

# ASCientia

Transforming the future

## Food and Nutrition



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*Addressing Needs > Accelerating Change*

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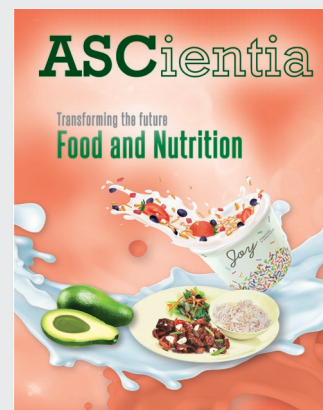
**ASCientia** is a combination of ASC (acronym for School of Applied Science) and scientia (Latin word for knowledge, science and skill)

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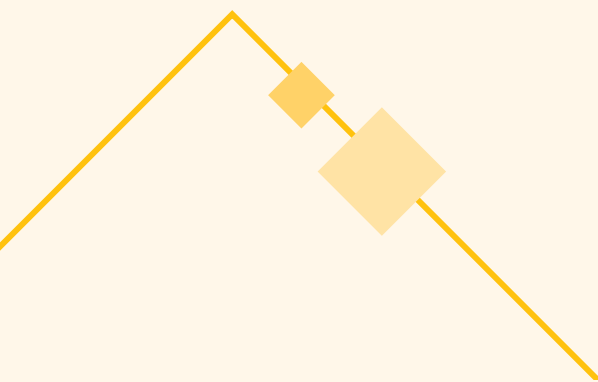


# Director's Message

School of Applied Science (ASC) is very proud to showcase our food, nutrition and culinary expertise at ASConference 2018. The conference is aptly themed: Transforming the future of food and nutrition.

With the food and beverage industry having a massive economic impact in Singapore and with more emphasis on technology and innovation to drive this industry, it is critical that we prepare a workforce that can handle such challenges and changes. Through research in food and nutrition, we have not only assisted many industry partners to create healthier and tastier foods, but were able to assist in evaluating their impact to health. We are also responding to the global demographic shift due to increasing ageing society, by curating texture-modified meals with local flavours for elderly.

Lee Chee Wee, PhD



**ASC** has come a long way in this food trajectory we had undertaken with the first Glycemic Index (GI) testing of selected fruits and noodle varieties in 2000 leading to the Glycemic Index Research Unit (GIRU) winning the MOE Innergy Awards 2017 (Bronze Award) for Most Innovative Project 'Glycemic Index-Assessing the Quality of Carbohydrates'.

In September 2017, ASC collaborated with Leong Guan Food Manufacturer Pte Ltd, one of Singapore's largest noodle suppliers and manufacturers in licensing our low GI wholegrain noodle formulation that is also Healthier Choice Symbol (HCS) to them. With this successful commercialisation deal, low GI noodles will be another healthier option made available to the public in the near future.

ASC also launched the 1<sup>st</sup> commemorative cookbook, *Singapore Hawker Classics Unveiled: Decoding 25 Favourite Dishes*, which won the Gourmand World Cookbook Awards in 2016 for 'Best in the World' in the category of 'Street Food'.

We partnered NTUC Foodfare and launched a range of Ready-to-Eat low GI pizzas in NTUC Fairprice in 2017, being the first meal product that is suitable for diabetes to be retailed in supermarkets.

Moving with the changing trends, we have reformulated our healthier ice creams produced by ASC's KoolWerkz training factory to produce a new range of ice creams with improved novel flavours and functional ingredients under a new packaging labelled JOY. These will be retailed on campus and online.

Early this year we opened Bistro Lab Cafeteria and Cu2+ Staff Lounge. Bistro Lab is a learning enterprise and training facility for students to apply their learnt knowledge and sharpen their skills in baking, culinary science, operations management, technology application, as well as nutrition, to plan and serve healthier menu options.

These developments testify and confirm that we have the skills, capability and right people to collaborate with you in areas of food, nutrition and culinary science. Let's transform the future of our health together with the right food and nutrition as this requires concerted efforts of both the food and F&B industries.

*Partner us, make your business better.*

# Centre for Aquaculture & Veterinary Science (CAVS)

Is a 4 storey purpose-built centre established in 2016 with specialised learning enterprises and research facilities with the strategic aim in providing:

- Quality testing services for the agrotechnology (aquaculture and horticulture), biomedical, pet and veterinary industries
- Customised skill-based training courses of relevance to meet the manpower needs of the industry
- Collaborative research and development via integrated and multi-disciplinary approach to provide innovative solutions for the respective industry

**CAVS** has also been recently appointed as the Technology Resource Centre for the Asia-Pacific Economic Cooperation (APEC) Policy Partnership on Food Security (PPFS) particularly in the sustainable development of agricultural and fishery sectors in November 2017. The appointment opens up opportunities to work with 23 country members in APEC PPFS looking for innovative solutions in the agrotechnology sector.

