

EX 5.

LIST OF PAPERS READ OR PUBLISHED. (1980-1983)

5.1. Papers read or published on topic relevant to DMR/JICA Project.

(a) Bacterial enteric diseases and diarrhoea.

1. Khin Maung U, (1980). Laboratory and Field studies in Diarrhoea of adults and children in Tropical Climate. Presented at Clinical Gastroenterology Meeting on 12-12-80 at the MRC Clinical Research Centre, Harrow, Middlesex, England.
2. Khin Maung U, (1981). Intestinal Transport Studies of Calcium and Phosphate a model for ionic transport study in diarrhoea. Presented at Clinical Cell Biology Seminar on 3-4-81 at the MRC Clinical Research Centre, Harrow, Middlesex, England.
3. Khin Maung U, (1981). Operational Research Methodology for domiciliary oral rehydration of acute diarrhoea among village children in Burma, and its effect on their growth and nutrition. Presented at Harvard University School of Public Health on 7-5-81 Boston, Massachusetts, U.S.A.
4. Khin Maung U (1981). Effect of oral rehydration on growth and nutrition in rural Burma. Presented at International Food and Nutrition Programme Seminar on 7-5-81 United Nations University, Massachusetts Institute of Technology, Boston, Massachusetts, U.S.A.
5. Khin Maung U, (1981). Operation Research Method to study feasibility, acceptability and effectiveness of oral rehydration for acute diarrhoea among village children by their mothers at home and its effect on their growth and nutrition. Presented at Inter-university School of Medicine, Baltimore, Maryland, U.S.A.

6. Tin Aye, K. Wachmuth, J.C. Feeley, R.J. Gibson and S.R. Johnson, (1981). Plasmid profiles of *Legionella* species. *Current Microbiol.*, 6: 389-394.
7. Tin Aye, Mar Mar Nyein. (1982). Etiological agents responsible for acute diarrhoea in children. Proceedings of the Research Seminar on Acute diarrhoea in childhood, Department of Medical Research, Rangoon, Burma.
8. Tin Aye, Mar Mar Nyein (1982). Recent knowledge on Bacterial enteric Pathogens of acute diarrhoea diseases. Proceedings of the Research Seminar on acute diarrhoea in childhood. pp 73-78, Department of Medical Research, Rangoon, Burma.
9. Khin Maung U (1982). Community management of acute diarrhoea. Proceedings of Research Seminar on Acute Diarrhoea. pp 113-142. Department of Medical Research, Rangoon, Burma.
10. Khin Maung U (1982). Recent advances in the Pathophysiology and management of acute diarrhoea. Proceedings of Research Seminar on Acute Diarrhoea p 143-158. Department of Medical Research, Rangoon, Burma.
11. Kyi Kyi Khin (1982). Viral agents causing diarrhoea in childhood. Proceedings of the Research Seminar on Acute Diarrhoea in childhood. p 79-93. Department of Medical Research, Rangoon, Burma.
12. Aung Myo Han (1982). Epidemiology of acute diarrhoea in childhood. Proceedings of the Research Seminar on Acute Diarrhoea, p 1-20, Department of Medical Research, Rangoon, Burma.
13. Aung Myo Han, Thein Mg Myint, Thein Hlaing and W. Tun Lin. (1982). Incidence of acute diarrhoea in children under five years in North Okkalapa township. Proceedings of the Research Paper Reading Session, Medical Sciences Division, Abstr., p 4, Rangoon, Burma.
14. Tin Aye (1983). A comparative study of heat-labile toxin of ETEC by CHO, GM<sub>1</sub> ELISA and Biken assay systems. Presented at 2nd Asian Conference on diarrhoea diseases on 21-24 Feb. 1983, Calcutta, India.

15. Tin Aye, Mar Mat Nyein, Y. Kanemasa and H. Hayashi (1983). Etiological agents responsible for acute diarrhoea in children in an urban community in Burma. *Microbiol. Immunol.* 27(6), 551-556.
16. Thane Toe, Khin Maung U, Tin Aye, Mar Mar Nyein and Ye Htut.( ). Oral rehydration therapy in the home by village mothers in Burma. *Trans. of the Roy. Soc. of Trop. Med. & Hyg.*, (in Press).

(b) Dengue Haemorrhagic fever and arboviral infections.

1. Anthony Sebastian, Myat Myat Thu and Myint Myint Sein(1980). The use of dragonfly nymphs in the control of *Aedes aegypti*. *Southeast Asian J. of Trop. Med. & Hyg. Publ. Hlth*, 1:(11), 104-107.
2. Oyama, A., Thet win & Tanimura E. (1981). Isolation and identification of Dengue virus (type2). by Toxorhynchites mosquitoes. The 23rd Annual Meeting of Japanese Society of Tropical Medicine, 1981 Tokushima, Japan.
3. Ito T., Tanimura E., Yamamoto N., Nakamichi A., Aung Myint and Ohyama A., (1981). Quantitative detection of Dengue and Rubella viruses using cultured cells. The 29th Meeting of Japanese Virologist 1981, Tokyo, Japan.
4. Thet win and Ohyama, A., (1981). Detection of Dengue 2 prototype virus in Toxorhynchites mosquitoes using intracerebral inoculation techniques. Dengue Newsletter. Southeast Asian and Western Pacific Regions, W.H.O., 7: 51-52.
5. Mi Mi Khin, (contributor). Rapid Laboratory techniques for the diagnosis of viral infections. Report of a WHO Scientific Group, Technical Report Series 661, WHO Geneva 1981.
6. Ito, T., Tanimura, E., Yamamoto, N., Aung Myint, and Ohyama, A., (1981). Macroscopic observation of slow appearing cytotoxic viruses in cultured cells by EFFT (Enzyme Focus Forming Assay). Proceedings of 29th Annual Meeting of the Society of Japanese virologist (in Japanese). 20-23 October 1981, Tokyo, Japan.

7. Thet Win (1982). Detection of Dengue virus by immunofluorescence after intracerebral inoculation of mosquitoes. *Lancet*, 2: 53-54.
8. Mi Mi Khin, (1982). Viral infection in Burma. Mackenzie, J.E. ed, *Viral diseases in Southeast Asia and the Western Pacific*. Sydney, Academic Press, 210-216.
9. Kyi Kyi Khin, (1982). Neutralizing capacity of the sera of dengue haemorrhagic fever patients to Japanese encephalitis virus. *Journal of the Kansai Medical University*, Supplement of Vol. 34.
10. Mi Mi Khin, Khin Aye Than and Tin U, (1982). Recovery of Dengue Viruses from autopsy material. *Proceedings of the Research Reading Session, Medical Sciences Division*, Paper.
11. Mi Mi Khin and Khin Aye Than (1983). Transoviral transmission of dengue 2 virus by *Aedes aegypti* in nature. *Am. J. Trop. Med. Hyg.*, 32: 590-591.

## 5.2 Papers read or published on other topics.

### (a) Snake-bite Research

1. M. Aung Khin, Khin Ohn Lwin & Thant Zin, (1980). Immunogenicity of the toxoid of Russell's Viper Venom. *The Snake*, 12: 45-53.
2. Aye Kyaw, Thant Zin & Aung Khin (1982). Partial purification and some properties of Caseinolytic activity in Russell's Viper Venom. *The Snake*, 14: 18-22.
3. Khin Ohn Lwin and Aye Aye Myint (1982). The use of enzyme linked immunosorbent assay (ELISA) in detection of Russell's Viper venom in body fluid. *The Snake*, 14: 77-82.
4. Khin Ohn Lwin, Aye Aye Myint, Tun Fe, Theingie Nwe and Min Naing. ( ). Russell's viper venom levels in serum of snake-bite victims of Burma. *Transaction* (in press).

