100 years of Biomedical research in Sarawak

Datu Dr Andrew Kiyu
(Consultant Epidemiologist, Sarawak Health Department)
Partly based on work done with
Dr Goh Pik Pin [1] and Dr Kirubashni a/p Mohan [2]

Presented at Sarawak Development Institute, Kuching.
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[1. Director, National Clinical Research Centre, Ministry of Health, Malaysia]
[2. Medical Officer, Clinical Epidemiology Unit, National Clinical Research Centre, Ministry of Health, Malaysia]
Objective of presentation

- To show a mosaic of the
  - topics of biomedical research carried out in Sarawak over the past 150 years,

- To give us a glimpse of the
  - determinants of health,
  - health and disease conditions, and
  - health status, and
    - how they have changed over the past 150 years or so.
Time span: 1915-2015

Topics scope: wide; 12 themes and subthemes

- CRC
- Plants, Esoterica;
- Cardiovascular diseases;
- Cancers;
- Parasitic infections;
- Bacterial infections;
- Viral infections;
- Environmental health;
- Nutrition health;
- Indigenous health;
- Health care delivery system;

Depth: shallow
Borneo Biomedical Bibliography

Third edition, 2009

A. Baer, Department of Zoology, Oregon State University, Corvallis OR 97331, USA
Borneo Biomedical Bibliography 1996-2009

- Originally published by A. Baer and G.N. Appell in the Borneo Research Bulletin 27:77-89, **1996**.
  - had **173** references.
- 2\textsuperscript{nd} Edition (**2000**) bibliography for the Institute of East Asian Studies, UNIMAS, Sarawak.
  - contains more than **330** references.
- 3\textsuperscript{rd} Edition (**2009**) Borneo Biomedical Bibliography
  - Contains **1079** references

The selected reports provide an overview of the health status of ethnic Bornean groups. Yet a coherent picture is elusive, since the studies were done at different times and places with disparate aims. No single report provides a thorough health survey of any particular group, one in which all ages were surveyed.

Moreover, even for so dire a disease as malaria,

- little longitudinal information is available,
- despite the fact that 70% of reported malarial cases in Malaysia in 1990 were from Sabah (Lim, 1992).
- an early malarial survey of Sarawak and Brunei (de Zulueta, 1956) provides reliable information only
  - on age 2-9 yrs.
  - at single time points in various areas,
  - despite known seasonal and annual variation in malarial parasitemia.
- Recent malarial reports have not built systematically on this 1956 survey base.

Some longstanding health problems in Borneo include

- Malnutrition - childhood and adult,
- filariasis,
- intestinal parasites,
- malaria, and
- some microbial infections.

Some longstanding health problems in Borneo

**Tetanus neonatorum** (tremendous improvement)

- Schwenk (1975) reported that the Iban once had “one of the highest incidences in the world of tetanus neonatorum,” or newborn lockjaw;
  - this resulted from cutting the umbilical cord with an unsterilised bamboo splinters (slivers), and
  - controlling bleeding of the cord with kitchen-fire ashes,
- but the administration of anti-tetanus toxoid (ATT) now to antenatal mothers
  - has reduced this form of tetanus to a very low level, at least in Sarawak (A. Kiyu, Personal communication)

**Sources:**
Example of kitchen-fire ashes that were applied to umbilical cords of newborns

Sina Rang Lemulun Homestay, Bario Asal, Kelabit Highlands, Sarawak
https://media-cdn.tripadvisor.com/media/photo-s/08/85/76/c7/sinah-rang-lemulun-homestay.jpg
Conditions on which little has been published include

- complications associated with pregnancy or childbirth (that is, female reproductive health),
- geriatrics,
- childhood communicable diseases,
- dental problems,
- venereal diseases and
- genetic disorders, to name a few.

- With notable exceptions, health-oriented demography has also been neglected ...

- **Source:** A. Baer. Borneo Biomedical Bibliography, 3rd ed. 2009.
Borneo Biomedical Bibliography:  
*Introduction to 2*nd ed. 2000*

- Borneo ethnic groups received vastly different amounts of attention in biological or biomedical journals
  - Kayan/Kenyah – only biomedical reports on them are on nutrition and malaria
  - Ibans – have at least 8 biomedical topics

**Source:** A. Baer. Borneo Biomedical Bibliography, 3rd ed. 2009.
• “Much of human life has changed radically over the past few centuries in Borneo and elsewhere ...
• Those changes have been lost to human memory or is now vanishing during our lifetimes
• Fuller information on people, their environments and cultures, and all other basic elements of existence and experience
  • can only help enrich our understanding of human life, now and into the future
• The goal of biomedical research is to foresee (the) myriad of problems and inform our fellow human beings as to possible ways to solve them”

• Source: A. Baer. Borneo Biomedical Bibliography, 3rd ed. 2009.
Major studies on Iban, Bidayuh, Melanau, Malays, etc during the British colonial period
Socioanthropology and ethnographic research excluded in this presentation


- The **Land Dayaks** of Sarawak. William W Geddes. London: Her Majesty’s Stationery Office, **1954**


- Report on the **Iban**. Derek JD Freeman. Athlone Press, LSE Monographs on Anthropology 41, **1955** (317 pp.)

