First International Conference on Natural Products Genomics and Drug Discovery

“Herbal Products and Nutraceuticals in the Prevention and Treatment of Disease”

22 – 24 July 2015

Galadari Hotel, Colombo, Sri Lanka

PROGRAMME & ABSTRACT BOOK

Organised by the
International Society for Natural Products Genomes and Drug Discovery

http://www.icnpgdd.org
First International Conference on Natural Products Genomics and Drug Discovery

“Herbal Products and Nutraceuticals in the Prevention and Treatment of Disease”

22 – 24 July 2015

Galadari Hotel, Colombo, Sri Lanka
MESSAGE FROM THE CONFERENCE CO-CHAIRS

It is said that if mother-nature gives us the disease, mother-nature also provides the cure to these diseases. By the 19th century, the source of all drugs sold in drug stores in Europe and North America was natural products. These drug stores eventually developed into larger pharmaceutical companies. According to some estimates, as many 80% of the drugs used even today, have their roots in natural products. Examples include statins for heart, metformin for diabetes, steroids for inflammation, aspirin for pain and chemotherapeutic agents such as paclitaxel, camptothecin, vinblastin, vincristine, thalidomide. In fact, of the 121 prescription drugs in use today for cancer treatment, 90 are derived from plants.

A rich assortment of medicinal plants has been the foundation of Sri Lanka’s indigenous ayurvedic system of healing. The word “Ayurveda” comes from Sanskrit meaning “knowledge about life” or knowledge which shows us how to maintain good health and how to cure illnesses. Many of the ancient kings have dedicated their services to the development of ayurveda medicine in Sri Lanka such as King Pandukabhaya (4th Century BC), King Buddhadasa (362-409 AD), King Datusena (460-478 AD) (Mahavamsa and Chulavamsa). Therefore Sri Lanka, known also for its natural beauty, becomes a leading choice as venue to host a conference focusing on natural products. The focus of this conference is not only to discuss the different ways natural products have impacted modern medicine, but also to discuss the potentially many ways they can contribute towards future drug discovery around the world. We welcome all of you to this conference and hope you enjoy the proceedings.

Prof. Priya Weerasinghe  
Conference Chair  
Assistant Professor, Pathology & Laboratory Medicine, University of Texas Medical School, Houston, Texas, USA

Prof. Vajira H. W. Dissanayake  
Conference Co-chair  
Director, Human Genetics Unit, Faculty of Medicine, University of Colombo, Colombo, Sri Lanka
Day 1: 22 July 2015, Wednesday

**8.15 am**
**Inauguration**

Address by Co-Charis Priya Weerasinghe & Vajira H. W. Dissanayake

Address by the Chief Guest Sirimali Fernando, Prof. of Microbiology, Faculty of Medical Sciences, University of Sri Jayewardenepura and Chairperson, National Science Foundation

**Keynote Address**
Discovering New Drug Leads Through Natural Product Repurposing

![David Tweepdy](image)

David Tweepdy
Professor and Chair, Division of Internal Medicine, The University of Texas M.D. Anderson Cancer Center, Houston, Texas, USA

**9.15 am**
**Symposium 1**

**9.15 am**
**Drugs from plants: single compounds or complex mixtures?**

![Ajith Abeysekera](image)

Ajith Abeysekera
Emeritus Professor, Department of Chemistry, Faculty of Science, University of Sri Jayewardenepura, Sri Lanka

10.00 am - **Chemistry and biological activities of aqueous soluble proanthocyanidins of the inflorescence of Cocos nucifera L.**

10.15 am - **Efficacy of Myristica fragrans on multi- drug resistant strains of Candida species**

10.30 am
**Tea**

**11.00 am**
**Symposium 2**

**11.00 am**
**Exploring diverse fungi of Sri Lanka for bioactive molecules**

![E Dilip De Silva](image)

E Dilip De Silva
Senior Professor of Organic Chemistry, Chair in Organic Chemistry, Department of Chemistry, Faculty of Science, University of Colombo, Sri Lanka

11.45 am - **In-vitro anti-Candida activity of isolated pestalotin derivatives from endophytic fungal strain and its semi synthetic product**
12.00 pm - Health benefits of *Hisbiscus esculentus*

12.15 pm
Plenary 1

**From Traditional Medicine to Modern Medicine: A Look at Genomics of Sanguinarine**

Priya Weerasinghe
Assistant Professor, Module Director, Co-Director Morphoproteomic Research Laboratory, Department of Pathology & Laboratory Medicine, University of Texas Medical School, Houston, Texas, USA

1.00 pm
Lunch & Lunch Time Plenary 1

**A new hope against cancer through Sri Lankan traditional medicine**

Kamal Perera
Senior Lecturer & Head of Department of Ayurveda Pharmacology and Pharmaceutics, Institute of Indigenous Medicine, University of Colombo, Sri Lanka

2.00 pm
Symposium 3

2.00 pm
**The toxicology of pharmacologically active plant and other natural products.**

S. N. Arseculeratne
Emeritus Professor of Microbiology, Faculty of Medicine, University of Peradeniya, Sri Lanka

2.45 pm - Cytotoxic Effect and Safety Evaluation of A-Eleostearic Acid Rich Fat Extracted From *Momordica Charantia* (Bitter Melon)

3.00 pm - Assessment of Ayurvedic Treatment Modality in Adenocarcinoma In Prostate Cancer/Case Study