5. Tun Pe, Aye Aye Myint, Min Naing and Thein Win. The efficacy of bolous dose of Russell's viper antivenom in human viper bite victims. Presented at 2nd Conference of Medical Specialities. 13-17 October, 1983, Rangoon.
6. Mg Mg Thwin, Thein Than and Hla Pe. The relationship of administered dose of venom levels in blood following experimental envenomation of Russell's viper (*vipera russelli*) venom in mice. *Toxicon*. (in press)

(b) Nutrition

1. Tin Tin Oo, and Khin Maung Naing (1980). Breast feeding and weaning practices in Burma. The Proceedings of a Research Seminar on Breast feeding and weaning practics in Burma. Department of Medical Research, Rangoon, Burma.
2. Khin Maung Naing, Tin Tin Oo, Kywe Thein and Nwe Nwe Hlaing (1980). A study on lactation performance of Burmese mothers. *Am. J. Clin. Nutr.* 33: 2655-2668.
3. Tin Tin Oo and Khin Maung Naing (1982). A comparison of milk output of Burmese mothers by three different methods. *Reference Food and Nutrition Bulletin*, 4:(4), 66-68.
4. Thane Toe and Thein Than (1982). Serum Ferritin studies in Burmese Pregnant Women. *Am. J. of Clin. Nutr.*, 35: 95-99.
5. Iles, C.A., Sharman, I.M., Thane Toe, Wardsworth, G.R. (1983) Material diet and nutrition during early pregnancy and after delivery in North London. In " Prevention of Spina Bifida and other Neural tube Defects", Ed: John Dobbing, Academic Press, London, 1983.

(c) Viral Hepatitis and Liver diseases.

1. Khin Mg Tin and Tun Khin. Alcohol and the liver, The Proceedings of the 28th Burma Medical Conference, 1981, Rangoon, Burma.

2. Khin Maung Tin, Tin Htut, Hla Myint & Tun Khin. Prevalance of Hepatitis A&B in Burma, The Proceedings of the 1st Conference of Combined Medical Specialities, 1981, 1: 26-31, Rangoon, Burma.
3. Khin Maung Tin, Myo Thwe and Myo Han (1982). Chapter 9, Liver and Biliary tract. Text book of Internal Medicine, Section of the Burma Medical Assoc. p 9.1-9.48, Rangoon, Burma.
4. Aye Kyaw, Thidar Aung, Tin Htut, Hla Myint and Khin Maung Tin (1983). Lysosomal enzyme activities in normal and in patients with chronic liver diseases. Clinical Chimica Acta (Japan). 131: 317-323.
5. Hla Myint, Khin Maung Tin, Nwe Nwe Oo, Tun Khin, and Myint Myint Soe. Non-A, Non-B Hepatitis in Rangoon, The 2nd Conference of Combined Medical Specialities, 1983, Rangoon, Burma.

(d) Malaria

1. Long, E., Lwin M., Targett, G, Dornhoff, M. (1981). Factors affecting the acquisition of resistance against *Schistosoma mansoni* in the mouse, VIII Failure of concurrent infections with *Plasmodium chabaudi* to effect resistance to reinfection with *S. Mansoni*; Am. Trop. Med. Parasitol. 75(1):79-86.
2. Lwin M., Last, C., Targett, G.A., Dornhoff, M.J., (1982). Infection of mice concurrently with *Schistosoma mansoni* and rodent malarias: contrasting effects of patent *S. mansoni* infections on *Plasmodium chabaudi*, *P. yoelii* and *P. berghee*. Ann. Trop. Med. Parasitol., 76:(3) 265-273.
3. Hla pe, Phu Phu, Tin Win, Win Myint Than and Franco Tin (1982). Protective action of glucose-6 phosphate dehydrogenase deficiency against malaria. The Proceedings of the Research Paper Reading Session, Medical Sciences Division, 1982, Abstr., p 5, Rangoon, Burma.

4. Myint Oo, Myint Lwin, Min Zaw & Ye Htut (1983). Biochemical characterization of chloroquine-resistant isolates of *Plasmodium falciparum*. Trans. Roy. Soc. Trop. Med. Hyg. (in press).

(e) Pharmacology and Indigenous drugs

1. S.J. Tha, Aye Than, Thawka Kyin and Chit Mg (1981). Drug oxidative status of Burmese with reference to Antipyrine. Proceedings: 1st Conference of Combined Medical Specialities, 1981, p 82-86, Rangoon, Burma.
2. Chit Maung, Malar Lwin, Saw Po Aung, Saw Han and S.J. Tha, (1981). Sulphadimidine pharmacokinetics and its acetylation phenotyping in Burmese. Proceedings: 1st Conference of Combined Medical Specialities, 1981, p 76-81, Rangoon, Burma.
3. Malar Lwin, Saw J. Tha and Chit Maung (1983). Sulpadoxine in Pharmacokinetics in Burmese. Proceedings: 2nd Conference of Combined Medical Specialities, 1983, p 45, Rangoon, Burma.
4. Saw Han, Tin Myint and Saw J Tha (1983). Effect of tea and coffee on drug oxidation metabolism in Burmese. Proceedings: 2nd Conference of Combined Medical Specialities, 1983, p 45, Rangoon, Burma.
5. S.J. Tha, Khin Maung Tin and Hla Maung Din (1983). Clinical trial on the anti-helminthic action of Burmese pineapple, Nanat. Proceedings of 2nd Conference of Combined Medical Specialities, 1983, p 43, Rangoon, Burma.
6. Saw J. Tha (1983). New antimalarials Qinghaosu and mefloquine, Burma Med. J., 29,(2), p 122-125.
7. Ma Aye Than and Saw J Tha (1982). Hypotensive mechanism of Plantago major extraction PM-9. Proceedings of the Research Paper Reading Session, Medical Sciences Division, 1982, Abstr. p 20, Rangoon, Burma.

(f) Biochemistry Research

1. Hla Pe and Tin Win (1980). A simple method for recording thin layer acylamide gel electrophoresis, J. Clin. Path. 33, 642

2. Aye Kyaw, Khine Khine Nwe and Hla Pe (1980). Decreased pyridoxal kinase activity in iron deficient rat liver. *Biochem. Med.*, 23: 17.
3. Phone Myint, Tin Win, Tin Oo and Hla Pe. Effect of iron on DNA synthesis; serine hydroxymethylase activity and <sup>deoxyribo-</sup> nucleic acid content of iron deficient rat tissue. *Proceedings of the Research Paper Reading Session, Medical Sciences Division, 1982. Abstr, p 6. Rangoon, Burma.*

(g) Health Services Research

1. Thein Hlaing and Aung Myo Han (1981). Comparative analysis of mortality of insured workers in industrial establishments and of working age population in Rangoon. *Burma Med. J.*, 28: 1-18.

(h) Others

1. No<sup>Ma</sup>guchi, H., Mar Mar Nyein, Kohsaka, K., Yoneda, K., and Mori, T., (1980). The growth and drug sensitivity of *M. Lepraemurium* by tissue culture applying monolayer and agar suspension technique. *International J. of Leprosy*, 48: 277-284.
2. Khin Maung Zaw, T. Muto. Intestinal adenomatosis associated with campylobacter like bacteria in guinea pigs. *Japanese Journal of Medical Sciences Biology*. (in press)
3. Aung Myo Han. Mode of transmission of leprosy: a review. *The Burma Med. J.* (in press)





**VII. DMR RESEARCH FINDINGS APPLICABLE  
TO  
HEALTH CARE**



DEPARTMENT OF MEDICAL RESEARCH  
MINISTRY OF HEALTH  
NO.5, ZAFAR SHAH ROAD  
RANGOON, BURMA

(1984)

## INTRODUCTION

The principal aim of research conducted at the Department of Medical Research (DMR) is to improve the health of the people of Burma. Within this context, the general objectives are to identify current and future health problems and their determinants, and to discover or develop new and improved methods for the control, diagnosis and treatment of the identified major health problems and diseases in Burma. It is envisaged that the insights and tools so provided will be made use of by the providers of health care and medical educators.

DMR keeps itself informed about the health conditions, health problems and constraints in their solution - by participating in Country Health Planning (CHP) processes at various levels, by scrutiny of reports emanating from the Department of Health, and through formal and informal channels with the Department of Health, Department of Medical Education, Department of Sports and Physical fitness. On the basis of the identified health problems researchable questions addressed to these problems are formulated by DMR, and depending upon available resources long and short term research programs and research projects are planned and implemented. Field, clinical or laboratory based researches are carried out as indicated.

Most of the researches are performed by DMR staff, some are in collaboration with scientists and colleagues from other Departments and some are carried out solely by scientists from other Departments with financial and technical support by DMR.

