

## PHARMACOLOGY RESEARCH DIVISION

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Research activities of the division involve traditional and herbal medicine research as well as research on Western medicines. Research concerning traditional and herbal medicines includes basic research and clinical research. Basic researches include botanical identification, phytochemical and physico-chemical investigations, experimental pharmacology and toxicity studies of selected medicinal plants. Clinical researches are conducted to test the therapeutic potential of reputed medicinal plants. Research on Western medicines include pharmacokinetic study of the western drugs in human. Additional activities performed are toxicological, physico-chemical, phytochemical tests and assessment of pharmacological activities of locally available traditional medicines.

### RESEARCH PROJECTS

#### 1. COMMUNICABLE DISEASE

##### 1.1 DIARRHOEA

##### 1.1.1 Standardization, safety and anti-diarrhoeal activity of unripe fruit of *Aegle marmelos* Linn. (Rutaceae) (ဥသျှစ်သီး)

Diarrhoea has long been recognized as one of the most important health problems and leading cause of mortality and morbidity in the developing countries. *Aegle marmelos* Linn. (Rutaceae) commonly known as Bael is a tree which grows throughout Southeast Asia as a naturalized species. *Aegle marmelos* Linn. is an important medicinal plant with several ethnomedicinal applications in traditional and folk medicinal systems. Traditionally, *Aegle marmelos* Linn. is used in the treatment of diarrhoea and dysentery. The aim of this study is to standardize and investigate the active constituent/s of unripe fruit of *Aegle marmelos* Linn. on castor oil induced diarrhoea in albino mice model. The antibacterial activity of two extracts such as pet-ether extracts and defatted 70% ethanolic extract were investigated on eight different strains of bacteria causing diarrhoea. Pet -ether extract do not show antibacterial activity and defatted 70% ethanolic extracts showed antibacterial activity against

*Shigella Sonnei* (zone inhibition 15 mm) and *Shigella flexneri* (zone inhibition 11 mm). It was done anti-diarrhoeal activity on castor oil induced diarrhoea mice model. Anti-diarrhoeal index in percent of defatted 70% ethanol extract of *Aegle marmelos* Linn. extracts were 18.02% at 0.5 g/kg b.w, 37.7% at 0.75 g/kg b.w, 55.4% at 1.0 g/kg b.w, 40.9% at 2.0 g/kg b.w and 81.46% at standard loperamide 6 mg/kg b.w. Therefore, among them defatted 70% ethanolic extracts 1.0 g/kg b.w possessed higher *in vivo* anti-diarrhoeal activity and *in vitro* antibacterial activity. Defatted 70% ethanolic extracts of unripe fruit were successively extracted with organic solvent by non polar to polar series. They obtained three fractions: ethyl acetate fraction, methanol fraction and water fraction. Methanolic fraction of defatted 70% ethanolic extracts showed antibacterial activity against *Shigella Sonnei* (zone inhibition 12mm) and *Shigella flexneri* (zone inhibition 11 mm). It contained polyphenolic compounds by screening of Thin Layer Chromatographic method.

## 2. NON-COMMUNICABLE DISEASES

### 2.1 DIABETES MELLITUS

#### 2.1.1. Antihyperglycaemic activity of ethanolic extract from leaves of *Cinnamomum tamala* FR. NEES & EBERM (ကရင်ပေး) on adrenaline induced hyperglycaemic albino rats

The study was done to determine acute toxicity and antihyperglycaemic activity of 95% ethanolic extract of *Cinnamomum tamala* FR. NEES & EBERM. leaves. The leaves of *Cinnamomum tamala* FR. NEES & EBERM were collected from Yangon area. Then, botanical identification was done in Botany Department, Yangon University. They were air dried under shade and then the air dried leaves were made into powder by grinding machine. The dried leaves powder was extracted with 95% ethanol to get 95% ethanolic extract. Acute toxicity study of 95% ethanolic extract of *Cinnamomum tamala* leaves were done in albino mice by using the method of OECD (425) guideline. No toxic signs and lethality were found even with the maximum dose of 5g/kg body weight. So, the medium lethal dose (LD<sub>50</sub>) was observed to be more than 5g/kg. For determination of antihyperglycemic activity, 95% ethanolic extract of *Cinnamomum tamala* leaves 2g/kg and 4 g/kg bodyweight were administered by oral route to adrenaline induced hyperglycemic rat model. The result showed that significant antihyperglycaemic effect of 95% ethanolic extract of *Cinnamomum tamala* leaves (2g/kg) was found at 3 hours and 4 hours (p<0.05- p<0.001) whereas significant antihyperglycaemic effect of 95% ethanolic extract (4g/kg) was found at 2 hours upto 4 hours (p<0.05). Percent reduction of hyperglycaemia with 95% ethanolic extract of the plant at the dose level of 2g/kg and 4g/kg were (38.9-43.07%) and (23.45%-44.29%) respectively. Comparison of antihyperglycemic activities between different doses of 95 % extracts and the standard drug, glibenclamide (4 mg/kg), the antihyperglycemic activity of glibenclamide was greater than that of the 95% ethanolic extracts of the plant. In conclusion, the 95% ethanolic extract of *Cinnamomum tamala* leaves was found to possess the significant antihyperglycemic effect on adrenaline induced hyperglycemic rats with no acute toxic effect up to the dose of 5 g/kg.