3.15 pm
Tea

3.30 pm
Symposium 4

3.30 pm
**The Future Potential of Conducting Scientific Research on Herbs used in Traditional Medicines in Sri Lanka**

Piyal Marasinghe
Former Medicinal Plant Scientist, Herbal Gardens, Haldummulla

4.15 pm - Assessment of the prescribing pattern of herbal product by the Western medical practitioners at rural set up in Sri Lanka

4.30 pm - Competitive analysis of nutraceuticals market in Sri Lanka

4.45 pm Close
Day 2: 23 July 2015, Thursday

8.15 am
Plenary 2, 3

8.15 am
Pathobiology of Myocardial Ischemic and Reperfusion Injury: Current Knowledge and New Directions for Therapy

L. Maximilian Buja,
Professor Pathology & Laboratory Medicine, University of Texas Medical School, Houston, Texas, USA

9.00 am
Lactoferrin: A Natural Modulator for Innate and Adaptive Immune Function

Jeffrey Actor
Professor, Department of Pathology & Laboratory Medicine, University of Texas Medical School, Houston, Texas, USA

9.45 am
Symposium 5

9.45 am
Small molecule therapeutics – the role of natural products

Veranja Karunaratne
Associate Director Science & Strategic Relations, Sri Lanka Institute of Nanotechnology (Pvt) Ltd, Sri Lanka

10.30 am - “Hela Suwaya” Special Porridge Formula (HSPF): A timely food based solution for rising Non Communicable Diseases (NCD) in Sri Lanka

10.45 am
Tea

11.00 am
Symposium 6

11.00 am
Converting Cancer to Fat by Manipulating PPAR-gamma and Omega-3-Fatty acids

Preethi Gunaratne
Associate Professor, Department of Biology and Biochemistry, University of Houston, Texas, USA

11.45 am
Chemistry and Bioactivity of Calebin A: novel constituent in Curcuma Longa

Dr. Beena Bhat & Dr. Anjali Pandey

12.15 pm
Plenary 4

Structure-Function Studies of Piperlongumine

David Tweardy
Professor and Chair, Division of Internal Medicine, The University of Texas M.D. Anderson Cancer Center, Houston, Texas, USA
1.00 pm
Lunch & Lunch Time Plenary 2
Genetic Resources and Intellectual Property

Vijaya Kumara,
Emeritus Professor of Chemistry, Faculty of Science, University of Peradeniya, Sri Lanka

2.00 pm
Symposium 7

2.00 pm
Natural Products and Drug Discovery before Genomics

Colvin Gunaratana
Emeritus Professor of Physiology, Faculty of Medicine, University of Colombo

2.45 pm - Case study - Management of hyperlipidemia with herbal formulations with special reference to Ayurveda medicine

3.00 pm - Spermatogenic Effect of the Cardiospermum halicacabum

3.15 pm
Tea

3.30 pm
Symposium 8

3.30 pm - In-vitro lipase and amylase inhibitory effect of plant materials in polyherbal formula “Lekhaneeeya Dhashakaya”

3.45 pm - Standardization and quality control of Healing Herbs – Herbal Cough Syrup

4.00 pm - Case study on Adverse Effects and Drug Interactions of Echinacea

4.15 pm - Inhibitory action caused on the formation of advanced glycation end products (AGE) by the herbal formulation Nawarathne Kalka (NK) used in traditional medicinal systems in Sri Lanka

4.30 pm
Close
Day 3: 24 July 2015, Friday

7.30 am
Visit to Link Natural Products

11.30 am
Symposium 8

11.30 am
Sequencing Plant Genomes - The Goda Wee Story

Sanjeewa Singhabahu
Lead Scientist, Synthetic Biology Group,
Human Genetics Unit, Faculty of Medicine,
University of Colombo

12.00 pm
Platform Technologies for Testing Natural Products
Students of the MSc Regenerative Medicine Course
Human Genetics Unit, Faculty of Medicine, University of Colombo

12.30 pm
Natural Product Genomics and Drug Discovery in Sri Lanka - the Way Forward
Vajira H. W. Dissanayake
Director and Medical Geneticist, Human Genetics Unit, Faculty of Medicine,
University of Colombo, Sri Lanka

Closing Comments
Priya Weerasinghe
Conference, Chair

1.30 pm
Lunch
ABSTRACTS OF FREE PAPERS

Chemistry and biological activities of aqueous soluble proanthocyanidins of the inflorescence of Cocos nucifera L.
Padumadasa C1, Dharmadana D1, Abeysekera A2, Thammitiyagoda M2
1Department of Chemistry, Faculty of Applied Sciences, University of Sri Jayewardenepura, Nupegoda, Sri Lanka
2Animal Centre, Medical Research Institute, Colombo 8, Sri Lanka

Introduction: Proanthocyanidins belong to a class of polyphenolic compounds called flavonoids and it has been reported to exhibit important pharmacological activities. We have previously reported that the inflorescence of Cocos nucifera L. (var. aurantiaca) contain around 5% of proanthocyanidins on dry weight basis. Objectives: Extraction and purification of aqueous soluble proanthocyanidin fraction (AQSPA) from immature inflorescence of Cocos nucifera L. and determination of its monomeric composition. In addition, the determination of antioxidant, anticancer and anti-inflammatory activities of AQSPA.