Hitherto, results of research at DMR are communicated to health professionals in Burma through formal and informal channels-- by publication in national and international medical journals, by papers presented within Burma at Research Congresses, Research Seminars,

Medical Conferences, and by Reports presented to inter-Departmental meetings and by direct communication to Departments and individual health professionals concerned.

From among the various research findings produced by DMR up to March 1984, those which it deems directly applicable to health care in Burma have been selected and presented very concisely in this booklet. A complete list of pertinent References have also been given.

It is urged that the pertinent research findings be used by the concerned health professionals for the benefit of the health of the people of Burma.

Dr Aung Than Batu

M.B., B.S; F.R.C.P (Edin.)

Director-General

Dept. of Medical Research

## CONTENTS

### INTRODUCTION

1. Nutrition, Growth and Development especially  
in infants and children, and Physical fitness
2. Nutritional Anaemias
3. Goitre and Iodine deficiency
4. Beri-Beri and Thiamine (Vitamin B<sub>1</sub>) deficiency
5. Haemoglobinopathies, Thalassemias and Glucose  
6 Phosphate Dehydrogenase deficiency
6. Malaria.
7. Viral hepatitis and chronic liver diseases
8. Dengue haemorrhagic fever
9. Leptospirosis
10. Leprosy
11. Acute diarrhoea
12. Chronic diarrhoea and miscellaneous  
gastrointestinal disorders
13. Ascariasis and other intestinal helminths
14. Snake bite
15. Indigenous medicine

N O T E

Copies of References cited here may be obtained by responsible health officials on request to Dr Kywe Thein, Deputy Director (Administration).

Further information on the research findings may be obtained from Dr Khin Maung Tin, Director, and Deputy Directors (Research) Dr Thane Toe, Dr Thein Maung Myint and Dr Mi Mi Khin, and from the authors concerned.

Address:

Department of Medical Research  
No.5, Zafar Shah Road  
Rangoon, Burma.

Telephone Numbers:

72033  
72071  
77541  
77288  
76357

NUTRITION, GROWTH AND DEVELOPMENT ESPECIALLY IN INFANTS AND  
CHILDREN AND PHYSICAL FITNESS

1. Flattening of growth curve between six months and 2 years of age in Burmese children

Surveys by DMR in several Burmese population groups and construction of growth curves of the children show that there is a definite flattening of the average growth curve between 6 months and about 2 years of age ( 1, 2).

Concurrent dietary intake studies using reliable methods indicate that the average caloric intake during this period is not sufficient for proper growth needs ( 2,3).

2. Breast feeding and weaning practices and weaning foods

Studies by DMR show that breast feeding is almost universal among Burmese village women and about 70% among urban Rangoon women. Studies of Breast milk output in Burmese mothers show that it is adequate for the nutritional needs of the child up to at least 4 months of age ( 2,3).

On the average, weaning foods and practices are not sufficient for caloric needs between 6 months and 2 years of age. The weaning diet consists of low caloric density foods---principally rice or rice-gruel with little or no addition of oil or animal proteins. The frequency of feeding is also insufficient. (These findings are corroborated by similar studies from the Department of Health). The caloric gap compared to FAO/WHO requirement for proper growth is from 120 to 380 Calorie/day in under 3-year-old children in some rural communities.

DMR has found that children of urban itinerant working mothers are especially vulnerable and that their breast feeding practices and weaning diets are least satisfactory when compared with other regularly employed mothers and housewives. (4).

3. Prevalence and distribution of protein-calorie malnutrition (P.C.M)

Extensive studies by DMR among several Burmese population groups reveal that the prevalence of PCM (Waterlow Classification) Grade I is 40%, II is 12% and III is 1% (These findings are corroborated by similar studies by the Department of Health) (1,2,3,4).

4. Physical and Functional antropometry of Burmese (7 to 35 years of age)

Using International Biology Year (IBP Hand-Book, 1969) standard methods parameters including height, weight, etc., were measured on large urban and rural samples (age groups 7 to 35 years) from several geographical regions of Burma including Rangoon, Central Burma, Inland and Delta regions.

Composite Height for age and weight for age curves have been constructed for males and females from the urban and rural samples of the different geographical regions. (8)

5. Energy expenditure of farmers and other occupational groups

As part of a long-term programme of determining the energy requirements of different major occupational groups in Burma DMR has measured the energy expenditures of the following groups;

1. Side-car peddler (male) 2750+553 Kcal/day (1978)
2. Saw mill workers (male) 2434+269 " " (1980)
3. Weavers (female) 2548+319 " " (1981)
4. Farmers (male)
  - Monson 3757+405 " " (1982)
  - Harvest 3002+393 " " ( " )
  - Summer 2251+542 " " ( " )
5. Steel mill workers (male) 2354+303 " " (1983)
6. Dockyard workers or rice sack carriers 8.8 Kcal/Kgm/hr (1978)

(9,10, 11,12,13 )



#### 6. Physical fitness of different population groups

DMR started the study on the physical fitness of Burmese in 1965. The fitness findings up to 1968, were compiled and reported by the Technical Committee of the Burma Medical Research Council (7). In the report, collected work, anthropometry, physical fitness and performance, biochemical, clinical and nutritional studies were described. Subsequently studies on the cardiovascular fitness of the Burmese workers (14) and one of the national groups - Chin (15) have been carried out. The effect of some factors like, anabolic steroids, B<sub>12</sub>, G-6PD and anaemia on the physical fitness were also investigated. (16,17,18).

The effect of urban and rural residence (19,20) and a conditioning programmes (21) on the physical fitness level were also investigated. A study was conducted to determine the anaerobic work power and capacities on some groups of Burmes workers (22).

In 1974, a country-wide physical fitness study was included as part of the Growth, Development and Fitness research progress (GDF), with the aim to understand the current fitness of Burmese and to improve the level of physical fitness. This programme covered 2400 persons from four geographical areas, rurals and urbans, both sexes of five age groups (8).

#### 7. Research on Athletes

The study of sports physiology on athletes was started in 1964 by DMR. DMR has reported on medical, anthropometric and physiological data on (540) selected Burmese athletes for SEAP game in Olympic Medical Archives form in 1966 (23), 1969 (24) and 1972 (25). The food intake study of some of the athletes were also included and reported in terms of the nutrients and vitamins content (26). Methods for the sex determinations were developed at the DMR and tested on the female athletes (27). In 1975 a group of top Burmese swimmers were studied for their physical performance and cardiovascular fitness (28). A similar study

was also carried out on the top Burmese boxers in 1981 (29). A detailed study was carried out in 1970 to assess the physiological status and changes that occurred during the long -distance running in a group of the top Marathon runners (30). In addition to the physical performance and cardiovascular fitness, the anaerobic power and capacities of the top athletes according to the sport events were also studied. (31,32).

#### Applicability

##### Nutrition Planning and Nutrition programme delivery

- (1) The substantial evidence provided by DMR regarding flattening of growth curve between 6 months - 2 years of age and the lack of adequate caloric intake during this period focusses greater attention on the problem of proper weaning foods and practices, documents previous impression about the magnitude of the problem, and strengthens the hand of health authorities in mobilizing resources to combat this problem.
- (2) The substantial body of data collected by DMR on weaning foods and practices among various population groups documents previous impression about low caloric density weaning food and infrequency of feeding and provides a basis for promoting better weaning food and practices.
- (3) DMR studies on breast feeding and weaning foods among urban working mothers reveal the greater vulnerability of the children of urban itinerant working mothers. These studies focus attention on children of urban working mothers as possible targets for a different type of nutrition programme possibly by making available nutritious weaning food packets.
- (4) Physical anthropometric data collected by DMR provides base-line data for assessing changes in growth and development of the population.
- (5) Energy expenditure and requirements of different occupational groups are essential data for national planners when drawing up the country's food budget.

#### Applications in industry and schools

- (1) Functional anthropometric data collected by DMR is of use in procuring appropriately designed machines, tools and clothes for workers and furniture for school children.

#### Promotion of physical work capacity and Physical fitness

- (1) The available informations on the physical fitness of Burmese would provide a base-line for programmes aimed at promotion of physical fitness of the people.