### 2.2. SNAKE BITE

#### 2.2.1. Anti-snake (Russell's viper) venom activity of leaves of *Acalypha indica* Linn. (ခေကြာင်ခိုဝေ) and root of *Vitex negundo* Linn. (ခေကြာင်ဝန်းကြီး)

The aim of this study is to determine the anti-snake (Russell's viper) venom activity of leaves of *Acalypha indica* Linn. and root of *Vitex negundo* Linn. *In vitro* anti-snake venom

activity was accessed by inhibition of *in vitro* Human Red Blood Corpuscles (HRBC) lysis. In this study, watery and 95% ethanolic extracts of *A. indica* leaves and *V. negundo* root were tested. The venom induced haemolysis was evaluated *in vitro* by the method of Lakshimi and Vadivu (2010). Blood was collected from healthy human volunteers by vein puncture and heparin was used as an anticoagulant. The collected blood was washed three times with normal saline and 1% HRBC was prepared. Venom was dissolved in physiological saline solution to make a stock solution of 100µg/mL. Then 1 ml of venom, 1 ml of phosphate buffer (pH 7.4) and 1 ml of 1% HRBC was taken in various tubes. To these tubes different concentration of aqueous and 95% ethanolic extracts of both plant samples were added. The test samples of extracts were prepared using physiological saline while the control samples were prepared without extracts. The anti-snake venom serum 100 µg/ml was used as standard. The mixture were incubated at 37°C for 30 minutes and centrifuged at 1000 rpm for 3 minutes. The absorbance of the supernatant was measured at 540.0 nm using UV Spectrophotometer (UV-1601 Shimadzu). The percentage inhibition of haemolysis was calculated. The results showed that among the four extracts, the 95% ethanolic extract of *V. negundo* showed the maximum activity. *In vivo* anti-snake venom activity test were done according to Win Aung *et al.* (1996). In the determination of the effective doses (ED<sub>50</sub>) of plant extracts on envenomed mice, a total of 48 mice were divided equally into 8 groups. Immediately after intramuscular injection with the lethal dose 7.5 mg/kg body weight of the mice (2LD<sub>50</sub>) of RVV into hind leg muscle, the various doses (750 mg/kg, 500 mg/kg, 250 mg/kg and 125 mg/kg body weight) of both plant extracts were administered into the other hind leg. Control mice received normal saline instead of plant extract after envenomation. The number of mice which survived after 24 hours were recorded. ED<sub>50</sub> were calculated. In this study, 95% ethanolic extracts of both plants have maximum *in vivo* anti-snake venom activity at the dose level of 750 mg/kg body weight. In conclusion, the present study found out that 95% ethanolic extracts of *Vitex negundo* Linn. root and *Acalypha indica* Linn. leaves have anti-snake venom activity and 95% ethanolic extract of *Vitex negundo* Linn. root showed maximum *in vivo* (ED<sub>50</sub> = 520 mg/kg body weight) and *in vitro* anti-snake venom activity.

### 3. OTHERS

#### 3.1. ANTIOXIDANT ACTIVITY

##### 3.1.1 Antioxidant activity of methanolic extract from kernels of purple corn *Zea mays* L. (ဆေးဓါတ်တိုက်ဖျက်မှု)

In the present study the antioxidant activity of anthocyanins from ruby corn *Zea mays* L. (hybrid) was studied. Methanolic extracts of fresh kernel, dried kernel, boiled kernel and fresh cob were prepared by maceration method. The fresh kernel juice was prepared by blending. The antioxidant activity of these extracts were determined by using 1,1-diphenyl-2-picryl-hydrazyl (DPPH) assay. Phytochemical screening of fresh kernels showed the presence of flavonoids, polyphenols, tannins, saponins, amino acids, glycosides and carbohydrates. But dried kernels did not contain evident saponins and fresh cobs did not contain tannins and amino acids. The ruby corn did not contain harmful cyanogenic glycosides. The results of Physico-chemical characterization of dried kernels and dried cob were swelling index (3.0ml, 17.0ml), foaming index (<100, <100), water and volatile matter content (9.8%, 5.2%), total ash (2.1%, 0.4%), water soluble ash (2.0%, 0.4%), acid insoluble ash (0.2%, 0.01%), pet-ether soluble matter (3.6%, 2.7%), ethanol soluble matter (3.5%, 4.0%) and water soluble matter (31.6%, 17.0%) by using WHO, Quality control of medicinal plant material (1998). Anthocyanin compound was isolated from methanolic extracts of fresh kernel by Preparative Thin Layer Chromatography method using BAW solvent system (R<sub>f</sub>=0.65). The wave lengths