Methods: AQSPA was extracted from the immature inflorescence using 70% aqueous acetone, purified using chromatography on sephadex LH-20 and characterized by chromatographic and spectroscopic methods. Antioxidant, anti-inflammatory and cytotoxic activities were evaluated by DPPH and SOR assays, oxidative burst assay and MTT assay respectively.

Results: Acid catalyzed cleavage followed by TLC indicated that AQSPA is composed of (epi)catechin and (epi)afzelechin monomeric units while thiolysis followed by NMR spectroscopy revealed the monomers to be the epi-isomers. 13C NMR studies of AQSPA showed signals characteristic for epicatechin units indicating that AQSPA is composed mainly of epicatechin units. AQSPA showed antioxidant activity against both DPPH and superoxide radicals with IC50 values of 21.69 ± 0.6 µg/mL and 35.48±0.14 µg/mL respectively. It exhibited cytotoxicity towards HeLa cells (IC50= 14.63 ± 0.99 µg/mL) while low cytotoxicity was observed against PC3 cells (IC50= 67.35 ± 0.16 µg/mL). AQSPA also showed anti-inflammatory activity (IC50= 22.34±1.67 µg/mL).

Conclusion: Proanthocyanidin fraction, AQSPA obtained from inflorescence of Cocos nucifera L. has been effectively purified and separated from other phenolic compounds by chromatography on sephadex LH-20. It possesses mild antioxidant, cytotoxic and anti-inflammatory activities.

Acknowledgement: The research work was financially supported by the university research grant of Sri Jayewardenepura University, Sri Lanka: ASP/06/RE/SCI/2010/11.

Efficacy of Myristica fragrans on multi- drug resistant strains of Candida species
Karawita KVDH1, Fernando KMEP1, Wijendra WAS2, Jayasekera PI2
1Department of Botany, University of Sri Jayewardenepura, Gangodawila, Nupegoda
2Department of Mycology, Medical Research Institute, Colombo 8

Drug resistant strains of Candida species have emerged due to increasing rate of Candida infections and use of available antifungal drugs for treatment. This study aimed to evaluate the potential therapeutic use of the spice nutmeg (Myristica fragrans) as an antifungal agent against local multi-drug resistant strains of Candida species. Efficacy of M. fragrans extracts against four Candida species; C.albicans, C.tropicalis, C.glabrata and C.parapsilosis were evaluated. The growth response of Candida species to aqueous and methanol extracts of M. fragrans was assessed by agar well diffusion method and poison food technique. Minimum Inhibitory Concentrations (MIC) of methanol extract of M. fragrans for multi-drug resistant strains of C.albicans, C.tropicalis and C.glabrata isolated from patients with onychomycosis candidiasis and candidemia were determined by broth microdilution method. Ketoconazole was used as a positive control while water and methanol were used as negative controls. Methanol extract of M. fragrans was identified as the potent antifungal extract which exhibited fungicidal activity against tested species producing inhibition zones, while no inhibition zones were given by the aqueous extract. 100% growth inhibition was observed in all tested species grown in the medium containing methanol extract. MIC values for all strains were within the range from 0.31 to 2.50 mg/ml signifying all tested multi-drug resistant strains were susceptible to methanol extract. The present study reveals that M. fragrans possesses effective fungicidal properties and can be used as a promising agent for the development of a new antifungal drug.
In-vitro anti-Candida activity of isolated pestalotin derivatives from endophytic fungal strain and its semi synthetic product
Hewage RT1, Wijeweera AA2
1Department of Natural Products, Medical Research Institute, Colombo 08, Sri Lanka.
2Department of Mycology, Medical Research Institute, Colombo 08, Sri Lanka.

Introduction: Endophytic fungi have proven to be a rich and important source of bioactive compounds with pharmaceutical interest. So far anticancer, antimicrobial, anti-inflammatory, and antimalarial activities were reported from fungal metabolites.

Objective: Identify the anti-Candida activity of isolated compounds, (-) pestalotin (1), 6-(1-hydroxypentyl)-4-methoxy-2H-pyran-2-one (2) from endophytic fungal strain Xrum R (from the roots of medicinal plant Xylocarpus rumphii), and brominated pestalotin derivative (3).

Methods: Compounds (1) and (2) were isolated using Sephadex LH-20 column chromatography followed by C18 RP-HPLC. Structures of (1) and (2) were elucidated by a combination of spectroscopic methods (1D, 2D NMR, IR, UV, and MS).

The reaction mixture of step II was poured into water and the organic layer was separated to obtain the compound (3). The anti-Candida activities of the compounds were assessed using paper disc diffusion method against Candida tropicalis and Candida albicans at 37°C. Ketoconazole (30μg/disc) and voriconazole (1μg/disc) were used as reference drugs.

Results: Compound 3 showed the highest activity, 18.3 ± 0.6 mm diameter of zone inhibition against Candida tropicalis and 18.0 ± 1.0 mm against Candida albicans. Compounds 1 and 2 showed dose-dependent low activity with zone inhibition diameters of 13.0 ± 2.1 mm and 8.0 ± 0.0 mm against Candida tropicalis, and 14.0 ± 0.0 mm and 10.6 ± 1.2 mm against Candida albicans, respectively.

Conclusion: Compound 3 has potential as anti-Candida agent with high sensitivity (≥17 mm in diameter) to both Candida strains at 10.0 μg/disc levels.