#### Training and Selection of Athletes

- (1) The available informations on the athletes would provide the current status of cardiovascular and physical fitness and physiological changes that occurred during activity. In addition, these information would also assist in selection of an athlete for a particular sport event and training for better performance and achievement in competition.
- (2) The information provided by DMR on the physical work capacity and nutrition of workers on various jobs provides the basis for improving their work performance.

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1. Growth studies of Urban Burmese infants and children in Insein and Thuwana townships. DMR Departmental Report (1972). Nutrition Research Division.
2. Khin Maung Naing, Tin Tin Oo and Kywe Thein (1979). Weaning foods and practices and their nutritional adequacy in a rural community. Proceedings of the research seminar on Breast feeding and weaning practices in Burma. Published by Department of Medical Research.
3. Tin Tin Oo, Khin Maung Naing & Kywe Thein (1979). The pattern of breast feeding and its nutritional adequacy in rural communities. Proceedings of the research seminar on Breast feeding and weaning practices in Burma. Published by Department of Medical Research.

4. A study of feeding practices in infants and young children in Rangoon Division. DMR Departmental Report. (1982). Nutrition Research Division.
5. Kywe Thein, Tin Oo, Tin Tin Oo & Khin Kyi Nyunt (1971). An epidemiological study of protein caloric malnutrition in Rangoon. Union of Burma J. Life Sci., 4, 569-573.
6. Cho Nwe Oo (1971). PCM in Three Islands of Mergui Archipelago. Sixth Burma Medical Research Congress (abstract).
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8. Anthropometric and Individual food intake studies of growth, development and physical fitness programme (GDF survey). DMR Departmental Report, (1974-79), Physiology Research Division.
9. Tin May Than & Mya Tu (1969). The basal metabolic rate of the Burmese. J. Life Sci., 2, 373-382.
10. Htay Htay & Ma Hla Yee (1981). A study on the energy expenditure and physical fitness of the Dockyard workers. Burma Medical Journal, 27, 49-53.
11. Nyunt Khin, Hla Win & Tin May Than (1968). Energy expenditure in agricultural activities in Burma. Union of Burma J. Life Sci., Vol. 1, 359-363.
12. Energy intake and output of Burmese farmers at three different seasons. DMR Departmental report (1983). Physiol. Research Division.
13. Ma Hla Yee (1981). Energy expenditure and physical fitness of Dockyard workers. Burma Medical Journal, 27, 49-53.
14. Htin Kyaw, Myo Thein, M. Mya Tu, Aung Myint and Khin San Aung (1971). Maximum oxygen uptake of Burmese sedentary workers. Paper read at 6th Burma Research Congress.
15. Mya Mya Aye (1974). The physique of Cains. M.Sc (Physiol.) Thesis, Institute of Medicine I, Rangoon.
16. Win May (1972). Adreno-cortical function and physical fitness in the Burmese. M. Sc (Physiol.) Thesis, Institute of Medicine, Mandalay.

17. Tin May Than, Win May, Khin San Aung and M. Nya Tu (1978). The effect of vitamin B<sub>12</sub> on physical performance activity, British J. Nutri., 40, 269.
18. Yin Thu (1972). Haematological parameters and physical performance capacity in Burmese. M.Sc (Physiol.) Thesis, Institute of Medicine, Mandalay.
19. Htay Htay (1976). A comparative study of the physical performance capacity of rural and urban Burmese women aged 19-24 years. South East Asian J. Trop. Med. & Hygiene, 7, 452-459.
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21. Po, Lilian (1974). The effect of conditioning programme on physical fitness of Burmese girls aged 14-17 years. M. Sc (Physiol.) Thesis, Institute of Medicine I, Rangoon.
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23. M. Mya Tu, Tin May Than, Nyunt Khin and Tha Moe (1966). Medical, anthropometric and physiological data on Burmese athletes. Union of Burma J. Life Sci., 5, 177-194.
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25. Medical, anthropometric and physiological data on Burmese athletes (1972). DMR Departmental Report, Physiol Research Division.
26. Study of food intake of Burmese athletes (1969). DMR Departmental Report, Physiol. Research Division.
27. Sex determination of female athletes (1969). DMR Departmental Report, Physiol. Research Division.
28. Study of the physical performance of the top Burmese swimmers (1971). DMR Departmental Report, Physiol. Research Division.
29. Physiological measurements of the top Burmese boxers (1981). DMR Departmental Report, Physiol. Research Division.

30. Myo Thein, Htin Kyaw, Aung Myint and M. Mya Tu (1970). Physiological assessment of two Burmese marathon runners. Union of Burma J. Life Sci., 3, 313-327.
31. Aung Myint, Myo Thein, Pe Thaung Myint and Oded Bar-Or. (1976). Effect of the anaerobic training on Burmese athletes. Paper read at 10th Burma Medical Research Conference.
32. Myo Thein, Pe Thaung Myint and Aung Myint (1976). Study of the effect of track events on anaerobic work of male athletes. Paper read at 10th Burma Medical Research Conference.

## NUTRITIONAL ANAEMIAS

### 1. Prevalence and distribution of anaemia, (iron deficiency, folate deficiency and B<sub>12</sub> deficiency)

The prevalence of anaemia in men (Hb concentration less than 12.0 Gm%) is 4% and in women is 36%; in pregnant women (Hb less than 11.0 Gm%) in 71% at 24 weeks, 42% at full-term and in children 5 to 14 years 48%. The mean haemoglobin level in man is (14.4 Gm%) and (12.5 Gm%) in non-pregnant women. (1)

#### Major determinants of nutritional anaemias

Based on serum iron and storage iron estimations, serum folate and B<sub>12</sub> levels and therapeutic trials done on large samples it has been shown that iron deficiency is the major determinant accounting for approximately 50% of the nutritional anaemias; folate deficiency is important in pregnant women, being responsible for 2% of the anaemias of pregnancy and puerperium. B<sub>12</sub> deficiency was not detected as a cause of nutritional anaemia. Protein deficiency by itself was not found to be a cause of anaemia. The prevalence and distribution of iron deficiency, folate deficiency and B<sub>12</sub> deficiency was investigated and documented (2,3,4,5,6,7,12,14).

### 2. Iron content of Burmese foods and Burmese diet and availability

Although chemically determined iron is present in apparently adequate quantities in the Burmese diet only a relatively small proportion is available and absorbed. (8,9,10,12,15).

### 3. Prophylaxis of Anaemia of pregnancy

Several controlled prophylactic trials, some of which were part of WHO collaborative projects, have demonstrated that ferrous sulphate (60mg iron-base) twice a day after meals from the 24th week of pregnancy till full term will prevent the fall of Hb to less than 10 Gm% at full term and will increase the mean Hb from 10.9 to 11.3 Gm%.

The optimum dose appears to be 120 mg/day which will bring the Hb at full term to 11 Gm%. Increasing the dose to 240mg will not increase

Hb concentration and will bring about more side-effects but will further increase the amount of storage of iron in the women. Adding 5mg of folic acid twice a day or B<sub>12</sub> does not generally increase significantly the mean Hb or significantly reduce the incidence of anaemia. (11,12,13,16)

#### 4. Prophylaxis of iron deficient anaemia in the general population

Iron deficiency being the major determinant of nutritional anaemia, methods of fortifying generally consumed Burmese food with iron were investigated.

Fortification of salt with iron pyrophosphate is neither cost-effective nor feasible nor necessary. The target population for preventive measures should be pregnant women and possibly growing children but our studies so far have not shown clear indications for the latter group. (12,16)

#### 5. Anaemia and work performance

Investigation on a limited number of subjects indicates that anaemia, unless severe with a fall of Hb by at least 2 Gm%, will not significantly affect work performance as measured by PWC 170. (17)

### Applicability

#### Planning control measures

1. The DMR surveys on the prevalence, distribution and etiology of nutritional anaemias using standardized protocols and reliable and advanced laboratory methods provide reliable and extensive basic information for the national planning of control measures for nutritional anaemias which rank as one of Burma's major nutrition problems. The data has been used by health authorities during planning of PHP-I and PHP- II and will continue to be useful as reference data base. The data has also been used by WHO for assessment of the problem of nutritional anaemias on a regional and global basis.



## 2. Diagnosis and management of anaemia of pregnancy and iron dosage

The relative frequencies of iron, folate and B<sub>12</sub> deficiency found by DMR in Burma provide a basis for rational decision pathways in the diagnosis of anaemia of pregnancy and will eliminate unnecessary and sophisticated laboratory investigations and unnecessary therapy in the management of individual cases and population groups.