of isolated compound was found to be 279.0 nm and 510.0 nm. FTIR absorption bands at 3317  $\text{cm}^{-1}$ , 2955 $\text{cm}^{-1}$ , 1643  $\text{cm}^{-1}$ , 1566 $\text{cm}^{-1}$ , 1411 $\text{cm}^{-1}$  and 1095  $\text{cm}^{-1}$ . From UV and FTIR spectral data, it was concluded that compound A<sub>2</sub> was cyanidin-3-glucoside. The % inhibition were 10 $\mu\text{g}$  of methanolic extract of fresh kernel 20.66%, methanolic extract of fresh cob 19.69%, fresh kernel juice 19.12%, methanolic extract of boiled kernel 18.29% and methanolic extract of dried kernel 17.55% and standard drug (ascorbic acid) 80.83% respectively. The IC<sub>50</sub> value of methanolic extract of fresh kernel was 23.9  $\mu\text{g}/10\text{uL}$ , methanolic extract of fresh cob was 28.21  $\mu\text{g}/10\text{uL}$ , fresh kernel juice was 28.98  $\mu\text{g}/10\text{uL}$ , methanolic extract of boiled kernel was 33.53  $\mu\text{g}/10\text{uL}$ , methanolic extract of dried kernel was 36.41  $\mu\text{g}/10\text{uL}$  and standard drug (ascorbic acid) 6.94  $\mu\text{g}/10\text{uL}$  respectively. The results show that anthocyanins from ruby corn were good sources of dietary antioxidants.

### 3.1.2. Quantitative determination of curcumin content from four *Curcuma* species in Myanmar

Curcumin was popularly used in dietary supplement and drugs as potent antioxidant and natural coloring agent. Curcumin is well known anticancer agent and possessed several medicinal properties. In Myanmar, rhizomes of four selected *Curcuma* species: *Curcuma longa* Linn. (နန္ဒင်း), *Curcuma comosa* Roxb. (နန္ဒင်းခါး), *Curcuma petiolata* Roxb. (မာလာ) and *Curcuma amada* Roxb. (သရက်ကင်း) are widely used in dietary food and traditional medicine. Botanical identification of four selected *Curcuma* species was done by morphological characters of flowers and microscopical characters of dry rhizome powder. Phytochemical investigation of four *Curcuma* species was done by phytochemical method and physico-chemical characterization was done by Quality control methods for medicinal plant materials. In this study, qualitative and quantitative determinations of active curcumin compound in 97% ethanolic extract of dry rhizome of four *Curcuma* species were investigated. Qualitative identification was carried out by Thin Layer Chromatography ( $R_f = 0.68$ ), UV spectrum (425.5 nm) and FT-IR spectrum (3356.2  $\text{cm}^{-1}$ , 2924.18  $\text{cm}^{-1}$ , 2854.74  $\text{cm}^{-1}$ , 1635.69  $\text{cm}^{-1}$ , 1589.4  $\text{cm}^{-1}$ , 1519.96  $\text{cm}^{-1}$ , 1419.66  $\text{cm}^{-1}$ ). In TLC study, plate was precoated silica gel F<sub>254</sub>, solvent system was dichloromethane: methanol (98:2) and standard sample was curcuminoid. Quantitative determination of active curcumin was performed by TLC scanner - 4 (Densitometer, CAMAG), in the absorbance mode at 425.0 nm. The analysis data of the calibration plots showed good linear relationship with  $R^2=0.994$  and % recovery is within 89.0 % to 119.0 %. Among the four *Curcuma* species, curcumin concentration was  $2.4 \pm 0.04$  mg/g in *C. longa*. It is the highest amount. Curcumin concentrations were  $0.24 \pm 0.006$  mg/g and  $0.05 \pm 0.001$  mg/g in *C. comosa* and *C. petiolata*. The lowest amount of curcumin was found in *C. petiolata* rhizome. Curcumin was not present in *C. amada* but demethoxycurcumin was present. Acute toxicity test of 97% of ethanolic extract of four *Curcuma* species were done by using OECD (423) guideline on administration of mice model. LD<sub>50</sub> cut off values of *C. petiolata* and *C. amada* were more than 5000 mg/kg body weight (non toxic) but those of *C. longa* and *C. comosa* were (>2000 mg/kg - 5000 mg/kg) body weight (slightly toxic).