Activities carried out at CAVS are broadly categorised as:

- Training programmes with emphasis on industry-centric and relevant core skill sets and knowledge in well-equipped facilities such as licenced TP Animal Clinic and Animal Wellness Facilities. Communication and thinking process skills are also in-built to provide well-rounded student training
- Testing services related to feeding trials and feed evaluation, diagnostic detection and kit development; product testing and validation; animal biomodelling; immunohistochemical and molecular testing of animal tissue and body fluids at Veterinary Diagnostic Laboratories, Necropsy and Procedure Laboratories
- Applied Research & Development in areas of product development such as feed formulation and development, functional feeds and additives, vaccine and pathogen detection, disease treatment and control; breeding strategies and seedstock development, animal modelling, animal behavioural enrichment at Aquaculture Research Facility, Specific Pathogen Free Laboratory Animal Facility and Animal Wellness Facility



*Researchers attending industry-centric training programmes*

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# Centre of Innovation for Complementary Health Products (COI CHP)

The Centre of Innovation for Complementary Health Products (COI CHP) is a one-stop centre of excellence for the advancement of the CHP industry, providing scientific evidence-based analysis to enhance quality, safety and efficacy. Jointly established with SPRING Singapore in 2016, the COI CHP at Temasek Polytechnic also facilitates a high level of innovation in evidence-based analysis for CHP development, validation and training. With a national drive towards innovation and productivity, the COI CHP strives to offer innovative and creative solutions for technical challenges faced by SMEs, to better support their business.

## INNOVATIVE SOLUTIONS FOR INDUSTRY

Our technical expertise and state-of-the-art equipment allows us to be a one-stop centre for you



## ONE-STOP CENTRE COMPLIMENTARY HEALTH PRODUCTS

The Centre of Innovation is a one-stop resource centre to facilitate a high level of innovation in CHP development, validation and training.



## QUALITY PRODUCTS HOW WE CAN HELP

Guaranteeing the quality, safety and efficacy of your products so you can stay ahead of the competition.

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# Centre for Molecular Diagnostic (CMD)

The Centre's primary objective is to enable innovations through education and partnership. Some of the services that we offer include:

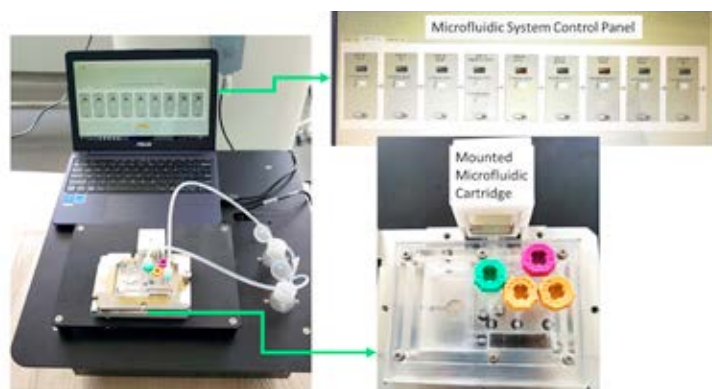
Surge Research and Education Programme (SuRE)

- Capability building for detection and diagnosis of known & unknown pathogens
- Preparation and planning for specific types of emergencies - natural disasters, sporadic and epidemic outbreaks and Zoonosis
- National preparedness - a strategic stockpile of therapeutic supplies, epidemic information exchange, preparedness and response
- Build capability for monitoring and surveillance of disease agents of importance in aqua, pet and wildlife animals
- A 'Makerspace' serving the SuRE Programme

Point of Care (POC) and Continuous Monitoring Diagnostics Platform Development

- POC detection systems for on-site diagnosis of pathogens and toxins
- Portable instrumental analysis systems for molecular typing

## OIA-Microfluidics System for automated sample processing and pathogen/toxin detection

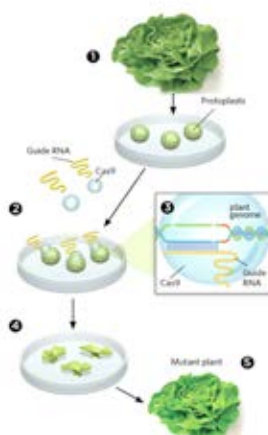


- Field capability to detect pathogens/toxins/biomarkers
- Development of POC kits customised for diagnostic applications
- Development of molecular diagnostic kits for customised pathogen test panel

Synthetic Biology with Bioinformatics Programme

- Whole genome analysis and bio-informatics services
- Modular functional plants, microbes using CRISPR cas system
- Development of database for plant pathogens, control measures and diagnostic capabilities
- Developing and teaching Bioinformatics elective cluster for Diploma in Biotechnology
- Developing CET courses for Bio design, synthetic biology and bioinformatics

## Reprogramming biological systems:



Specific LED light spectrums for increasing yield and inducing pest resistance in leafy vegetables



**Synthetic Biology (CRISPR cas system)** - Metabolome analysis and DNA-free genome editing in leafy vegetables with preassembled CRISPR-Cas9 ribonucleoproteins

**Photo-induction system (LED lights)** - Modulating leafy vegetables, herbs for urban intensive farming systems - soil based, hydroponics, aeroponics and aquaponics

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# Feeding the Future through Aquaponics