The minimum and optimum doses of iron required for prophylaxis of anaemias of pregnancy in Burma gives guide-lines for dosage schemes to be used for individual patient as well as by antenatal clinic throughout Burma. The indication for adding folic acid or B<sub>12</sub> can now be properly assessed.

## 3. Estimation of quantity of iron, folic acid and B<sub>12</sub> required.

In the light of DMR findings regarding the relative frequencies of iron, folic and B<sub>12</sub> deficiency as causes of nutritional anaemia there is now sufficient information for assessing the quantity of iron, the type of iron, the quantity of folic acid and of B<sub>12</sub> which may be needed by the population and procured by health authorities and which may be produced by BPI, or imported.

The minimum and optimum doses of iron for prophylaxis of anaemia of pregnancy and the indications for routinely adding folic acid or B<sub>12</sub> can provide basic data for calculating the amount of these drugs to be procured by health authorities.

## 4. Nutritional education

Hitherto unknown information about the poor availability of iron from rice and vegetable should alter the content of the advice given by health personnel regarding dietary measure to prevent iron deficiency.

## 5. Medical education

Many of the research findings could and should be incorporated into the content of instructions on Nutritional Anaemias being given to undergraduates and postgraduates at the Institutes of Medicine

especially data on prevalence, relative frequencies of iron, folate and B<sub>12</sub> as etiological factors, and the poor availability of iron in Burmese diets such data being hitherto not available in standard textbooks written by Western authors.

The textbook on Internal Medicine written by Burmese authors and produced by the Burma Medical Association has incorporated some of the significant findings.

Some of the papers also provide valuable reference material for teachers and postgraduates.

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## GOITRE AND IODINE DEFICIENCY

### 1. Prevalence and distribution of goitre and iodine deficiency in hilly regions of Burma

Baseline surveys conducted by DMR in 1967-68, using standardized protocols, biochemical determination of iodine in the environment and various biochemical indicators of iodine nutrition including radioactive iodine measurements in samples of the population reveal the followings:-

The prevalence of Goitre in the Chin Hills, Khanti District and Kaya State were 91.1%, 51.8% and 60.1% respectively. (1).

The iodine content of the water and soil was low. Biochemical and radioactive iodine measures confirmed that the etiology of goitre was environmental iodine deficiency. (1,2).

### 2. Prophylaxis of goitre by distribution of iodized salt and its impact on goitre rates

From 1969 to 1975 DMR undertook the responsibility of supervising the iodination of salt which was to be distributed to the population of Chin State by the Trade Department. The impact of distribution of only iodized salt to the population of Northern Chin State was assessed after 3 years by DMR. Goitre rates were reduced from baseline values of 92% to 25% (3).

With the decontrol of salt distribution in 1976, non-iodized salt is also being consumed by the population of these areas and it is unlikely that the reduction of goitre rate will be as impressive as before.

### 3. Prevalence and distribution of goitre in the Irrawaddy Delta and other non-hilly regions of Burma

Surveys undertaken by DMR in the Irrawaddy Delta using clinical assessment together with biochemical and radioactive measurement reveal the followings:-

There are pockets of endemic goitre in the Delta-goitre rates being 53% in men, 78% in women, 30% in 0-5 year age-group and 93% in 6-12 year group. The iodine content of soil and water is low and biochemical tests of iodine nutrition including radioactive iodine measurements in samples of the population show that the etiology of goitre is iodine deficiency. (4)

It is probable that the poor iodine content of the soil in the vicinity of the pockets of endemic goitre is due to leaching of iodine from frequent flooding.

Surveys conducted in collaboration with the 3 Institutes of Medicine also show unexpectedly high prevalence of goitre in other non-hilly regions of Burma in 75 townships. (4)

#### 4. Oral iodized oil for prophylaxis in pockets of endemic goitre

DMR has tested the efficacy of oral iodized oil for preventing iodine deficiency. One dose of 475mg Iodine in 1 ml of oil will maintain satisfactory iodine nutrition for at least 12 months. This could be an alternative low cost method, especially for preventing occurrence of pockets of endemic goitre. (5)

### Applicability

#### 1. Planning control measures

The extensive and reliable studies on prevalence and distribution of endemic goitre in Kachin and Chin States, including biochemical and radioactive iodine tests of iodine deficiency, provide basic information for planning national control measures. The data has been utilized by health authorities in development of PHP I and II and will continue to be useful as baseline data.

The demonstration by DMR of unexpectedly high prevalence of proven iodine deficient endemic goitre in a large number of pockets in the Irrawaddy Delta and elsewhere in the lowlands adds a new dimension to the magnitude of the goitre problem. Its incidence in the densely

populated Delta indicates that a population at risk is large.

2. Efficacy of iodized salt in controlling goitre

DMR has demonstrated that the distribution of iodized salt can effectively reduce the high prevalence of endemic goitre in the hilly regions of Burma if iodized salt is the sole source of salt in the region.

Decontrol of salt distribution has diluted that impact calling for review of policy or for alternative more expensive control measure.

3. Oral iodized oil as a low cost control measure in pockets of endemic goitre

DMR findings regarding efficacy of oral iodized oil in maintaining iodine nutrition for at least 12 months indicate a possible low cost method of prevention for target groups in pockets of endemic goitre which may be considered as an alternative to iodized oil injection.

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## BERI-BERI AND THIAMINE (VITAMIN B<sub>1</sub>) DEFICIENCY

### 1. Prevalence and distribution of thiamine deficiency and thiamine intake in Burma

Surveys by DMR using standardized protocols and reliable laboratory methods reveal the followings:-

Biochemical evidence of thiamine deficiency is present in 33.9% of the men, 34.3% of women, 4.8% of children, 33.3% of pregnant women, and 37.5% of lactating mothers (1).

Thiamine intake was found to be 0.81 mg/day per person or 0.4 mg/1000 Cal. and less than WHO recommended intake of 1.2 mg/day (1).

However, clinical manifestation such as bilateral loss of ankle jerks (peripheral neuritis) and beri-beri were not seen in surveys of the general population and may be assessed as less than 1.0% (2).

### 2. Cardiac beri-beri in infants; its causes and prevention

A cluster of cases of cardiac beri-beri in infants was studied by DMR in collaboration with clinician of the Children's Hospital, Rangoon. Clinical manifestations and results of tests for thiamine deficiency were recorded, and antecedent causes were investigated.

Administration of 2 mg thiamine to lactating women at early stage of lactation daily for at least a week, improved their thiamine status as well as that of breast milk and presumably could prevent cardiac beri-beri; however, it was not possible to study the impact on incidence of cardiac beri-beri (3,4,5).

### 3. Thiamine content of Burmese foods (6,7)

Roasted pea	- 804 ug%
Pork	- 777 ug%
Various strains of rice	
Nga-Sein	- 90.1 ug%
Nga-Kywe	- 107.3 ug%
Emata	- 62.0 ug%
Meedon	- 101.1 ug%
Letywezin	- 74.8 ug%

### Applicability

#### Nutrition Planning and Nutrition Programme Delivery

1. Numerous reports on thiamine deficiencies and beri-beri form the basis for planning nutritional programme and has provided baseline information for PHP I and PHP II. The data is also important for implementing nutritional programme and for content of nutritional recipes.

#### Clinical use

The studies on cardiac beri-beri are of value for clinicians.

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HAEMOGLOBINOPATHIES, THALASSEMIAS AND GLUCOSE 6 PHOSPHATE  
DEHYDROGENASE DEFICIENCY

1. Prevalence, distribution and Gene frequency of haemoglobin  
E and Thalassemias in Burma

Extensive surveys conducted by DMR among many of the indigenous races and geographical regions reveal the followings:-

The prevalence of Hb-E trait is 21-28% in the Burmese, 22% in Shans, 22% in Mons, 10% in Kachins, 4% in Karens, and 1% Chins. The gene frequencies have also been calculated. The prevalence of  $\alpha$ -thalassemia trait is 10% in the Burmese, and  $\beta$ -thalassemia trait is 5% (1,2,3,4).