### 3.1.3 Acute toxicity study and antioxidant activity of herbal tonic Eva "ေဝ".

Free radicals are highly reactive molecular species with an unpaired electron. The most damaging radical in biological system are oxygen radical (sometimes called reactive oxygen species). Antioxidants are normally produced from the body to prevent adverse effects of these free radicals. Antioxidants have antiageing property. Antioxidant from natural substances such as plants, fruits, vegetables, spices and herbs that are consumed as food or ingredients have been widely investigated for several biochemical and pharmacological

properties. Most of antioxidants compounds in atypical diet are derived from plants sources. The herbal tonic medicine (၈၀) contains honey, Za-deik-pho, Lay-hnyin, Betel leaves, Sindone-ma-nwe, Natha-phyu, Nwe-gyo, Natha-ni, Gant-kaw, five kind of Sa-mone-myo and salt. In the present study, the objectives were to determine the phytochemical constituents, acute toxicity study and the free radical scavenging activity (antioxidant activity) of the test drug to compare with standard ascorbic acid. Preliminary phytochemical constituents of the test drug was done by according to the Harborne methods (Harborne, 1984) and physico chemical test of the test drug was done by WHO method (1998). Free radical scavenging activity was evaluated using 1,1-diphenyl -2-picrylhydrazyl (DPPH) free radical. Acute Toxicity test was performed according to OECD (423) guideline (Organization for Economic Co-operation and Development). The test drug contains flavonoids, glycosides, resins, polyphenols, carbohydrates, amino acids, saponins, tannins, steroids/triterpene and reducing sugar. Ethanolic extract (50%) of the test drug was found to have radical scavenging activity (antioxidant activity) with IC<sub>50</sub> (50% Inhibition Concentration) values of 12.39µg/ml. This herbal tonic drug was non toxic up to maximum permissible doses of 5000mg/kg. It could be concluded that the test drug possess antioxidant activity in the experimental study. Therefore, this herbal tonic " ၈၀" is experimentally proven as a safe and a good source of traditional medicine used as tonic drug.

## SERVICES PROVIDED

### ACADEMIC

Sr.	Name	Course	Responsibility
1.	Dr. Khine Khine Lwin	PhD (Botany) MMed Sc (Pharmacology) and M. Pharm 1 <sup>st</sup> year MMedSc (Pharmacology) 1 <sup>st</sup> year M Pharm M.Pharm (Yangon)	Co-supervisor  Teaching, training demonstration
2.	Daw Mu Mu Sein Myint	PhD (Botany) 1 <sup>st</sup> year MMedSc (Pharmacology) 1 <sup>st</sup> year M Pharm	Co –examiner Co-supervisor Teaching, training demonstration
3.	Dr. Khin Tar Yar Myint	M.Pharm 1 <sup>st</sup> year MMedSc (Pharmacology) 1 <sup>st</sup> year M Pharm	Co-supervisor Teaching, training demonstration

### LABORATORY

Sr.	Subject	Tested samples
1.	Determination of acute and sub-acute toxicities of herbal medicine from private sectors	3 samples
2.	Determination of antioxidant activity of herbal medicine from private sector	1 sample

## PHARMACOLOGY RESEARCH DIVISION (POL)

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	...	U Kyaw Min Aung BA(History)(Meikhtila University)
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	...	Daw Moh Moh Lwin BSc(Chemistry)(MU)
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Laboratory Attendant	...	Daw Rai Kit

Pharmacology Research Division has been actively engaged in conducting a number of research projects in areas of quality, efficacy and safety of medicinal plants and traditional medicine. For safety of plastic food containers, chemical analysis has also been conducted. The division provides academic services to postgraduate students as well as collaboration with other universities.

### RESEARCH PROJECTS

#### 1. TRADITIONAL MEDICINE

##### 1.1 ANTI-INFLAMMATORY ACTIVITY

###### 1.1.1 Anti-inflammatory activity of the root of *Leea macrophylla* Roxb. (ကြာဖတ်ကြီး) on carrageenan-induced albino rats