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Domain Lead/Agrotechnology

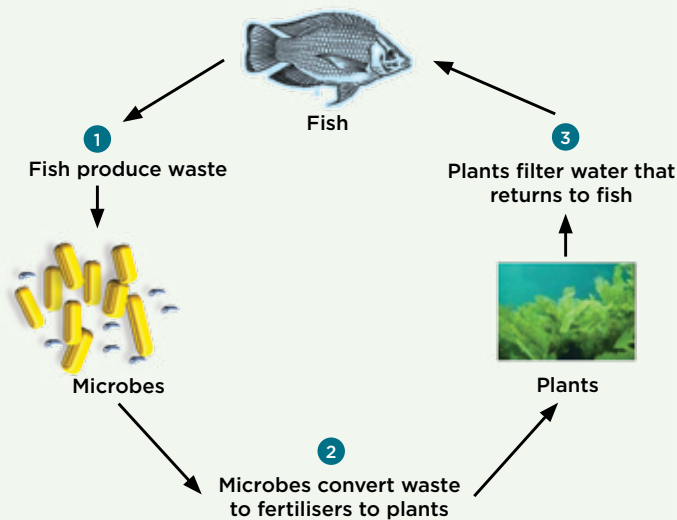
Global farming systems have been rapidly evolving to meet the growing food demands of the population. Technological advancements in agriculture has resulted in increased production while at the same time reduced operating costs. These innovations in agro-technology enabled the production of food, including vegetables and fish in urban areas, in order to meet a significant portion of the food requirements for the population. Singapore is no exception to this scenario, where food security and sustainability is a major concern due to land scarcity, rapid urbanisation and low local food productions of fish and vegetables. In the context of a healthy lifestyle, standard of living in the country has tremendously improved and consumers are more aware of having to eat high quality, safe and nutritious food. There are now initiatives toward establishing indoor farms for plants and fish as well as applying the concept of growing your own food at home or in the backyard. An example of a food production system that is suited in urban areas is aquaponics. Interests in adopting aquaponics came about as a result of increasing demand for local food and at the same time ensures a way of harvesting not only edible plants in an urban environment but also protein including fish and shrimp.

Aquaponics is an integrated multi-trophic system that combines essential features of recirculating aquaculture and hydroponics. It literally means using water (aqua) to augment the needs of cultivating plants, and at the same time the plants are filtering the water of organic wastes for growing fish. It is a soil-free natural process that is also common in lakes, ponds and rivers. This growing cycle is profitable and totally sustainable. In fact, using a recirculating system in aquaponics enables the cultivation of more plants by using less water than field agriculture. In addition, one can grow a variety of fish without facing risks of damaging the native species. In short, aquaponics as a method of producing food entails a smaller ecological footprint. How the aquaponics system works is straightforward. Water from the fish tanks is enriched with nutrients is subsequently used for plant growth. The water from the fish tank is full of wastes, which is a good source of nutrients for the plants. The nutrient-rich water is pumped up from the fish tank into the plant grow-bed. Then the water passes through the growth media, past



*Pak choi in a growbed atop of the aquaponics set-up*





the roots of the plants before draining back into the fish tank. There are bacteria that live on the surface of the grow-bed media and these bacteria are able to convert ammonia wastes from the water into nitrates that can be used by the plants. The roots extract the nutrients from the water, resulting in clean water for the fish.

Aquaponics is a good alternative to current farming methods that can improve food security. Here are some reasons why this is so:

- does not rely on oil
- does not depend on high feed input
- does not rely on the use of chemicals

Another salient feature of aquaponics is that the produce will always be fresh. The plants could be harvested on the day they are consumed, thereby retaining their maximum nutrient levels and are healthier to eat. Aquaponics mimics biology and in terms of operation, the system can be easily set-up in the backyard or inside the house. It can also be done on a community level and can be used as a strategy of educating and enabling people to grow their own food.

The fish and plants that are grown in an aquaponics system should preferably have similar needs including temperature and pH. The closer these conditions match the needs of both fish and plants, the higher chances of success. As a general rule, warm, fresh water, fish and leafy crops such as lettuce and herbs are the best combination. In a system heavily stocked with fish, one may cultivate fruiting plants such as tomatoes and pepper. Plants that are best suited in an aquaponics system include (but not limited to) salad greens, pak choi, mung bean, tomatoes, lettuce and different types of herbs (e.g. basil and watercress). When deciding what fish to use for the aquaponics system, one must take into consideration the purpose of growing the fish - whether to be raised as food or simply to complement with the plants, in the case of ornamental fish. Fish, being the power house of an aquaponics system, provide nutrients for plants. If one

is growing foodfish, these can also be a good protein source for us. A suitable foodfish that can be grown in aquaponics is tilapia. They have fast growth, can tolerate poor water conditions and require warm/tropical water. They live in shallow streams, ponds, rivers and lakes. They feed on algae or any plant-based food, thus making them an important fish species in aquaculture. They are a rich source of protein and are popular among artisanal fisheries. It is crucial that the health of the fish is taken care of as they are the lifeline of the aquaponics system. The system must be regularly monitored to ensure that both the plants and the fish are in good health.

The aquaponic system is an innovative way to promote sustainable living, whether done on a large or small scale. This system can easily be set-up at home, provided some basic rules are followed. As urban farms are heading towards the mainstream in Singapore, industry practitioners are embracing aquaponics as one of the solutions to supply the food requirements and could be one of the potential strategies to feed future populations.