2. Clinical spectrum of haemoglobinopathies and thalassemias  
in Burma

The clinical picture of the various combinations of the thalassemia genes and the haemoglobin-E genes as seen in hospital practice in Burma were first described and documented by DMR. Beta thalassemia trait, (heterozygous), Cooley's anaemia (beta thalassemia homozygous), alpha thalassemia trait, haemoglobin-H disease, and beta thalassemia/Hb-E disease have been described. Some of these findings have now been further documented by workers from other Departments. (4,5,6,7,8).

3. The prevalence and distribution of G-6PD deficiency in Burma.

Surveys by DMR show that G-6PD deficiency trait (hemizygous) is present in 9% of the Burmese, 14% of the Karens, 8% of the Mons. Some of these findings have been corroborated by workers from other departments. (9)

4. Biochemical characteristics of the G-6PD enzyme and clinical  
manifestation of G-6PD deficiency in Burma

Biochemical analysis, enzyme assays and characterization studies at DMR demonstrate that the G-6PD enzyme in the Burmese is different from the G-6PD (beta) seen in American Negroes and appears similar

to the Canton variety with similar susceptibility to mild oxidant drugs. (9)

Clinical studies show that G-6PD deficient subjects in Burma develop severe haemolysis when exposed to mild oxidants such as sulpha, chlorophenicol, PAS, nitrofurantoin (9,10).

Cr<sup>51</sup> labelled cross-transfusion experiments show that 40% of red cells of G-6PD deficient Burmese subjects are lyzed when given a standard regime of Primaquine for radical cure of *P. vivax* malaria (11).

### Applicability

#### 1. Planning

The hemoglobinopathies, thalassemias and G-6PD deficiencies are the most common congenital abnormalities of health significance in Burma. DMR findings provide extensive and reliable basis for assessment of the magnitude and severity of the problem in terms of national health priorities. DMR data has been used by health authorities during planning of PHP 1 and 11 and will continue to serve as valuable basic data.

#### 2. Clinical management of thalassemias and hemoglobinopathies

The spectrum of clinical manifestation and their relative frequencies as documented by DMR provides valuable framework for diagnosis and investigation of thalassemias and haemoglobinopathies. The gene frequencies provide a basis for proper genetic counselling.

#### 3. Diagnosis and prevention of drug-induced haemolysis

The characteristics of the G-6PD enzyme variety in the Burmese and its susceptibility even to mild oxidant drugs as documented by DMR will help in the diagnosis and prevention of drug-induced haemolysis.

The severe haemolysis in Burmese G-6PD deficient subjects after

standard primaquine dosage for radical cure of P. vivax malaria alerts doctors and malaria personnel to the potential dangers of its use in individual cases as well as on a community scale.

#### 4. Medical education

The information on Burma provided by DMR is not available in Western textbooks and is more relevant to students.

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## M A L A R I A

### 1. Drug Resistant Malaria

Scientists from DMR provided the first scientific proof of the occurrence of chloroquine resistance in Burma in 1969 (1,2). Further studies organised and headed by DMR gave base-line information on susceptibility or resistance to other drugs (2,3) regimes. The chloroquine resistant P. falciparum is resistant to the following drug regimes;

- |   |   |
|---|---|
| (a) Sulphamethoxy Pyridazine 1g   | - single dose                                       |
| (b) Pyrimethamine 50 mg   | - single dose                                       |
| (c) Pyrimethamine 6.5 mg  | - twice a day plus Dapsone<br>100 mg for one day    |
| (d) Pyrimethamine 50 mg   | - plus Sulphamethoxy pyridazine<br>1g - single dose |
| (e) Trimethoprin 80 mg plus<br>Sulphamethoxazole (400 mg tablet)<br>2 tablets | - twice a day for 1 day.                            |

The chloroquine resistant P. falciparum is sensitive to the followings: (4)

- |  |                           |
|--|---------------------------|
| (a) Pyrimethamine 50 mg plus<br>Sulphadoxine 1g (Fansidar) | - single dose             |
| (b) Trimethoprin 500 mg plus<br>Sulphalene 750 mg          | - single dose             |
| (c) Pyrimethamine 12.5 mg plus<br>dapsone 100 mg           | - once a week for 4 weeks |
| (d) Quinine sulphate 0.6 g<br>tablets for 10 days          | - 3 times a day           |

DMR and scientists from the Defence Services have done pharmacokinetic studies of sulpha demonstrating that most cases of Fansidar resistance reported previously by others in Burma are true drug resistance and that some are drug failure due to rapid plasma clearance (5,6).

DMR is supporting and co-ordinating trials of various drug combination against resistant malaria (7,8).

DMR has also helped WHO in testing of in vitro micro test system for chloroquine resistance (9,10).

2. Trials of traditional remedies against malaria

Controlled clinical trials of several traditional drugs against malaria failed to demonstrate efficacy in clearing parasitemia (11).

3. Search for Artemesia annua and trial of local species of Artemesia

A search for Artemesia annua, the source of the Chinese antimalarial drug Quinghausu, was carried out by DMR scientists but was not found in the areas accessible to them. Local species of the Artemesia genus were tested for antimalarial effect in the Mouse - P. berghei model but no reduction of parasitemia or mortality was observed (11,12,13).

4. Primaquine induced haemolysis in G-6PD deficiency

Cr<sup>51</sup> labelled cross-transfusion of red cells have shown that Burmese G-6PD deficient subjects lyse 40% of their red cells when given standard dose of primaquine for cure of *P. vivax* malaria (14).

5. Taxonomy of Anopheles Species

Using morphological features as well as cross fertilization experiment, it was shown that the so-called variant of A. balabacensis breeding in wells in Moulmein and in forests in Taikkyi were of the same species but may belong to different subspecies. They were identified as A. dirus and not *Anopheles balabacensis* (unpublished observation).

Applicability

1. DMR first report in 1969 of the occurrence of chloroquine resistant malaria was of extreme importance and timely in alerting health authorities in Burma and WHO of this health hazard.

Subsequent stimulation, coordinating and support by DMR and work by other departments has now provided substantial information about the distribution of drug resistance in Burma and its resistance, susceptibility to various drug combinations, and has enabled this important factor to be taken into consideration in treatment and in the control of malaria.

2. Information on drug-induced haemolysis in G-6PD deficiency and the prevalence of G-6PD deficiency in various ethnic groups reported by DMR is an important factor in treatment and control of malaria with drugs.
3. The demonstration that some traditional medicines used for malaria are not effective is worthy of note.
4. The discovery of the existence of Artemesia in Burma would be of great help and economic significance equal to that of finding Cinchona.

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## VIRAL HEPATITIS AND CHRONIC LIVER DISEASES

### VIRAL HEPATITIS

#### 1. Prevalence, distribution and epidemiology of Hepatitis A.

DMR has conducted extensive hospital, and field surveys of viral hepatitis.

Hepatitis caused by Hepatitis A virus (HAV) has been fully described clinically and epidemiologically. Methods for the identification of HAV using radioimmunoassay are well established at DMR (1,2).

The prevalence of HAV in the population is 98 per cent. (2).

#### 2. Prevalence, distribution and epidemiology of Hepatitis B.

Viral hepatitis caused by Hepatitis B virus (HBV) as seen in Burma has been described clinically and the prevalence and distribution of HBsAg and antibodies in the population stratified according to age, sex, urban/rural residence has been described. Methods for the detection of HBV marker including HBsAg, anti-HBc, HBc and their antibodies using radioimmunoassay are well established at DMR (2). The prevalence of HBV in the population is 60 per cent (2).

#### 3. Non-A, Non-B hepatitis (NANB)

Using epidemiological and virological methods (by serological exclusion of HAV & HBV) DMR has now demonstrated that the epidemic of viral hepatitis in Mandalay in 1977 (3) and the 1982-83 epidemic of viral hepatitis in Rangoon are mainly due to NANB hepatitis virus. The epidemiological feature differs markedly from HAV and HBV, older age groups being more susceptible. The clinical features are similar but the outcome is different in that pregnant women have a high mortality (4). The prevalence of NANB in patients with viral hepatitis in hospital is 75.6 per cent (4).

#### 4. Mode of transmission of HBV and NANB

DMR has demonstrated that perinatal transmission of HBV takes

place in Burma (5).