*Leea macrophylla* Roxb., locally known as kya-hpet-gyi (ကြာဖတ်ကြီး) belonging to Leeaceae family is a herbaceous shrub with very big size leaf. It is widely grown throughout Myanmar and traditionally used as anti-inflammatory agent. Experimental evaluation of the anti-inflammatory activity of *Leea macrophylla* was studied on carrageenan-induced inflammation in albino rats. Rats were randomly allocated into five groups and treated with single oral administration of the root powder of test plant 0.8 g/kg, 1.6 g/kg, 3.2 g/kg body weight, negative control vehicle (distilled water) 10 ml/kg and positive control acetyl salicylic acid (aspirin) 300 mg/kg, respectively. Then, the basal paw volumes were measured immediately prior to the inducing of carrageenan and thereafter at 1 hour (hr), 2 hr, 3 hr, 4 hr, 5 hr and 6 hr by using plethysmometer. The mean paw volumes of rats were significantly reduced in the highest dose ( 3.2 g/kg ) of the test powder at 5 hr and 6 hr ( $p < 0.05$ ) and the

positive control aspirin also caused paw volume reducing starting at 1 hr ( $p < 0.001$ ), 2 hr ( $p < 0.01$ ), 3 hr, 4 hr, 5 hr, 6 hr ( $p < 0.001$ ), compared to that of negative control group. The percent (%) inhibition on carrageenan-induced inflammation in rats was highest in the concentration of the test powder 3.2 g/kg at 6 hr (51%) though it was less than aspirin (90%). Thus, this study showed that the root powder of the test plant possess potential anti-inflammatory activity.

## 1.2 ANTIMICROBIAL ACTIVITY

### 1.2.1 Antibacterial activity of *Justicia adhatoda* L. (မုရားကြီး) leaves extracts

*Justicia adhatoda* L. is a well-known medicinal plant and widely distributed in Myanmar. In this study, antimicrobial activity of different extracts (95% ethanol and methanol) of *Justicia adhatoda* L. leaf was studied on *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Escherichia coli*. Ceftriaxone was used as positive control. Antimicrobial activity of *Justicia adhatoda* L. leaf extracts was determined by agar disc diffusion method. Ethanolic and methanolic extracts showed zone of inhibition, i.e., 10 mm for *Escherichia coli*. Broth dilution method was used for determination of Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC) of ethanolic and methanolic extracts of *Justicia adhatoda* L. leaf. MIC of ethanolic and methanolic extracts were observed in 200 mg/ml and MBC of both was observed in 200 mg/ml. Phytochemical analysis of *Justicia adhatoda* L. leaf was also carried out and alkaloids, glycosides, steroids, phenolic compounds, amino acids, starch, flavonoids, proteins, resins, phenols, tannin and carbohydrates were detected. The presence of phenolic compound seemed to be exert antimicrobial activity. So this study provided referential information about the antimicrobial activity of different extracts of *Justicia adhatoda* L. leaf.

### 1.2.2 Antimicrobial activity of *Anacardium occidentale* L. (Cashew) (သီတိုဋ်သရက်) different extracts on bacteria causing common gastrointestinal infection

*Anacardium occidentale* L. (သီတိုဋ်သရက်) belongs to the family Anacardiaceae, which are widely distributed throughout the tropical countries. In this study, antimicrobial activity of different extracts of *Anacardium occidentale* L. leaves and barks was studied on *Shigella flexneri*, *Shigella dysenteriae*, *Salmonella typhi* and *Escherichia coli* causing common gastrointestinal infection. Ethanol 90%, ethanol 70%, acetone and aqueous extracts of *Anacardium occidentale* L. leaves and barks were used to test antimicrobial activity. Ciprofloxacin, chloramphenicol and ceftriaxone were used as control antibacterial agents. Phytochemical and physicochemical tests of *Anacardium occidentale* L. leaves and barks were carried out. The presence of phenolic and tannin compounds seemed to exert antimicrobial activity. Screening of antimicrobial activity of crude extracts of *Anacardium occidentale* L. leaves and barks was determined by agar disc diffusion method. Among the crude extracts, aqueous extract of *Anacardium occidentale* L. leaves and barks showed larger zone of inhibition against *Shigella dysenteriae* than other bacteria. All extracts of *Anacardium occidentale* L. leaves and barks did not show significant zone of inhibition on *Escherichia coli*. Broth dilution method was used for determination of Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC) of different extracts with the above microorganisms. This study provided evidence based information of the phytochemical constituents obtained from *Anacardium occidentale* L. leaves and barks and its antimicrobial activity.