*Tilapia grown in an aquaponics system*



*Live shrimp grown through aquaponics*

# In-Vitro Feasibility Studies on Teeth-whitening Agents

Meliana Riwanto, PhD  
*Domain Lead/Biologics, Nutraceutical & Pharmaceutical Technology*

Irsan Lim, PhD  
*Lecturer/Biologics, Nutraceutical & Pharmaceutical Technology*

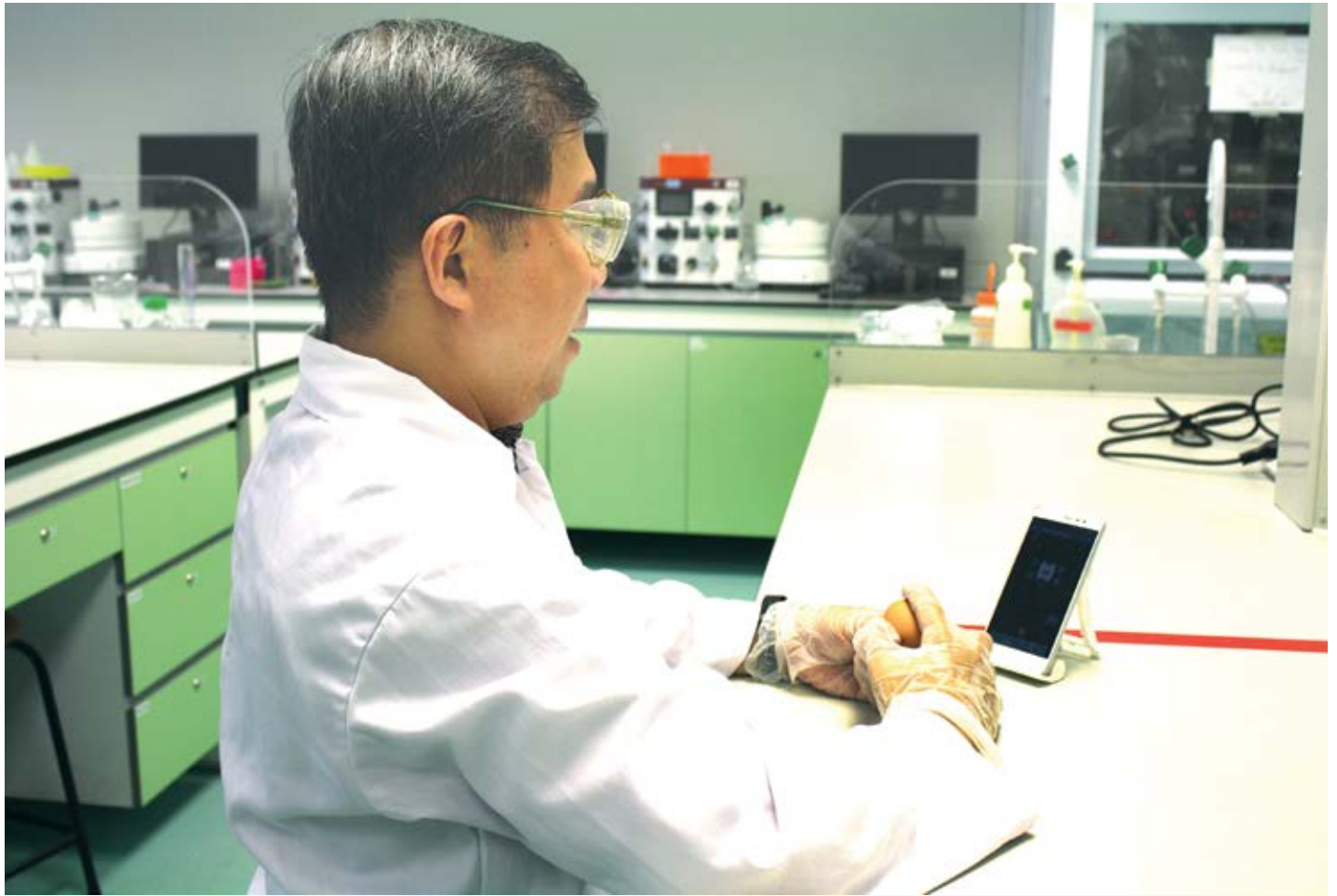
Having a set of white teeth, in a properly maintained oral cavity, is an added bonus. Ideally, by proper brushing our teeth twice a day, one should get both white and healthy teeth. To achieve the ideal, testing a potential preparation is mandatory for producing an evidence-based product. For testing potential preparations of their whitening effect, one of the problems is getting a suitable in-vitro substrate. One possible solution is using an egg shell as a model for teeth.

The aim of this study was to develop a method to stain model system 'egg shells' in a reproducible manner and to

perform a qualitative/semi-quantitative assessment of test formulations stain removing properties. White egg shells are ideal as substrate as the neutral white of the shell gives better contrast in shade comparison.

Tea, as a staining agent, was prepared by adding 500ml of boiling water into three Ceylon tea bags. It was let cool to room temperature before use. Eggs were stained using the tea prepared earlier by immersing the eggs in the tea for 20 minutes. The stained eggs were then removed and left to dry at room temperature.