13% of blood transfusion results in transmission of viral hepatitis with persistent abnormality of liver function. HBV and NANB are responsible for 26% and 18.7% of the viral hepatitis caused by transfusion (6).

It has been demonstrated that transmission of NANB hepatitis in Rangoon (1982-83) is not significantly through the parenteral route by syringes and injection but that there is intrafamily transmission probably by close person-to-person contact (4).

#### CHRONIC LIVER DISEASES

##### 5. Chronic hepatitis, Cirrhosis liver and Cancer of liver

The clinical feature, and histopathology of cirrhosis of the liver seen in Rangoon has been fully described (7,8,9).

The presence of aflatoxin, a possible etiological agent for chronic liver disease in various Burmese food-stuffs have been reported, being present in significant quantities in dried chillies, etc (10).

Clinical picture of Primary hepatoma in Rangoon has been described. Methods for the detection of alphafetoprotein are established at DMR (11,12,13).

#### Applicability

1. The magnitude of the problem of HAV and HBV, their relative frequencies in different age groups and in urban and rural populations, the level and persistence of HBS-antigen in the population and the percentage of carriers as shown by the extensive studies of DMR have revealed the public health importance of the problem and enabled national control measures to be undertaken.
2. The evidence for the perinatal transmission of HBV has now focussed attention on this age group for special control measures which will have long-term impact.

3. The HBs-antigen-carrier rate, the 4% rate of transmission of viral hepatitis by blood transfusion and the high incidence of chronic hepatitis in these patients has shown the magnitude of the danger of transfusion-caused hepatitis. DMR has established methods for the detection of HBs-antigen and has helped screen blood for HBsAg before transfusion in large hospitals in Rangoon.
4. The existence in Burma of a previously unrecognized viral agent(s) causing NANB hepatitis which has a different epidemiological pattern, different mode of transmission and higher mortality in pregnant women has been clearly shown by DMR and has enabled rational and timely control measures to be undertaken. Public health measures with new emphasis on person-to-person transmission and focussed on pregnant women are now being undertaken.
5. The clinical and histopathological picture of chronic hepatitis, cirrhosis and cancer liver seen in Burma as documented by DMR would be of help in diagnosis and management of these cases.
6. The major role played by viral hepatitis rather than nutritional deficiencies in the etiology of chronic liver disease in Burma has been confirmed by DMR and directed attention to viral infectious agents rather than on nutritional factors for prevention of chronic liver diseases.

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## DENGUE HAEMORRHAGIC FEVER

### 1. Dengue Haemorrhagic Fever - diagnostic methods

Department of Medical Research established the mosquito inoculation method of dengue virus isolation for the first time in Burma. Further modifications using the intracerebral route now enable virus isolation to be done within 5 days. Using tissue culture it is now possible for Department of Medical Research to supply large quantities of dengue 1 antigen for routine diagnostic laboratories, if requested (2,3).

### 2. Common Dengue Virus Serotypes in Burma

It has been shown that Dengue 2 is the commonest dengue virus serotypes circulating in the community in Rangoon. (1)

### 3. Transovarian transmission of Dengue Virus in nature

Department of Medical Research has demonstrated that transovarian transmission of dengue virus occurs in Aedes aegypti in nature. This is the first report in the scientific literature (4).

### 4. The ecology of Aedes aegypti

Extensive studies of the ecology of Aedes aegypti, its seasonal density, biting habits, and the length of its larval stages have been studied in detail (5).

### 5. The use of dragonfly nymphs in control of Aedes aegypti

DMR tested the use of dragonfly nymphs in the control of Aedes aegypti and found it to be effective (6).

## Applicability

1. The rapid diagnostic methods including mosquito-inoculation methods are now in practical use in Burma, and Department of Medical Research gives service to the Rangoon Children Hospital in cases requiring virus isolation.

2. Bionomics of *Aedes aegypti* as studied by Department of Medical Research together with other data collected by the Department of Health provides the basis for control measures.
3. The first report by Department of Medical Research of transovarian transmission of dengue virus in nature is of scientific importance regarding the survival of dengue viruses and has implications for long-term control measures.

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## LEPTOSPIROSIS

### Clinical description and Laboratory confirmation of Leptospirosis

While leptospirosis has been previously and clinically suspected, DMR scientists first clearly demonstrated significant leptospiral antibodies in jaundice patients and showed that leptospiral antibodies were widespread in the population (1,2,3,).

DHS in collaboration with DMR scientists were able to isolate leptospira from patients and described the clinical pattern of leptospirosis seen in Rangoon. The importance of involvement of 2-3 organ-systems was demonstrated (4).

### Applicability

DMR has given early notice of the importance of leptospirosis as a cause of jaundice in Burma and has provided an in-depth clinical picture of leptospirosis in clinical practice.

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## LEPROSY

### Dapsone Resistant Leprosy

Using the mouse-foot-pad technique, DMR has collaborated with DHS in detecting the existence of Dapsone resistance in *M. Leprae* in Burma and has described its epidemiology (1).

### Applicability

The demonstration of Dapsone resistance has modified the strategy of Leprosy control in Burma.

### References

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## ACUTE DIARRHOEA

### 1. Epidemiology

The seasonality of acute diarrhoea, its incidence according to age groups in urban/rural children and relationship to environmental factors have been extensively studied by DMR (1,2). Acute diarrhoea in children is highest during the rainy season, being approximately 2.4 (urban) and 6.6 (rural) episodes per child per year, and is less during the cold and dry seasons. The highest prevalence is among children under two years. The prevalence is higher also in rural children. In semiurban areas (North Okkalapa), acute diarrhoea is directly associated with low income and crowding.

### 2. Aetiologic agents responsible for acute diarrhoea in children

Using advanced methods, the relative role of V. cholerae, ETEC (LT & ST), EPEC, EIEC, Salmonella species, Shigella species, Campylobacter, intestinal parasites and rotavirus in the aetiology of acute diarrhoea in children have been extensively studied by DMR in hospital populations (3), urban communities (4) and rural communities (2) in different seasons in Burma.

The major bacterial agents were Enterotoxigenic E. coli during the wet season and rotavirus and ETEC in the cold season. V. cholerae, Salmonella, Shigella, EPEC, Campylobacter, Yersinia and intestinal parasites played minor and unimportant roles in endemic diarrhoeas (5). In neonatal gastroenteritis in hospital, the major pathogens are EPEC, ETEC and rotavirus (6,7).

This is the first time that these aetiologic studies of acute diarrhoea covering a whole range of bacterial, viral and parasitological agents have been completely studied in Burma using the latest and reliable methods including routine methods as well as ELISA, toxin assays, electronmicroscopy and immune electronmicroscopy, etc.

### 3. Antibiotic resistance of enteric bacteria and Shigella

Resistance of E. coli from acute diarrhoea patients to various antibiotics have been tested by DMR (4,5,8,9).

	<u>E. coli</u>	<u>Shigella</u>
Tetracycline resistance	48 %	37 %
Chlorophenicol resistance	37 %	26 %
Kanamycin	-	-
Sulpha drugs	57 %	88 %

### 4. Clinical trials of ORS, therapeutic agents and diet for acute diarrhoea

4.1 The ability of village mothers to prepare ORS using household measures, and the acceptability and efficacy of ORS when given village mothers have been studied and found satisfactory (9).  
The danger of storing ORS solution prepared with well water for more than 24 hours had been demonstrated (10).

4.2 Alternative formulae to substitute for ORS: the use of sucrose has been confirmed to be efficacious (11,12). Incomplete formulae such as salt and sugar, salt and jaggery, have also been studied (13).

4.3 Various feeding regimes for use during acute diarrhoea have been studied. Continuation of breast feeding and boiled rice during diarrhoea do not have a deleterious effect on acute diarrhoea in children. They prevent dehydration and promote nutrition (14).

### 5. Development of methods for identification and rapid diagnosis

The Biken test (ELEK test) etc., various tests for E. coli have been established and their usefulness compared by DMR (15).

### Applicability

#### 1. Clinical management and control

The relative frequencies of various aetiologic agents as a cause

of acute diarrhoea in hospital and urban and rural communities according to age and season have been reliably documented for the first time. The relatively low frequency of V. cholera (when endemic) and the high (about 30%) frequency of ETEC and rotavirus shown by DMR is of importance for clinical management and control measures.