Acknowledgement: Dr. Kittakoop P (Chemical Biology Program, Chulabhorn Graduate Institute, Thailand)

Health benefits of Hisbiscus esculentus
Sumudunie KAV1, Uluwaduge i2, Premakumara GAS2 and Wijayabandara J1
1Department of Allied Health Sciences, Faculty of Medical Sciences, University of Sri Jayawardanepura, Nugegoda, Sri Lanka.
2Industrial Technology Institute, Colombo 7, Sri Lanka.

Okra or lady’s fingers (H.esculentus) is a mucilaginous vegetable and popular worldwide. The present study was carried out to investigate the hypoglycaemic and hypocholesterolaemic effect of crude water extract of H.esculentus fruit.

To evaluate the hypoglycaemic effect, crude water extract of okra fruit in different doses (500, 1000 and 1500 mg/KgBW) was orally administered to test group of male Wistar rats (n=6, 100-150g BW) for one week. Animals were fasted for the collection of blood for fasting blood glucose assay.

A hypercholesterolaemic rat model was created by feeding a diet containing 10% butter into 90% WHO recommended feed to male rats for 28 days. These hypercholesterolaemic rats served as the positive control and test of the study. The positive control and test (n=6) were continued on the hypercholesterolaemic diet for another 7 days while the test group was orally fed with the crude water extract of okra at doses of 500 and 1000 mg/KgBW. The negative control was fed on WHO recommended feed. The rats were fasted overnight and blood was collected to estimate fasting serum cholesterol levels.
Results revealed that all 3 doses significantly reduced (p<0.05) the blood glucose levels of rats and 500mg/KgBW dose being the most effective. It was evident that administration of crude water extract of okra fruit at the dose of 1000mg/Kg BW showed significant reduction (p<0.05) in the fasting serum cholesterol levels of Wistar rats. The study concluded that okra fruit possess hypoglycaemic and hypocholesterolaemic properties and could be used as a promising medicinal value added vegetable.

**Cytotoxic Effect and Safety Evaluation of A-Eleostearic Acid Rich Fat Extracted from Momordica Charantia (Bitter Melon)**

Jayasooriya LJPAP2, Ranasinghe KNK3, Hilmi AI3, Kularathna SAM4, Madhujith T5, Rajapakse RPVI1
1Department of Veterinary Pathobiology, Faculty of Veterinary Medicine and Animal Science, University of Peradeniya, Peradeniya, Sri Lanka
2Department of Veterinary Basic Science, Faculty of Veterinary Medicine and Animal Science, University of Peradeniya, Peradeniya, Sri Lanka
3Cancer Treatment Centre, Teaching Hospital, Kandy, Sri Lanka
4Department of Medicine, Faculty of Medicine, University of Peradeniya, Peradeniya,Sri Lanka
5Department of Food Science and Technology, Faculty of Agriculture, University of Peradeniya, Peradeniya, Sri Lanka

**Introduction:** *Momordica charantia* (bitter melon, karawila) is a well-known vegetable available in Sri Lanka. Seed portion of bitter melon contains a conjugated trienoic fatty acid named α - Eleostearic acid (α-ESA; 18:3; 9c, 11t, 13t). *In vitro* and *in vivo* studies strongly suggest that it has a potent anti-carcinogenic activity. However, toxicological evaluation of this fat source has not been well documented and it is a major impediment for conducting animal studies as well as clinical trials.

**Objectives:** To evaluate the cytotoxicity in cancer cells and safety of ingestion of α - Eleostearic acid.

**Methods:** To evaluate the cytotoxicity, the FAMES were prepared according to standard methods and the cytotoxic actions were measured by using MTT and soft agar clonogenic assays using human fibrosarcoma cells. To evaluate the safety of ingesting fat from bitter melon seeds, total of 40 eight-weeks-old female mice were divided into four groups as Control 1(C1), Control 2(C2), Test 1(T1) and Test 2 (T2). Mice were given feed and water *ad libitum*. Bitter melon fat was given to T1 and T2 at the rates of 1.5% and 3.0% as a percentage of food intake for 21 days, following the 7 days of acclimatization period. Behavioral and feeding patterns of mice were recorded daily. Body weights were taken once a week. WBC/DC was performed as a hematological investigation. Serum biochemical analyses were also performed.

**Results:** Conjugated trienoic fatty acids present in bitter melon and seeds exerted strong cytotoxic effects on human fibrosarcoma cells. Oral administration of bitter melon seed fat did not exhibit any kind of behavioral alterations or abnormalities in food and water intakes. Significant changes observed in body weight may be due to high appetite of T1 group mice and low appetite of C2 mice. Comparable values in hematological and biochemical parameters provide the evidence for safety of continuous ingestion of seed fat of bitter melon.

**Conclusion:** Fat rich in α - ESA with cytotoxic effects on fibrosarcoma cells did not exhibit any adverse effect in mice. These findings pave the way for further experimental trials with animal models and human subjects.