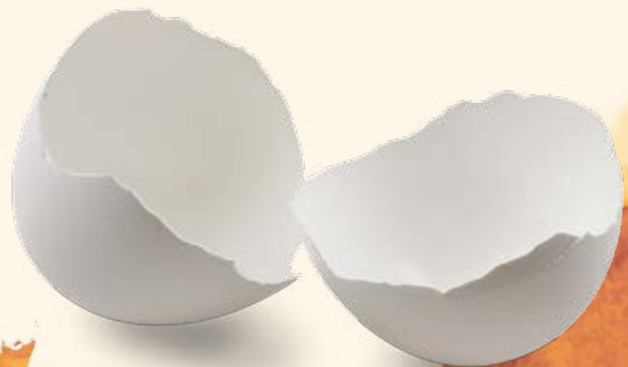




*Controlled rubbing test using a metronome app*

Before a rubbing test is conducted, the shade of each stained egg must be noted. Shading comparison of an egg was done against a series of standard shades of teeth. The stained egg shading was compared with the standard and a shade was noted. The egg would be subsequently used for the rubbing test. An appropriate amount of preparation was evenly distributed around the 'gloved' index finger and rubbed against the stained egg shell. Each egg was divided into imaginary four sections. Each section was used for either rubbing a control or a preparation. The movement of rubbing is a forward and backward or to and fro movement at a frequency of one second for each direction for a total rubbing time of one minute. The speed of rubbing was controlled by using a metronome app.

The data generated by the study of various materials were further analysed using a statistical software running the one-way ANOVA (analysis of variance) test. This study can serve as a possible in-vitro systematic approach for a feasibility study of potential teeth whitening preparations.





# Anabolic Supplements and Stimulants Among Gym Users

Shahedah Bte Md Ali  
*Lecturer/Biologics, Nutraceutical & Pharmaceutical Technology*

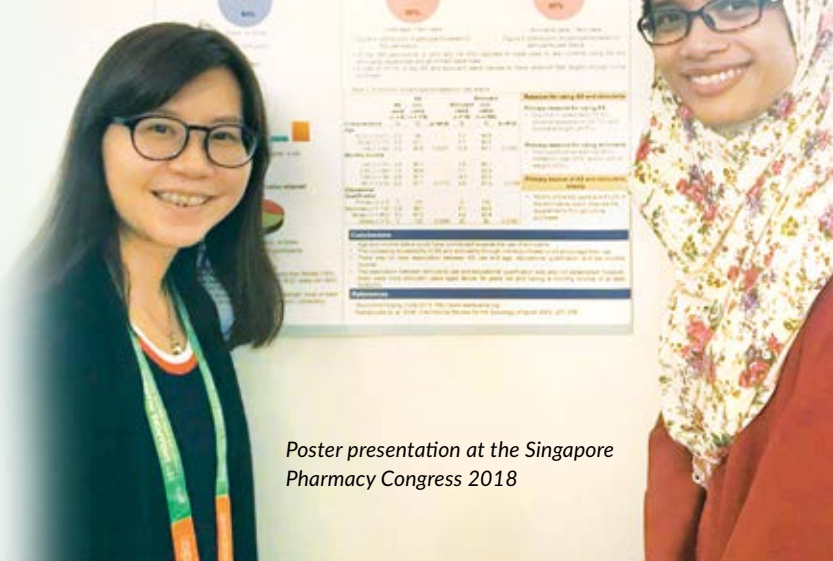
Tan Lay Khee  
*Manager/Academic Development*

The use of Image and Performance Enhancement Drugs (IPEDs) by athletes to improve their physique and sports performance is not uncommon (WADA, 2015). While IPEDs such as anabolic supplements (AS) and stimulants may present many health risks, their use has increasingly been extended to non-competitive athletes in gyms (Kartakoullis et al., 2008). In a New Paper article published in 2012, it was reported that illegal drugs such as stanozolol are readily available to gym users.

In view of limited data on the use of IPEDs in Singapore, this study aimed to establish the prevalence of AS and stimulants use among gym users in Singapore. This study was conducted with the support of Anti-Doping Singapore and Sports Medicine International. The study findings have been showcased at the Singapore Pharmacy Congress 2018.

A cross-sectional survey study was conducted and six students from the Diploma in Pharmaceutical Science participated in the administration of the surveys at seven different gyms across Singapore. A total of 385 participants, who were gym users of at least 16 years old, completed the questionnaire. Competitive athletes were excluded from the study. Participation in this study was voluntary, and the participants' anonymity and confidentiality were assured.

## PREVALENCE OF ANABOLIC SUPPLEMENTS AND STIMULANTS USE AMONG GYM USERS IN SINGAPORE



Poster presentation at the Singapore Pharmacy Congress 2018



Socio-demographic profile of the participants and the prevalence of AS and stimulants used were reported in this study.

Of the 385 participants, nine (2.34%) and 19 (4.94%) reported to have used or were currently using AS and stimulants respectively and all of them were male. Most of the AS users (55.6%) and stimulant users (42.1%) were in the age group of 16 - 25 years old. Most of the AS users (88.9%) and stimulant users (57.9%) received at least tertiary education. The primary reasons reported for using AS were mainly to improve muscle mass, physical appearance as well as muscle strength. Meanwhile, the primary reasons reported for using stimulants were to improve physical stamina and metabolic rate as well as to reduce weight. A total of 55.6% of the AS users and 63.2% of the stimulants users claimed to have obtained their supply through online purchase.