### 1.3 ACUTE TOXICITY

#### 1.3.1 Determination of the acute toxicity of Kant (ကန်), Kyauk-hsey-dan (ကျောက်ဆေးခန်း) and Yan-tay-zaw-nyein (ယမ်းတေဇာဠိမ်း) on mice

Myanmar traditional medicine practice means any form of medical treatment that belongs to any one of the four methods: Desana Method, Bhesijja Method, Nakkhatta Method, Vijjadhara Method. Vijjadhara Method is a form of medical practice that is concerned with the making of nine properties each of analogy and physiology as a medicament by means of special techniques and with the use of partitas preached by the Lord Buddha as well. The test drugs Kant, Kyauk-hsey-dan and Yan-tay-zaw-nyein are used in Vijjadhara Method by Myanmar traditional medicine practitioners. The present study aimed to determine the acute toxicity of Kant, Kyauk-hsey-dan and Yan-tay-zaw-nyein on mice. Laboratory based experimental animal study was done at Pharmacology Research Division, Department of Medical Research (Pyin Oo Lwin Branch), from June 2014 to March 2015. Acute toxicity of the test drug Kant was done on 40 albino mice which were randomly divided into four groups. Each group comprising 10 mice received a single oral administration of 27 mg/kg, 54 mg/kg, 108 mg/kg body weight of test drug (20 times, 40 times and 80 times of human dose) and 10 ml/kg of vehicle (control), respectively. The mortality and general behavior of toxic symptoms were observed for two weeks. Similarly, the acute toxicity of Kyauk-hsey-dan were carried out to group 1, 2, 3 of mice received 27 mg/kg, 54 mg/kg and 108 mg/kg body weight and that of Yan-tay-zaw-nyein conducted on mice with the doses of 100 mg/kg, 200 mg/kg and 400 mg/kg body weight, respectively, according to the above method. Even at the highest dose of the test drugs (80 times of human dose) did not exhibit any toxic symptoms and no death. Besides, the test drugs did not show significantly changes in body weight. So this study supported that the acute toxicity of the test doses of Kant, Kyauk-hsey-dan and Yan-tay-zaw-nyein are scientifically proved as safe for consumption.

### SERVICES PROVIDED

#### LABORATORY

Sr. No.	Laboratory Tests	Tested samples
1.	Acute toxicity test	5 samples
2.	Sub-acute toxicity test	1 sample
3.	Extraction of medicinal plants and polymer	7 samples
4.	Phytochemical tests on medicinal plants	2 samples
5.	Physicochemical tests on medicinal plant	1 sample
6.	Antioxidant activity	1 sample
7.	Polymer identification	1 sample

## PHYSIOLOGY RESEARCH DIVISION

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	...	Daw Phyo Phyo Wai BA(Eco)(UDE), Dip. Global English(YU)
Laboratory Attendant	...	Daw Kyi Kyi Htwe

The division has involved in research projects on sports physiology, non communicable diseases, metabolic diseases, and aging. The division has provided academic services such as teaching of post graduate students attending Universities of Medicine.

### RESEARCH PROJECTS

#### 1. NON-COMMUNICABLE DISEASES

##### 1.1. SPORT PHYSIOLOGY

###### 1.1.1. Cardiopulmonary fitness of adolescent students of Institute of Sports and Physical Education, Yangon

A cross-sectional descriptive study to determine the cardiopulmonary fitness and to find out the association between maximal oxygen uptake and anthropometric parameters of 14 to 16 years old 98 adolescent students (49 boys and 49 girls) was conducted at Institute of Sports and Physical Education (ISPE), Yangon. The cardiopulmonary fitness as a maximal oxygen consumption ( $VO_2max$ ) was determined by using Bruce protocol. In October, 2014, after primary screening such as electrocardiogram and random blood sugar, the test was performed by using computerized treadmill at Physiology Laboratory, DMR. The results showed that the boys and girls had no significant difference in age ( $15.18 \pm 0.99$  years vs  $15.06 \pm 0.77$  years) (mean  $\pm$  standard deviation (SD) and body mass index (BMI) ( $20.30 \pm 1.59$  kg/m<sup>2</sup> vs.  $20.42 \pm 1.72$  kg/m<sup>2</sup>), boys had significantly higher height ( $167.21 \pm 4.81$ cm vs.  $155.44 \pm 4.53$  cm,  $p < 0.001$ ) and weight ( $56.76 \pm 5.08$  kg vs.  $49.24 \pm 4.66$  kg,  $p < 0.001$ ) than girls. It was observed that boys'  $VO_2max$  ( $53.55 \pm 9.02$  ml/kg/min for boys vs.  $39.79 \pm 12.64$  ml/kg/min for girls) as well as exercise time ( $10.61 \pm 1.13$  minutes vs.  $9.45 \pm 1.16$  minutes) were significantly ( $p < 0.001$ ) greater than girls but maximal heart rate ( $HR_{max}$ ) had no significant difference in terms of gender ( $175.81 \pm 11.96$  beats/minute vs.  $174.17 \pm 9.59$  beats/minute). This was to be expected, cultural factors encourage physical activity and the resultant muscular development for boys more than girls. In 1996, one UK study offer typical values for boys of 48 to 50 ml/kg/min during adolescence, while for girls, their figures are 39 to 45 ml/kg/min. The  $VO_2max$  values from this study were found to be not much different

from that of the UK study. In this study, BMI of boys had significant positive association ( $r=0.11$ ,  $p < 0.000$ ) to  $VO_2$ max values and that of girls had significant inverse association ( $r= -0.18$ ,  $p < 0.000$ ) to  $VO_2$ max values. This was probably due to higher BMI of girls who have relatively more body fat than boys. Similar inverse association was found in a study conducted in 13-17 years old adolescent students of Babol City, Iran. Therefore, this study shows that a normal BMI is required for good cardiopulmonary fitness. It is hoped that the data from this preliminary study will serve as a base-line data for future large population-based studies on cardiopulmonary fitness status of adolescent students in Myanmar.