The antibiotic resistance pattern showing high frequency of resistance to tetracycline by ETEC and to tetracycline and sulpha drugs by Shigella is of therapeutic importance.

2. The concentration of electrolytes in ORS prepared by village mothers dissolving one packet of ORALYTE in three condensed milk tinsfuls of water are comparable to those prepared in the laboratory.

The demonstration of acceptability and efficacy of ORS when given by village mothers is of use in planning and implementing primary health care of moderately severe diarrhoea.

Well water contains high counts of coliforms and faecal coliforms so that ORS prepared with unboiled water should be used immediately and ORS prepared with boiled water should be used within 24 hours. The messages should be given in health education and during primary health care measures.

DMR confirmation that relatively available household sugar and jaggery may be substituted for expensive glucose in ORS is of practical and economic value in the treatment of diarrhoea at home.

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## CHRONIC DIARRHOEA AND MISCELLANEOUS GASTROINTESTINAL DISORDERS

### 1. The prevalence of subclinical malabsorption and intestinal villi abnormality

The prevalence of subclinical malabsorption (1,2), and of abnormal leaf-like villi in the Burmese population, their interrelationship and their relationship to intestinal infection have been studied for the first time by DMR (3).

### 2. Lactose intolerance in the Burmese

DMR has shown that more than 90 per cent of Burmese adults have lactose deficiency, and do not tolerate 50 Gramms of lactose (8 oz. of milk). (4)

### 3. The aetiology of chronic diarrhoea

DMR in collaboration with DME has shown definitely the aetiology of chronic diarrhoea in hospital practice:-

50 per cent are due to intestinal tuberculosis, and 20 per cent are due to tropical sprue (5)

DMR has shown for the first time that capillariasis exists in Burma and is a possible cause of some cases of chronic diarrhoea and malabsorption (unpublished observation).

### Applicability

1. The teaching of physiology: DMR studies give a better description of Burmese intestinal structure and function, and should reinforce descriptions based on Western literature alone.
2. Clinical management of diarrhoea: The studies on lactose tolerance and chronic diarrhoea will guide clinicians in their management of these cases.

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- absorption test as an index of intestinal absorption in the tropical region. Clin. Chim. Acta., 32, 141-146.
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## ASCARIASIS AND OTHER INTESTINAL HELMINTHS

### 1. Prevalence and health impact of intestinal helminths

The prevalence of intestinal helminths in Burma, using hospital data as well as results of several ad-hoc studies were compiled and the possible health impact was assessed by a Technical Committee appointed by the Burma Medical Research Council in 1968 (1). The importance of Ascariasis in the pathogenesis of bile-duct stone was reported (5,6).

### 2. Epidemiology of ascariasis

The prevalence, intensity and distribution of Ascaris infection according to age, rural versus urban residence region and several socio-economic factors including presence of latrines in households was studied by DMR among rural and semi-urban communities. The highest prevalence was among children aged 5 to 9 years being approximately 90 per cent. No association was demonstrable between prevalence and presence of latrines. The prevalence was highest in the low wet region and least in the dry zone of Burma (2).

### 3. The Dynamics of Ascaris infection

The dynamics of ascaris infection in a village community was studied and basic parasitological parameter including the basic reproductive age ( $R_0$ ) was calculated. The  $R_0$  was found to be 1.7 for the community as a whole and 2.1 for children under 10 years old (10).

### 4. Effect of various control measures including mass chemotherapy

This was studied in a series of field trials. It was found that pretreatment prevalence was regained in 4 months after a single mass chemotherapy (3,4).

A computerized mathematical model of the effect of different levels of coverage of mass chemotherapy with drugs of various efficacy was constructed and used to predict the effect on prevalence and



reinfection rates (10).

#### 5. Epidemiology of hookworm

This has been studied in several community and the relationship of hookworm infection and the prevalence of iron deficiency was investigated. Hookworm infection is highest in low wet region and absent in the Dry Zone. No relation between the prevalence and iron deficiency anaemia in the community was demonstrated (1,7).

#### 6. Development and trial of anthelmintics including indigenous remedies

Many indigenous herbs including Quiquialis Indica, Carica Papaya and Pine-apple were tested. Pine-apple showed significant promising results (8,9).

In vitro and in vivo test systems for anthelmintics action including biochemical screening method have been developed and are in use at DMR.

#### Applicability

1. DMR studies on the epidemiology of intestinal helminths and especially the comprehensive epidemiological studies on Ascaris provide valuable base-line data for planning of health measures and have been used for PHP I and II.
2. The definitive studies on dynamics of transmission and computer model prediction on the effect of mass chemotherapy may be made use of in implementing control measures in village.
3. The poor correlation between ascaris prevalence and construction of latrine is noteworthy.
4. The assessment of the efficacy of reputed local remedies is of importance for control and for health education. Pine-apple may be a possible low efficacy locally available anthelmintics but needs further studies.

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## SNAKE BITE

### 1. Development of Toxoid

- DMR has developed a toxoid (venoid) of Russell Viper Venom and has demonstrated its efficacy and safety in experimental animals (1,2) and in human subjects (3). It will protect animals against 2-4 times the lethal dose of venom and induces satisfactory level of anti-toxins for 6 months in human subjects which is equivalent to levels attained by monkeys which withstood lethal doses of venom.

### 2. Identification of specific viper venom in blood

DMR has developed an ELISA technique (4) for identification of viper venom in blood and urine which can differentiate it from venoms of Cobra, Krait, etc. (5).

### 3. Detection of venom levels in human viper victims

The venom level in viper victims before and after antivenom (7,8) has been determined indicating the neutralizing ability of antivenom when given under various circumstances.

### 4. Epidemiology of snake-bite in Burma

The epidemiology of snake-bite has been determined (6). Many similar studies were also done by workers in other departments.

## Applicability

- DMR viper toxoid when produced on a large scale and given to cultivators and other high risk groups prior to viper bite season will reduce the degree of envenomation to non-lethal levels in the average patients.
- DMR determination of viper venom levels before/after antivenom is important in the reassessment of antivenom dose required in snake bite victims and for judging the efficacy of antivenom under field conditions.

3. The factors associated with high risk of snake bite as reported in a study from DMR and by many other workers have made possible the planning of preventive and control measures.
4. New and advanced diagnostic tests detecting venom and antivenom established at DMR are available for demonstration and for special studies.

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## INDIGENOUS MEDICINE

### 1. Screening of Indigenous Drugs

DMR had screened (45) indigenous medicinal plants during period between 1963 to 1977 (1,2,3,4,5,6,7,8).

### 2. Clinical trials

Traditional drugs made available to DMR by responsible person from DHS (indigenous drug) were tested in properly designed controlled clinical trials for efficacy as claimed.

### 3. (a) For malaria

Two indigenous drugs, item No.6 and 25, administered orally to patients at the Indigenous Medicine Hospital in Mandalay, was found unsatisfactory (9).

### (b) For acute attack of bronchial asthma

Relief of bronchospasm during acute asthmatic attack by the indigenous drugs were investigated using air flowmeter.

Concurrent studies were carried out on classical drugs namely epinephrine and aminophyllin. The indigenous drugs tested did not produce any significant bronchodilator effect (10).

### (c) For expelling roundworms

Pineapple fruit-----Ripe pineapple fruit had a very significant round-worm expelling effect, indicating a satisfactory practical application in controlling the intestinal ascariasis mentioned (11).

### 4. Compilation of monograph on Burmese Indigenous Medicinal Plants

1. with reputed hypoglycemic action
2. with reputed hypotensive & hypertensive action
3. with reputed anthelmethic action
4. with reputed anti-inflammatory, anti-rheumatic and anti-arthritic action (4,12,13,14).

### Applicability

1. Out of (45) indigenous medicinal plants, two plants showed evidences of therapeutic values after undergoing clinical trials. They are Euphorbia Geniculata as purgative and Coptis teeta as agents against amoebiasis and vaginal trichomoniasis.
2. Out of the many drugs tested, pineapple showed promising result as a useful anthelmintic drug.
3. The monographs produced by DMR will be of great use to Biochemist, Pharmacologist, Pharmacist and Industry Personnels engaged in research studies and production of indigenous drugs as well as to indegenous medical practitioners.

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