Results from the statistical analyses revealed that age and income status could have contributed towards the use of stimulants. There was no clear association between AS use and age, educational qualification and monthly income. The association between stimulants use and educational qualifications was also not established, however, there were more stimulant users aged above 34 years old and having a monthly income of at least SG\$2,000.

# Food & Beverage Technology Domain - Capabilities

The F&B Technology domain's main capability is leveraging on functional ingredients, including the use of Traditional Chinese Medicine (TCM), to develop products that are healthier and nutritious without sacrificing on flavour. Our products and recipe formulations are stringent and meet the requirements of the Healthier Choice Symbol and the Healthier Dining Programme. Our range of healthier and functional products include low Glycemic Index (GI) noodles, beverages, ice-creams, sauces, confectionery and ready-to-eat meals. In line with the government's push to combat obesity and diabetes, our healthier products will help in the fight against heart diseases and assist weight management.



Low GI wholegrain noodles



Healthier ice-cream made from non-trans fat containing fibre

The domain's other capabilities include,



## Sensory Evaluation

- Conducting of consumer surveys to understand market demand
- Recruiting panelists from public to determine consumers' acceptability on food products' sensory attributes
- Employing statistical methods to analyze survey and sensory evaluation results



## Food Labelling & Claims

- Development of labels for packaged food products
- Providing consultancy service on nutrient claims

Anti-diabetic functional beverages formulated using TCM herbs to help in weight management.



### Shelf-life Study and Quality Assessment

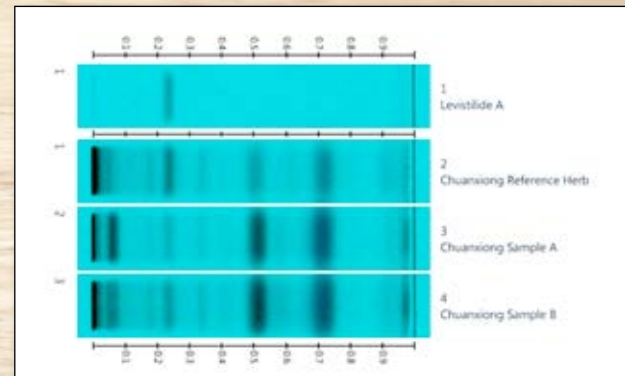
- Conduct real time and accelerated tests for products under various conditions to determine food product shelf-life at ambient temperature



### Applied Research

Study of starch chemistry to support R&D in the development of functional food ingredients/function products include:

- Determining the availability of carbohydrates (ACHO)
- In-vitro glycemic index (GI) assessment
- Resistant starch analysis
- Amylose/amylopectin ratio analysis



### Analysis of Quality Markers in Functional TCM Herbs

- Extraction of active compounds as quality markers in functional TCM herbs (such as raw herbs, concentrated granules)
- Chemical analysis using High Performance Thin Layer Chromatography (HPTLC) and High Performance Liquid Chromatography (HPLC)

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# Bistro Lab and Cu2+

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Petrina Lim  
Centre Head/Applied Nutrition Services



*Bistro Lab and Cu2+*

In January 2018, a 2-storey production kitchen facility was launched by the school. Managed by the Centre for Applied Nutrition Services, it serves as a training venue for students from the Baking and Culinary Science course as part of their work-based learning to operate a cafeteria and bakery. Students learn the application of catering technology and culinary science through the exploration of new food concepts and ingredient applications to offer customers a healthful and nutritive dining option.

Overlooking the Bedok Reservoir, the venue comprises a 118-seater cafeteria named Bistro Lab on the ground floor, and a 132-seater staff lounge named Cu2+ on the second floor. The cafeteria serves both Asian and Western cuisines, featuring weekly set meals, fusion-styled salads and sandwiches, whilst the bakery offers a selection of both European breads, cakes and pastries, as well as Asian-flavoured buns. The staff lounge also doubles up as a space for staff events, the catering for which becomes another learning concept for students. The training facility is also focused on promoting healthier eating; the cafeteria sets



*Students making pastries from scratch*



undetectable nudges to influence customers into selecting the healthier options. These nudges would include setting a reasonable or cheaper price for healthier options; placing healthier options at a more convenient reach for customers; offering vegetables as a default side dish for set meals; and

using descriptive menu labels as some of the environmental cues. Bistro Lab is also engaged in collaborative projects with other diploma courses along with the Health Promotion Board to study the perception and preference for wholegrains among young adults.



# Most Innovative Award in FIPA 2018

Mabel Wong Rong, PhD  
Domain Lead/Food & Beverage Technology



**FOOD INNOVATION**  
PRODUCT AWARD 2018

**MOST  
INNOVATIVE  
AWARD**

TAN SENG KEE FOODS PTE LTD  
& TEMASEK POLYTECHNIC



*Students winning the Most Innovative Award during FIPA 2018*

The Food Innovation Product Award event (FIPA) is organised by the Singapore Food Manufacturing Association (SFMA), supported by government agencies such as Enterprise Singapore (ES) and the Health Promotion Board (HPB). Institutes of Higher Learning (IHLs) have traditionally partnered companies in the food industry to keep abreast of standards and strengthen industry partnerships. Since FIPA's inception in 2016, the Applied Food Science & Nutrition (AFSN) diploma has fielded two teams for the event.

For FIPA 2018, the Most Innovative Award went to one of the teams from TP, working in conjunction with industry partner Tan Seng Kee Foods Pte Ltd.