## 1.2. OBESITY

### 1.2.1 Relationship between body fat composition, leptin sensitivity, insulin sensitivity and resting energy expenditure in non-obese and obese adults

Leptin resistance is the main biological abnormality in human obesity. It is of great importance to develop tools for quantifying leptin sensitivity/resistance in humans, in order to investigate clinical courses of patients with leptin resistance and the outcomes of therapeutic interventions. A simple, feasible test for identifying leptin resistance individuals is important for both population based research and clinical practice in planning optimal management strategies for patients with obesity. To investigate the usefulness of body mass index (BMI) or resting energy expenditure (REE) as a component in leptin sensitivity index formula, a cross-sectional study was conducted in 20 to 55 years old non-obese ( $n=42$ ) and obese ( $n=45$ ) adults. BMI was calculated as the ratio of weight in kilogram to height in meter square ( $kg/m^2$ ) after measuring height and weight according to standard procedures. REE was measured by using indirect calorimetry after overnight fast and resting for 30 minutes before the test. Serum leptin level was determined by enzyme linked immunosorbent assay method. Then, leptin sensitivity was calculated by 2 formula as described in the international literatures: leptin/BMI and REE/leptin. Results showed that there was a significant negative correlation between these two formula in expressing leptin sensitivity in the study groups ( $p<0.000$ ,  $r= - 0.55$ ). Thus, BMI and REE can be used as a component in leptin sensitivity index formula despite REE measurement is impractical in clinical practice and is difficult to perform in population practice based research studies.

## 1.3. METABOLIC DISEASES

### 1.3.1. Assessment of erythrocyte magnesium and serum calcium level in postmenopausal women

Many trace elements such as calcium, magnesium, zinc, copper and selenium are essential for normal growth and development of skeleton. Among them magnesium plays important role in bone metabolism as magnesium can help calcium absorption. Without the proper balance of magnesium to calcium, good bone health cannot be achieved. Therefore, this study aims to assess the erythrocyte magnesium and serum calcium level in postmenopausal women. A cross-sectional descriptive study was conducted on postmenopausal women from Shwe Pyi Thar Township, Yangon Region. After explaining the purpose of the study, the participants were chosen according to selection criteria. History taking and physical examination was done. Bone mineral density was measured by using bone densitometry to all postmenopausal women. After grouping of 99 postmenopausal women into 3 groups (normal, osteopenia and osteoporosis) according to T-score, venous blood was collected for erythrocyte magnesium and serum calcium concentration. The erythrocyte magnesium level was measured by magnesium Calmigate method by using Spectrophotometer within 24 hours. The serum total calcium level was measured by CPC

(o-cresolphthalein-complexone) method and the concentration (optimal density) was read by spectrophotometer. The mean age of all participants was 62.06±9.77 year. The mean age of menopause in this study was 46.28±5.1 year. In our study, 42.4% of postmenopausal women avoided some foods such as red meats, peas and some kinds of fruits and vegetables. The mean erythrocyte magnesium level (3.48 ± 0.71mg/dL) and serum calcium level (9.29 ± 0.94 mg/dL) were significantly lower (p<0.05) in osteoporotic postmenopausal women than in either osteopenic (3.93 ± 1.04mg/dL and 9.91 ± 2.31mg/dL) or normal (4.07 ± 1.14mg/dL and 10.69 ± 2.44mg/dL) postmenopausal women. The significant positive correlation was found between erythrocyte magnesium and T-score (n=99, Pearson's r=0.24) and serum calcium and T-score (n=99, Pearson's r=0.23). It means that magnesium could be as important to bone health as calcium. Magnesium converts vitamin D into active form so that it can help calcium with respect to bone health. Therefore, it can be concluded that proper balance of magnesium and calcium gave normal growth and development of bone.

