA in the oil contributed around 14% to 16% and 13% to 15% of the total, respectively. DHA was predominantly located at sn-2, whereas EPA and SDA were more evenly distributed across the sn-1, 3 and sn-2 positions. Estimated values of onset time for thermal oxidation were recorded to predict MBSO shelf life. Melting, crystallisation and decomposition profiles showed distinctive thermal stages, suggesting progressive thermal degradation involving PUFA, MUFA and SFA.
Keywords: MBSO lipids, LCPUFA, Wax esters, TAG fatty acid positional distribution, Thermal properties

P5: The effect of pulsed electric field on the quality of dried apricot

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The effects of pulsed electric field (PEF) treatments on the subsequent drying rate of apricots and the activity of peroxidase (POD), polyphenol oxidase (PPO) and colour were investigated. Four PEF treatment groups were investigated (10 kV for 60s plus SO2 treatment; 10 kV for 30s plus SO_2 treatment; 10 kV for 30s plus SO_2 treatment in addition to 2 min heating at 80˚C; and 5 kV for 30s plus SO_2 treatment). Three controls were tested in parallel (untreated control, control treated with SO_2 and control heated at 80˚C for 10 min). The SO_2 treatment used sodium sulfite solution (0.2% w/w) at 25˚C for 2 h. Subsamples were frozen in liquid nitrogen for the later determination of POD and PPO. The samples were air dried using a hot air dryer at a temperature of 40˚C and the final colour was also measured using a Hunterlab colorimeter. The drying rate of apricots treated with PEF at 10 kV was highest. PEF treatment reduced the activity of POD by 30–40%, while heating at 80˚C for 10 min decreased the enzyme activity up to 67%. PEF treatment reduced the activity of PPO by 10–20%, while the heated control had a decreased enzyme activity up to 40%. The results suggest that PEF could be effective in improving apricot drying. Studies are ongoing to determine the impact of treatments on the nutritional properties of the dried apricots.
Keywords: apricot, pulsed electric field drying, peroxidase, polyphenol oxidase

P6: Selenium speciation and bioactive compounds in Chinese Crab Apple tea leaves from a high soil-selenium area

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Selenium is an essential trace element and deficiency is often related to low soil selenium levels. The Chinese crab apple (*Malus hupehensis*) is used as a medicinal tea and it has been reported to contain bioactive compounds that benefit human health, including an anti-diabetic effect. This work studied selenium speciation and

determination of total phenolic and flavonoid content as well as DPPH assay activity in crab apple tea leaves from Hubei, a Chinese province with high soil-selenium. Ethanol, water and a mixture of cellulase and protease enzymes were applied for extraction. Selenium speciation was determined using HPLC-ICP-MS. The ethanol extract gave the highest total phenolic (69.6 mg g^{-1}), total flavonoid (12.9 mg g^{-1}), and DPPH assay values (17.2 μM Trolox g^{-1}). The total selenium content of 24.9 μg g^{-1} was determined and compared with a daily adult dietary requirement of approximately 70 μg day^{-1}. Only the inorganic selenium species of selenite and selenate were present in extracts that did not include enzymes. In the plus-enzyme extractions, several organic selenium species were found including selenomethionine, Se-methylselenocysteine and selenocystine. Selenium speciation is important for functionality because organic species have greater anticancer activity. This relationship will be explored in testing the extracts in experiments with cell lines.
Keywords: Selenium, Crab apple tea, Bioactive Compounds, Speciation

P7: Growth of and histamine formation by *Enterobacter aerogenes* isolated from Indonesian salted-boiled fish (*pindang*)
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Indonesian salted-boiled fish, locally named *pindang*, is a traditional fish product made from tuna, mackerel or scad. The processing involves salting and boiling (steaming) as method of preservation. Pindang has a high risk of being contaminated with histamine and reports indicate that the product has caused several histamine fish poisoning outbreaks in Indonesia. Several histamine-producing bacteria were isolated from the product, including *Enterobacter aerogenes* that can produce >4,000 mg/L of histamine in broth media at 30˚C. This study aimed to model and predict the growth and histamine formation of *E. aerogenes* under conditions relevant to *pindang* production. The isolate was inoculated into histidine broth with different concentrations of salt (1.5, 6, 10 and 20% w/v) and incubated at 10, 15, 20 and 30˚C. Growth and histamine formation during the incubation were recorded. The parameters: growth rate, lag time and maximum population were estimated using the Roberts and Baranyi model in the DMFit software version 3.5 Excel® add-in. Correlations between growth rate with salt and temperature were evaluated using linear regression. Growth rate and maximum population were significantly affected ($P<0.001$) by salt (NaCl) concentration and temperature. At 20% salt, no growth was observed. Salt addition also determined the maximum population at the end of incubation. At 10% salt, the population reached only 5.8 log CFU. The highest histamine concentration (>6,000 mg/L) was produced at 30˚C with 1.5% salt. Although the isolate survived 10% salt at 30˚C, the concentration of histamine was very low (<10 mg/L).
Keywords: Indonesian salted-boiled fish (pindang), predictive modelling, histamine, salt.

P8: Prevalence of NoV GII in shellfish from Indonesian fish markets
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Noroviruses (NoV) are the most common causative agent of acute gastroenteritis in humans associated with shellfish consumption. Shellfish are susceptible to NoV contamination because of their ability to filter large amounts of potentially contaminated water during feeding. This study presents the first prevalence data of NoV GII in three shellfish species from Indonesian fish markets that are commonly consumed i.e. Green Mussel (*Perna viridis*), Blood Cockle (*Anadara granosa*) and Oriental Hard Clam (*Meretrix lusoria*). A total of 171 shellfish were purchased from four fish markets (three traditional and one modern markets) in two regions (Jakarta and Panimbang, Indonesia) between August and October in 2016 and 2017. NoV from extracted digestive tissue of the shellfish were enumerated using enzymatic pre-treated real time reverse transcription PCR (pre-treated RT-qPCR). NoV GII was detected in 11 out of 171 samples (6.5%) with contamination levels from 2.67 x 101 to 8.98 x 103 copies/gram digestive tissue. NoV GII prevalence in Green Mussels was 10 % which was higher than the prevalence in Oriental Hard Clam (7.14%) and Blood Cockle (2.9%). NoV GII contamination was found in shellfish from traditional fish markets (Muara Kamal and Cilincing) in the Jakarta region but not from the Panimbang region. The genotype of NoV GII was confirmed by sequencing with primers that target region C (ORF1-ORF2 junction) of NoV genome. The findings from this study emphasise the need for surveillance and the implementation of control measures to reduce the potential risk from NoV-contaminated shellfish from Indonesian markets, especially from the Jakarta region.
Keywords: prevalence, norovirus, shellfish, Indonesia, pre-treated RT-qPCR