**Assessment of Ayurvedic Treatment Modality in Adenocarcinoma in Prostate Cancer/Case Study**

Jayathilaka N3, Kaluthotage S4, Kularathna B A D H4, Umayangani L.H.S4, Weerapalith W.G.T.P1
1Bandaranaike Memorial Ayurvedic Research Institute, Navinna, Maharagama, Sri Lanka

**Introduction:** Prostate cancer, also known as carcinoma of the prostate, is the development of cancer in the prostate, a gland in the male reproductive system. In 2007 the prevalence of Sri Lanka is increased among adult (above 56 years) about 9.2%. The cancer cells may spread from the prostate to the other parts of the body, particularly the bones and lymph nodes. It may initially cause no symptoms. In later stages it can cause difficulty urinating, blood in the urine, or pain in the pelvis, back or when urinating. *Charaka Samhita & Susrutha samhita* (700BC-Ayurvedic texts) both described the equilent of cancer as *granthi* (benign & minor neoplasm) & *arbuda* (malignant or major neoplasm). Both can be the inflammator or non – inflammatory, based on the *doshas* involved. The *tridoshic* tumors are usually malignant because all three major body humours loss mutual coordination.Therefore this study was conducted by specific ayuvedic treatment modality in the management of Prostate cancer.
Objective: The objective of this case study was to evaluate the efficacy of the ayurvedic treatment modality of the prostate cancer.

Methodology: The present study was a single case study within three months and conducted at cancer clinic in OPD Bandaranaike Memorial Ayurvedic Research Institute. Detailed history, clinical examinations and relevant investigation was conducted at the cancer clinic. By the following treatment principals in Ayurveda, oral administration of three herbal formulations (Sharibhadyasawa-60ml/day, Cheena ala choorna-10g/day, Gokshuradi gugglu-2/day) were applied to the patient throughout three months.

Results: Initial PSA of the patient was 8.95 ng/ml. After three months of treatment PSA of the patient was 7.15 ng/ml and symptoms (difficult in urination, lower abdominal pain, abdominal distention) were decreased.

Conclusion: The present case study done with the different herbal formulations are clinically effective for prostate adenocarcinoma.

Assessment of the prescribing pattern of herbal product by the Western medical practitioners at rural set up in Sri Lanka

Dolamulla SS1, Wickramasinghe PK2, Bellana MRE3
1,3Ministry of Health, 2Regional Director of Health Services, Kegalle, Sri Lanka

Introduction: Supplier induced demand is prominent in the Herbal medicine market due to inequalities of knowledge among consumers whilst prescribers play a major role as market controllers.

Objective: To assess the prescribing patterns of Herbal products by Western medical practitioners at a rural set up in Sri Lanka.

Methodology: A descriptive cross sectional study was carried with a pre-tested anonymous self-administered questionnaire among the medical officers attached to public hospitals in rural areas of Kegalle district in 2015.

Results: Respond rate was 95.5 % of 67 respondents. Majority of doctors (73%, n=44) were involved with dual practice. Most of them did not have a proper knowledge on products (85.9 %, n=55) such as indications (89%, n=57), contra-indications (85.9%, n=55), side effects (81.2%, n=52) and metabolism mechanism (93.7%, n=60) of herbal products. Main causes for the poor knowledge were non availability of medical instructions within the package (96.8%, n=62), not attaining sufficient knowledge on herbal medicine at any level of medical education (95.3%, n=61), difficulty in accessing the herbal product registry (92.6%, n=59), poor knowledge updates from marketers (79.6%, n=51). Respondents would like to prescribe herbal medicine for disease prevention (81%, n=51) and treatment (65.6%, n=42). Nearly 32% of respondents have prescribed herbal medicine during last 6 months and herbal medicine content was 5 to 10% of all prescriptions. Common cold, hay fever, alopecia, and liver diseases were the main illness treated by herbal medicine.

Conclusion: Even though western medical practitioners show interest in prescribing herbal medicine, practice was low due to the knowledge gap.

Competitive Analysis of Nutraceuticals Market in Sri Lanka

Dolamulla SS2, Bellana MRE3, Jeewaratne P2
2Ministry of Health, Sri Lanka

Introduction: Since public health authorities consider prevention and treatment with nutraceuticals as a powerful instrument in maintaining health and to act against nutritionally induced acute and chronic diseases, market sustainability of these products are very important.

Objective: The main intention of the study was to evaluate the nutraceuticals market by Competitive analysis in Sri Lankan context to find strategies for market sustainability.

Methodology: A pre-tested semi structured questionnaire based on Five force analysis of Michael Porter were used to gather information from Key informant survey and a focus group discussion among the health authorities, Prescribers, importers and manufactures, consumer agencies and retailers related to industry.

Results: Six themes were identified. The main theme was rivalry among the suppliers is moderate due to due to different products aim to different market segments. The second factor was threat of new product entry to market is high due to flexibility of registration process and fast development of various products. Threats from substitutes are higher due to range of product variation and same chemical agent acts for many diseases. Supplier power was moderate since many manufactures produce the same product. Since this is a supplier induced market, the power of the consumer is not strong. Moreover, the gray area of the nutraceuticals marketing on the media led to more supplier induced demand than consumer selection.
Conclusion: This study reviled that nutraceuticals market is highly complex and need to regularize with a comprehensive national policy to improve the market suitability, promote innovation and protect consumers.

“Hela Suwaya” Special Porridge Formula (HSPF): A timely food based solution for rising Non Communicable Diseases (NCD) in Sri Lanka
Senanayake P1, Senanayake NPWBVK1, Dahanayake KS1, de Silva RAD2
1Hela Suwaya Trust Fund, Sri Lanka
2National Cancer Institute, Maharagama, Sri Lanka

Introduction: Transition to western dietary habit and resulting extinction of traditional food habits with exposure to dietary toxins; explain the rising NCD in Sri Lanka. No adequate dietary solution is yet available. Traditionally, porridge had been prescribed to optimize nutrition and to facilitate digestion and absorption. In addition, HSPF is specifically meant to control present NCD, by minimizing prevailing profile of toxic induced tissue damage.