The competition involved students being in-charge of lab prototype development, which required them to create two ready-to-eat (RTE) noodle snacks by conducting market surveys to find out local flavours that were most popular with consumers, developing two sauces and formulating a



Winners and VIPs

noodle snack base in compliant with nutritional standards associated with the Healthier Choice Symbol (HCS) logo. The students also had to conduct sensory evaluation to find out the consumers' preference on the products. Targeted consumers are mainly school children who can share this healthier snack with friends during breaks between classes. It is hoped that the RTE snacks would replenish the children's energy required in their development while preventing obesity.

The success of the FIPA event provided IHL students an excellent platform in their learning journey. Clinching the Most Innovative Award meant a lot to TP and the students as we were pitted against a strong field such as SP, NTU and NUS. Winning the award also meant TP was able to showcase her outstanding R&D capability to all potential industry partners who may want to engage in collaborations with us.

From the students' perspective, they gained confidence and valuable experience from this achievement. In the process of working closely with an industry partner, the students understood the realities of market demand and industry requirements. They also learnt what it takes to work in a team and form collaborations with industry experts to overcome real challenges.



TP's award winners



Packaging by TP students

# JOY! Repackaging and Reformulation of KoolWerkz Ice Cream



Petrina Lim  
Centre Head/Applied Nutrition Services



Joy.

Happiness in every scoop

TP's off-campus ice cream factory, KoolWerkz was set up in April 2005 as ASC's first learning enterprise to provide training to students from the Diploma in Applied Food Science and Nutrition. Situated at the Gourmet East Kitchen (GEK), it had been producing and selling by direct marketing to MOE schools and healthcare organisations. Sold under the brand of KoolWerkz, its lower fat content 'ice cream' were referred to as 'frozen desserts' due to AVA's food regulations.

Twelve years on and managed currently under the Centre for Applied Nutrition Services, the product underwent a rebranding exercise in view of changing trends to reposition and expand its target audience and marketing channels. Working in collaboration with the School of Design's Centre for Design Communications for its rebranding exercise, KoolWerkz established a sub brand for its products. Named as JOY, this new brand also has a tagline, Happiness in Every Scoop, to communicate the brand purpose.

In keeping to KoolWerkz' established branding as a healthier product, the products were reformulated to reposition its marketing concept as a premium healthier ice cream instead of a frozen dessert that was less understood by consumers. The improved ice cream contains 6% fat that is almost half the fat content compared to regular ones, and is registered under the Health Promotion Board's Healthier Choice Symbol (HCS) programme. Tagged as 'Less than 200 kcal' per serving, it also claims to be 'Trans-fat Free' and 'Cholesterol Free'



apart from being a halal certified product. Despite satisfying the different regulatory requirements and guidelines, the products still maintain a well-acceptable mouthfeel, overall texture and stability, whilst categorised as an ice cream.

KoolWerkz has also developed various formulations that support other nutrient claims for 'Low Glycemic Index' and 'Source of Protein'. It is also developing a formulation suitable for vegans. These are to attract commercial partners such as caterers, wellness centres, hospitals, nursing homes, childcare centres and schools. This shift to achieving functional claims allows JOY to be recognised as a healthier premium ice cream to set itself apart from other ice cream products that are currently thriving on artisanal flavour profiles. Available to the public in a trendy 1-pint tub at the Bistro Lab Cafeteria and Bakery, pre-ordering of the 5-litre catering tubs are also available.



Staff and student eating and collaborating at Bistro Lab



Lunch service at Bistro Lab



Staff lounge at Cu2+



# A NTUC Foodfare & Temasek Polytechnic Partnership - Healthier Food for the Masses

Petrina Lim  
Centre Head/Applied Nutrition Services

Leveraging on the school's R&D expertise in food and culinary science, NTUC Foodfare's food service and manufacturing business entered into a partnership with TP's School of Applied Science in January 2017. Its purpose was to develop healthier food products and meal options that will benefit the masses through NTUC Social Enterprises' reach of dining, supermarket, eldercare and early childhood education chains.

This partnership saw the creation and launch of a series of healthier choice, low Glycemic Index (GI) meals that were made available at selected NTUC

Foodfare's dining outlets. It also led to the development of six varieties of Ready-to-Eat (RTE) low GI frozen pizzas that were marketed under the house brand of NTUC FairPrice. Bearing HPB's Healthier Choice Symbol 'Low in Glycemic Index' on the packaging of the frozen pizzas, these were also the first low GI RTE meals to be sold in Singapore. Tested at TP's accredited GI Research Unit, it was then launched nationwide in various NTUC FairPrice stores on September 2017.



Students with healthier choice dishes



Education Minister, Mr Ong Ye Kung witnessing an MOU signing between TP and NTUC Foodfare



Kids enjoying healthier meal items



Following that was the development of a set of healthier menus targeted at childcare centres. With the goal to improve the current menu choices and the nutritional quality of meals by incorporating more fruit and vegetables, the school collaborated with its Preschool Learning Academy (aka TP@PLAY) an on-campus kindergarten, to test-bed its specially created healthier menu items. This provided a unique opportunity to observe groups of nursery and kindergarten children on their food preference and acceptability of various healthier menu dishes that were nutritionally-enhanced with more fruit, vegetables and wholegrains. The tested items ranged from breakfast and tea snacks to lunch meals that were specially designed by a team of chefs, food technologists and nutritionists. These new menu items had to also fulfil the Health Promotion Board's nutrition guidelines for preschoolers. Some of the

tested items were Macaroni Ratatouille; Wholemeal Tofu and Hummus Sandwich; and Barley & Purple Sweet Potato Soup. This set of healthier menus were introduced into childcare centres catered by NTUC Foodfare.