#### 1.4. AGING

##### 1.1.1. Physical fitness of the elderly at the Home for the Aged (Hninzigone), Yangon

A cross-sectional descriptive study aimed to assess physical fitness in Myanmar elderly (above 70 years) by using the Senior Fitness Test in comparison to the US norms. One hundred and forty five elderly; 52 men (mean ± SD, 81.23 ± 6.36 years) and 93 women (79.03 ± 5.27 years) from the Home for the Aged (Hninzigone), Yangon volunteered for the study. Each person was asked to perform six tests of the senior fitness test; 30-second chair stand test to assess lower body strength; 30-second arm curl test to assess upper body strength; Chair sit and reach test to assess lower body flexibility; Back scratch test to assess upper body flexibility; 8-Foot up and go test to assess dynamic balance and 2-minute step test to assess aerobic endurance.

Body fat percent was calculated after skin-fold thickness measurement. Elderly men and women were divided into 5 groups according to age (Table-1). Most of elderly women had lower BMI and higher body fat percent than elderly men in all age group. The older the age, the higher the reduction were observed in BMI and body fat percent. All the elderly had completed the six fitness tests. Scores from each test were compared to Americans' norms by subject's age and gender and described as performance better than the norm, same as the norm, or worse than the norm. Generally, performance was better in strength tests (chair stand and arm curl) than cardiovascular tests (2- minute step and 8-foot up and go) or flexibility tests (chair sit and reach and back scratch) (Table-2). Test performance did not differ by gender and age. Since little information is available on the physical fitness of Myanmar elderly people due to technical difficulties, the results from this preliminary study will serve as a base-line data for future population-based studies and intervention studies on physical fitness of elderly in Myanmar.

Table 1. Basic characteristics of elderly men and women

	70-74 years		75-79 years		80-84 year		85-89 years		>90 years	
	Men (n=6)	Women (n=20)	Men (n=17)	Women (n=34)	Men (n=15)	Women (n=25)	Men (n=8)	Women (n=11)	Men (n=6)	Women (n=3)
BMI (kg/m <sup>2</sup> )	25.2 ± 5.32	23.9 ± 4.41	23.16 ± 4.0	23.84 ± 6.0	23.28 ± 3.05	23.21 ± 5.58	20.43 ± 3.76	19.68 ± 4.35	20.98 ± 2.8	22.02 ± 4.5
Body fat (%)	23.78 ± 8.03	25.29 ± 6.08	21.69 ± 6.12	23.84 ± 6.0	19.85 ± 4.97	23.47 ± 6.61	15 ± 4.79	19.62 ± 4.89	16.53 ± 3.8	22.23 ± 6.73

Table 2. Physical fitness of elderly men and women in compared to US norms

Test	Worse than norm		Same as norm		Better than norm	
	Men No. (%)	Women No. (%)	Men No. (%)	Women No. (%)	Men No. (%)	Women No. (%)
Chair stand	10 (19.23%)	22 (23.66%)	25 (48.08%)	49 (52.69%)	17 (32.69%)	22 (23.66%)
Arm curl	2 (3.85%)	4 (4.3%)	24 (46.15%)	25 (26.88%)	26 (50%)	64 (68.82%)
2 minute step	28 (53.85%)	43 (46.24%)	22 (42.31%)	49 (52.69%)	2 (3.85%)	1 (1.08%)
Chair sit and reach	13 (25%)	19 (20.43%)	16 (30.77%)	29 (31.18%)	23 (44.23%)	45 (48.39%)
Back scratch	29 (55.77%)	53 (56.99%)	7 (13.46%)	15 (16.13%)	16 (30.77%)	25 (26.88%)
8 foot up and go	31 (59.62%)	78 (83.87%)	16 (30.77%)	15 (16.13%)	5 (9.62%)	0 (0%)

## SERVICES PROVIDED

### ACADEMIC

Sr.	Name	Course	Responsibility
1.	Dr. Khin Mi Mi Lay	1 <sup>st</sup> year MMedSc (Physiology) Universities of Medicine	Lecturer/ co-examiner
		2 <sup>nd</sup> year MMedSc (Physiology) Universities of Medicine	Member of post graduate academic board of studies
		Workshop on Research Methodology (2015)	Facilitator
2.	Dr. Nway Htike Maw Daw Htike Htike Soe Daw Yi Yi Mon	1 <sup>st</sup> year MMedSc (Physiology) Universities of Medicine	Demonstration of Lung function and shuttle run
3.	Daw Khin San Lwin Daw Le' Le' Win Hlaing	1 <sup>st</sup> year MMedSc (Physiology) Universities of Medicine	Demonstration of Ergometer and Handgrip Dynamometer
4.	Daw Sandar Win Daw Htet Htet Lwin	1 <sup>st</sup> year MMedSc (Physiology) Universities of Medicine	Demonstration of skin fold caliper and Leg strength

### INTERVIEW

1. Interview with Dr. Khin Mi Mi Lay on Physical Inactivity and Non-communicable diseases was done by Sky Net