Objective: Introduction of HSPF as a potential timely solution to prevent and control current NCD in Sri Lankan population

Methods and results: HSPF are manufactured and prepared using a special combination and processing of four traditional rice varieties (cultivated through agrochemical free farming technology called “Hela Govithana” introduced by Hela Suwaya), natural spices, green leaves, herbs, vegetables, coconut milk and salt. The technology behind this special formula is solely derived through spiritual knowledge related to traditional medical practice.

Analysis of Antioxidant activity of 200 ml of HSPF (Table 01)

<table>
<thead>
<tr>
<th>Sample</th>
<th>Antioxidant activity (Radical scavenging activity)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method</td>
<td>TPC</td>
</tr>
<tr>
<td>HSPF White (A )</td>
<td>15.31 +/- 0.48</td>
</tr>
<tr>
<td>HSPF yellow (B)</td>
<td>14.83 +/- 0.86</td>
</tr>
</tbody>
</table>

Analysis of Nutritional composition of 200 ml of HSPF (Table 02)

<table>
<thead>
<tr>
<th>Test parameter</th>
<th>Unit</th>
<th>Test method</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin B 1</td>
<td>mg/200mg</td>
<td>MTLM In-house method based on journal of Chromatography A, 870 (2000) (ImbJC)</td>
<td>0.1</td>
</tr>
<tr>
<td>Vitamin B 2</td>
<td>mg/200mg</td>
<td>do</td>
<td>1.4</td>
</tr>
<tr>
<td>Vitamin B 3</td>
<td>mg/200mg</td>
<td>ITI- American Organization of Analytical Chemists (AOAC), 2000/2006</td>
<td>12.2</td>
</tr>
<tr>
<td>Vitamin B 6</td>
<td>do</td>
<td>do</td>
<td>1.1</td>
</tr>
<tr>
<td>Vitamin B 12</td>
<td>do</td>
<td>IMbJC</td>
<td>1.4</td>
</tr>
<tr>
<td>Beta carotene</td>
<td>gr/200mg</td>
<td>do</td>
<td>70</td>
</tr>
<tr>
<td>Vitamin E</td>
<td>gr/200mg</td>
<td>MTLM Method of analysis for nutrition labeling, 1993,method No:992.03</td>
<td>1.1</td>
</tr>
<tr>
<td>iron</td>
<td>gr/200mg</td>
<td>do</td>
<td>1.05</td>
</tr>
<tr>
<td>Zink</td>
<td>gr/200mg</td>
<td>do</td>
<td>0.36</td>
</tr>
<tr>
<td>Calcium</td>
<td>gr/200mg</td>
<td>do</td>
<td>10.54</td>
</tr>
<tr>
<td>Dietary Fiber</td>
<td>gr/200mg</td>
<td>do</td>
<td>1.4</td>
</tr>
<tr>
<td>Fat</td>
<td>gr/200mg</td>
<td>do</td>
<td>6.44</td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>gr/200mg</td>
<td>do</td>
<td>10.32</td>
</tr>
<tr>
<td>Protein</td>
<td>gr/200mg</td>
<td>do</td>
<td>2.03</td>
</tr>
<tr>
<td>Minerals</td>
<td>gr/200mg</td>
<td>do</td>
<td>1.85</td>
</tr>
</tbody>
</table>

Clinical Case reports - showing evidence of NCD control
Conclusions: Daily consumption of HSPF provide marked lipid lowering ability, fibers, synergistic antioxidant activity (associated by vitamin A and E levels) and required micronutrients (iron, zinc, vitamin B complex including vitamin B-12). With the clinical case reports, it could be considered as a potential dietary solution to prevent and control current disease pattern in a more socio-economically acceptable way. It further highlights the wisdom behind the spiritual knowledge based traditional “food science”.

Case study– Management of hyperlipidemia with herbal formulations with special reference to Ayurveda medicine
Welivitigoda C1, Senarathne TCI1, Perera PANG1, Kisholorjan SG1
1Bandaranayake Memorial Ayurvedic Research Institute, Nawinna, Maharagama, Sri Lanka

Introduction: Hyperlipidemia is one of the major risk factors for heart disease, which is the most important cause of hospital death in Sri Lanka. In 2008, the global prevalence of increased total cholesterol (>200mg/dl) among adults was 39% (37% for males and 40% for females). There is no specific term for hyperlipidemia in Ayurveda, however, it is closely related with Medhowurdi when comparing its symptoms and pathogenesis. The present study was conducted to identify the effect of herbal formulations in the management of hyperlipidemia (Medhowurdi).

Objective: The objective of this case study was to clinically evaluate the effect of herbal formulations in hyperlipidemia by means of Ayurveda treatment principles.

Methodology: Present study was a single case study and conducted at Medhowurdi clinic in OPD BMARI. Detailed history, clinical examinations and relevant investigations were conducted at the clinic. By following the treatment principles of Ayurveda, oral administration of three different herbal formulations (decoctions) namely Pippali moola abhaya-10 doses, Balabilwa shunti-8 doses, karavyadi-24 doses were prescribed to the patient.