This partnership is a game changer in the 'War on Diabetes' that aims to revolutionise awareness-building of how nutrition can reduce the risk of diet-related diseases. Thus it will play a pivotal role in developing other food products and meals, as well as nutrition education programmes for the community, with a keen focus in the healthcare, eldercare and childcare sectors. It will see more innovative product development towards commercialisation of healthier/low GI foods that will also be test-bedded within TP and NTUC Foodfare's establishments.

# Microalgae Fortified Foods for Better Food Nutrition

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Inadequate food nutrition is a common problem among our elderly. Functional staples based on algae can help improve the intake of important nutrients without adding stress to the elderly with eating restrictions that limit their intake of protein. With our aging population, these functional staples can play an important social role in enhancing nutrition. The ageing population is increasingly impacting many countries around the world and Asia is among the worst affected. It is estimated that by the middle of the century, one in five people globally will be aged 60 and above. This is an increase from 900 million in 2015 to 2.1 billion by 2050 (The Straits Times, 12 Sep 2017). As much as better healthcare and nutrition has increased our lifespans, our elderly still face issues getting the right amount of nutrients from their diet due to age-related changes. There is also an increased risk of chronic diseases







with age. This can mean that the elderly may need more radical dietary changes to prevent or manage chronic conditions. Hence, functional foods can play an important role in improving nutrient intake and in reducing the risk of chronic diseases associated with age. Algae is known to be a complete food. It is high in protein and lipid content and is a rich source of antioxidant (e.g. carotenoids). However, the current price of algae supplements is high, and this has deterred its widespread adoption in food products.

In the School of Applied Science, we have adopted a two-pronged approach to promote microalgae fortified foods. A feasibility study was conducted on the incorporation of Spirulina into a staple such as noodles. The incorporation of algae was then mixed with flour and water to ensure a homogenous mixture. The resulting algae-fortified noodles produced a higher protein content. Currently, we are looking at ways to economically cultivate food-grade microalgae. In particular, to recycle food trimmings to serve as the cultivation media for microalgae. Food trimmings consist of large amounts of nutrients which can be used to support the growth of other living organisms. By establishing the production of high-value microalgae from discarded food trimmings to support better nutrition, we hope to contribute to food sustainability in urban development.

# CHRONO-NUTRITION

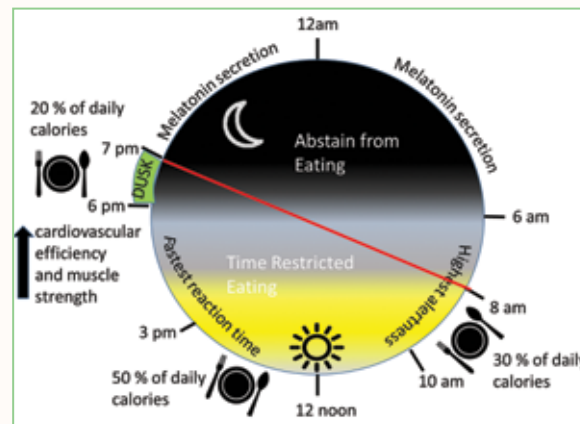
You are 'WHEN' you Eat

Kalpna Bhaskaran, PhD  
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& GI Research



What we eat and how much we eat has significant health consequences. But does timing of the meal matter? Could it also have health implications? In Ayurveda, the ancient Indian medical system, it is believed that our physiological processes are aligned with the natural cycles of the day; therefore, there are timing guidelines for food intake, physical activity and sleep. Similarly, Traditional Chinese Medicine believes each organ possesses its own rhythm, thereby recommending certain therapies at specific times of the day. Both of these alternative healing modalities encourage us to live in sync with these cycles in order to foster health.

Now, emerging Western research seems to validate this ancient wisdom. Circadian clock appears to operate as a critical interface between nutrition and homeostasis, calling for more attention on the beneficial effects of chrono-nutrition.



## CIRCADIAN MISALIGNMENT & HEALTH

- Inflammation
- Obesity
- Insulin resistance
- Diabetes
- Cardiovascular diseases
- Cancer

## TIPS TO ALIGN WITH YOUR MASTER CLOCK

Make breakfast and lunch bigger meals, and dinner a lighter meal.

Focus dinners around vegetables, lean protein and modest servings of Low GI fiber-rich whole grains to limit surges in blood sugar.

Avoid high fat unhealthy diets as they interfere with circadian rhythms of gut bacteria, causing a decrease in the number of key types of bacteria. Abstain from eating for at least 12 - 14 hours.

# Applied Nutrition & GI Research Domain

Addressing Needs > Accelerating Change

## War on Diabetes

Research, Innovation  
& Enterprise  
(RIE 2010)

Ageing Society


SkillsFuture

Sustainable  
Solution

Smart Nation





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