Results: Initial lipid profile of the patient was TC-256mg/dl, TG-162mg/dl, HDL-52mg/dl, LDL-171mg/dl. With the treatment of Pippali moola abhaya and balabilwa shunti decoctions, lipid fractions were decreased but not within the reference range. Therefore patient was administered strong oral decoction of karavyadi consisting of 21 ingredients. After three months, the end result was within nearly normal limits of lipid profile, which revealed TC-204mg/dl, TG-144mg/dl, HDL-28.8mg/dl, LDL-133.8mg/dl.

Conclusion: The present case study suggested that three different decoctions were clinically effective for the hyperlipidemia depending on the basic concepts of Ayurveda.

Spermatogenic Effect of the Cardiospermum halicacabum
Fernando WWSWC1, Senanayeke SMSNM2.
1Family Health Bureau, Colombo, Sri Lanka
2Holy Family Balika Viduhalawa, Wennappuwa, Sri Lanka

Introduction; Cardiospermum halicacabum originated from Tropical America. Found among the Chemical constituents of Cardiospermum are primarily the phytosteroids 1,4 Butandiol 2,3 Dimethoxy., and N,-(4 Oxo -4 Phenyl – 3 –Tosylbutaril Pyrrolidine. Therefore it was hypothesized that it increases spermatogenesis.

Objectives: To establish the spermatogenic activity of Cardiospermum on quality and quantity of sperms.

Methodology: Cardiospermum Hot Water Extract was given to ten randomly selected volunteers who visited the sub fertility clinic at Family Health Bureau. The subjects were given a sample of 30 g of Cardiospermum herb Hot water Extract for three days per week for three months. Pretest and post-intervention Seminal Fluid analysis was done.

Results and Analysis of Data: Sperm count; Mean increased by 14.6% (SD – 0.45,.95%, CI- 14.25—15.05). Motility (a+b)-Mean increase by 14.2% (SD- 2.89. 95% CI – 8.42.- 19.98). Morphology (Dead Forms); Mean decrease by 21.1 % (SD – 2.75. 95% CI – 21.2 – 21.2).

Conclusion: It is clear that Cardiospermum halicacabum is spermatogenic increases the viability and motility of sperms, and that it increases the normal forms. Therefore this treatment may be used to treat sub fertile men in the clinics to give them hope of children.
In-vitro lipase and amylase inhibitory effect of plant materials in polyherbal formula “Lekhaneeya Dhashakaya”
Attanayake AMKC¹, Karunarathne LTM¹, Fernando WIT¹
¹Department of Biochemistry, Faculty of Medicine, University of Peradeniya, Sri Lanka

In the traditional ayurvedic system of medicine number of medicinal plants and their formulations are used for treating hyperlipidemia and obesity. “Lekhaneeya Dhashakaya” (LD) has been described in classical ayurvedic text, Charaka Samhitha as formula containing the ten most effective herbs that could be used to treat ailments related to hyperlipidemia. LD is used as a decoction or tea in ayurvedic practice to treat hyperlipidaemia. A clinical study conducted using patients with ischaemic heart disease and obesity, has shown significant antihyperlipidaemic effects of LD. Screening medicinal plants in this formulation can lead to identification of potent inhibitors for lipase, thus these natural lipase inhibitors can be used as effective therapy for post prandial hyperlipidemia. Therefore the medicinal plant materials used in the formula of LD were subjected to extraction with methanol separately and the resulting extracts were evaluated for their porcine pancreatic lipase inhibitory and amylase inhibitory potentials and subjected to phytochemical screening. Among the plant materials in the formula Acorus calamus (Vacha) reported the highest lipase inhibitory activity followed by Picrorhiza kurroa (Kutki). Whereas the other plant extracts of the LD were not showing a significant inhibitory activity for lipase enzyme. Amylase inhibitory activity of the plant extracts was insignificant. Phytochemical constituents in Acorus calamus were screened and the results revealed the presence of alkaloids, terpenoids and flavanoids. In vitro study indicated that lipase inhibitors could be present in Acorus calamus and Picrorhiza kurroa. Thus the individual plant materials of “Lekhaneeya Dhashakaya” can be effective in lowering postprandial hyperlipidemia.

Standardization and quality control of Healing Herbs – Herbal Cough Syrup
Ajeethan V², Shanika², Thejan AK², Niles TT², De Zilwa J², and Perera PK²

Healing Herbs Cough Syrup is a herbal cough syrup which was formulated by Research & Development Department of Astron (Ltd) pharmaceutical company, which is WHO GMP accredited. Healing Herbs Cough Syrup contains Pelargonium (Pelargonium sidoids) root extract, Ivy (Hedera helix) leaf powder extract, Bees honey and other excipients. Water and ethanol extracts of above herbal plants are obtained from WHO GMP manufacturing accredited company (Switzerland). Authentication of plant materials was done according to declaration and related monographs of European Pharmacopoeia (Ph. Eur.), British Pharmacopoeia (BP) and United States Pharmacopeia (USP). Pelargonium root extract and Ivy leaf powder extracts were tested for appearance, loss on dry, bulk density, total polyphenolic compound, marker compounds (HPLC and TLC), total aerobic plate count, yeasts and moulds, Escherichia coli and Staphylococcus aureus. Bees honey was authenticated according to BP standards. It was tested for refractive index, optical rotation, chloride and sulphate. Finished product of Healing Herbs Cough Syrup was tested for marker compounds using HPLC and TLC methods, test for heavy metal and microbial limits (Total aerobic plate count, yeasts and moulds, Escherichia coli and Staphylococcus aureus) tested according to USP. The consistency of viscosity of herbal syrup was checked by using Brookfield viscometer. The pH of the finished product was checked by Thermo orion 410 plus. All the parameters tested were complied with standards parameters of relevant pharmacopeias. According to extensive clinical evidence of this plant materials and therapeutic properties standards preparation of this cough syrup is suitable for clinical uses.
**Case Studies on Drug Interactions and Side Effects of Echinaecea**

Gunawardhena R¹, Weerasinghe P²

¹University of Texas at Dallas, Dallas, Texas, USA
²University of Texas Medical School, Houston, Houston, Texas, USA

**Introduction:** Echinaecea is a common herbal supplement taken worldwide. This herb is primarily taken to help boost the immune system, and thus used to treat common ailments such as cold symptoms and upper respiratory tract infections. However, side effects with the use of echinacea have also been reported. A growing problem encountered in the clinic is the non- or under-reporting to their physicians of over the counter natural health products (NHPs) by patients, and echinacea is no exception. This can lead to possible adverse drug interactions of echinacea with physician prescribed conventional drugs. Additionally, the lack of knowledge of physicians on NHPs may also contribute to this problem.

**Objective:** The objective of this study was to highlight the possible dangers of not only the side effects of echinacea but also the drug interactions of echinacea with physician prescribed conventional drugs.

**Methodology and findings:** Presented below are 3 web-based primary case studies of patients who have had adverse reactions with echinacea ingestion. (1) A 61-year old man who was taking echinacea was administered etoposide for the treatment of lung cancer. The patient exhibited thrombocytopenia after 8 days of treatment. However, his platelet count returned to normal after he discontinued using echinacea in tandem with etoposide. (2) A study of echinacea’s effect on the drug-metabolizing enzyme cytochrome p450 found the herb to significantly increase the clearance of the drug midazolam, used to relax patients before surgeries, when taken per os. (3) A 51-year old white male was brought in with a case of hyper-eosinophilia, who was taking echinacea and having a history of asthma and allergic rhinitis. Since the reason for his hyper-eosinophilia was unknown, he was treated for hyperesinophilic syndrome with both hydroxyurea and imatinib, but both treatments were ineffective. Only prednisone, coupled with the discontinuation of echinacea, successfully brought the patient’s eosinophil count down.

**Conclusion:** The first 2 cases highlight the problem of drug interactions while the third shows the importance of knowing the side effects of echinacea as it can mask the accurate diagnosis of a patient, leading to ineffective reduction of symptoms due to the incorrect drug being administered. A vast number of people will continue to take NHPs, and these case studies show the importance of documenting NHPs in one’s medical history. Also these facts point towards the need to pursue further research into the mechanisms and side effects of NHPs.

**Inhibitory action caused on the formation of advanced glycation end products (AGE) by the herbal formulation Nawarathne Kalka (NK) used in traditional medicinal systems in Sri Lanka**

Karunaratne MGDT¹, Fernando SCD¹, Udawatte C¹, Perera PK²

¹College of Chemical Sciences, Institute of Chemistry Ceylon, Rajagiriya, Sri Lanka
²Department of Ayurveda Pharmacology and Pharmaceutics, Institute of Indigenous Medicine, University of Colombo, Rajagiriya, Sri Lanka

Advanced glycation end products (AGE) are formed due to chronic hyperglycemia and increased cellular oxidative stress. AGE via inflammatory mediator pathways can lead to various health complications such as diabetes, retinopathy, cataract etc. Nawarathne Kalka (NK) is mainly used as an anti-inflammatory, pain reducing drug for many ailments in traditional medicinal systems of Sri Lanka. The objective of this study was to investigate the inhibitory action caused on the formation of AGE by the aqueous extract prepared from NK.

NK was purchased from a traditional medicinal drug store. Contents of three sachets were pooled together and a wet weight of 15 g was refluxed with 400 ml of deionized water for 3 hours. The extract was filtered and the filtrate (1.0 ml) was used for each experiment. The anti glycation activity was measured using fluorescence spectrophotometry. Bovine serum albumin (BSA) solution (10 mg/ml) prepared in phosphate buffered saline (pH 7.4) containing sodium azide (0.02%) was mixed with fructose (500 mM) and different concentrations of NK. A sample containing BSA and fructose only (control) was used to induce the formation of advanced glycation end products. The fluorescence intensity of each sample was measured during 3 successive weeks with excitation and emission wavelengths at 355 nm and 460 nm respectively.

Glycated solutions showed higher fluorescence intensities contrast to samples containing BSA only. The samples treated with NK (15.4 - 1973.9 µg/ml) showed a significant decrease (p<0.05) in the fluorescence intensities compared to the control samples with an IC50 value of 108 ± 21 µg/ml. These results proved the potential of NK to inhibit fructose-mediated protein glycation in-vitro.
GOOD HEALTH FOR EVERYONE, Everyday

Prevents the incidence of 15 symptoms of colds and catarrh

Samahan
100% Natural, Safe Herbal Preparation

Link Natural Products (Pvt) Ltd

Rs. 15/-