- **World Within: a Borneo story**. Tom Harrisson. London Cresset Press, **1959**

- The **Malays** of South-West Sarawak before Malaysia: a socio-ecological survey. Tom Harrisson. London: Macmillan, **1970**
100 years of biomedical research in Sarawak – a compilation
The publications (in the compilation) were grouped into eleven themes namely:

1. Health care system delivery,
2. Indigenous health,
3. Nutrition and iodine deficiency disorders,
4. Environmental health,
5. Virus infections (with 5 sub-themes)
6. Bacteria infections (with 4 sub-themes)
7. Parasitic infections (with 2 sub-themes),
8. Cancer,
9. Cardiovascular research,
10. Esoterica
11. Plants

Note: only those with Abstracts were included in the compilation.
Number of publications (in the compilation) by 10-year-intervals

**Japanese Occupation** 1941-1945

**British Colony** 1946-22.7.1963

Sarawak Independence 22.7 – 16.9.1963

University Malaya Medical Faculty 1964

Federation of Malaysia 16.9.1963

CRC 2004

UNIMAS 1995

**Brooke Rajah** 1841-1946

1915-1925

1926-1935

1936-1945

1946-1955

1956-1965

1966-1975

1976-1985

1986-1995

1996-2005

2006-2015

**HC** = Health care delivery system; **IH** = Indigenous health; **NH** = Nutrition health; **EH** = Environmental health; **VS** = viruses; **BI** = Bacterial infections; **PI** = parasitic infections; **MI** = Malaria infections; **CA** = Cancers; **CV** = Cardiovascular diseases; **ES** = Esoterica; **PL** = Plants
Number of publications (in the compilation) by major research topics

HC = Health care delivery system; IH = Indigenous health; NH = Nutrition health; EH = Environmental health; VS = viruses; BI = Bacterial infections; PI = parasitic infections; MI = Malaria infections; CA = Cancers; CV = Cardiovascular diseases; ES = Esoterica; PL = Plants
100 years ago
somewhere along
Sarawak River
Kuching and Sarawak River as it might have been in 1915

Source: http://ssoonz.com/history/
Borneo Company Limited, formed in 1856, is one of the oldest companies based in Sarawak and Sabah.
Borneo Company Limited

- Founded on 8 May **1856** in London
- To exploit the business opportunities in Sarawak

- The **Borneo Company offices** in Kuching were on the spot near the Tua Pek Kong temple now occupied by the **Hilton hotel**.

- The manager's house, 'Aneberg', was on the hill above.

The company merged with the Inchcape Group in 1967

I wished to find the main reservoir of intestinal parasitism; I set to work to test 100 Malays living on the banks of the Sarawak River in their usual fashion, in palm leaf houses on high piles on the edge of the river. Most people are probably now aware that Malays let all their sewage run into their river. They squat for defaecation in it, and drink from near the same spot, trusting to the current and tide for cleansing. They love their river, are always bathing, swimming, boating, drinking, or fishing in it. To the casual observer they appear as a happy, clean family sporting beneath their coconut palms and fruit trees. ...
One of our Malays manages to struggle through his work as boatman and carpenter with

- filaria in his blood,
- amoebae,
- ankylostoma,
- round-worms and
- whipworm in his alimentary canal, having
- already become immune to malaria, which is found more frequently in the young.

With no small effort, and by
- sending this man and a laboratory assistant up and down the river,
- we managed to get good specimens of faeces in Petri dishes, carefully labelled,
- from 100 Malays—men, women, and children—in the order in which they offered, without any reference to present or past illnesses.
- The women were somewhat shy, and are therefore in the minority.

## Results

<table>
<thead>
<tr>
<th>Organism</th>
<th>% of samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amoeba histolytica:</td>
<td>59</td>
</tr>
<tr>
<td>Ankylostoma duodenale (or americanum):</td>
<td>59</td>
</tr>
<tr>
<td>Monads (Trichomonas, 63%, Cercomonas, 3%):</td>
<td>66</td>
</tr>
<tr>
<td>Round-worm (Ascaris lumbricoides):</td>
<td>79</td>
</tr>
<tr>
<td>Whipworm (Trichuris trichiura):</td>
<td>84</td>
</tr>
</tbody>
</table>

- Each person had several sorts at once—in fact, in 17 per cent, five were observed on the same slide, namely, ankylostoma, amoeba, monads, roundworm and whipworm.
- The figures are well under the mark, for in twenty cases which were previously negative, where we got a second specimen, we found amoeba in 50 per cent.

Results

• Those Malays who came to Sejijak Hospital afterwards for medicine,
  • did not complain of any symptoms,
  • but some looked pale and thin,
  • while others, who appeared normal, were not up to a fighting or athletic standard of vigour.

• On inquiry among 83 whom we were able to meet
  • Among those positive for amoeba:
    • 34 could remember having had dysentery,
    • 26 could not
  • Among those negative for amoeba
    • 10 had had dysentery, and
    • 13 had not.

• vast majority of cases is asymptomatic
• the carrier is unaware they are infected.
• ≈ 10% causes disease.
• Infections can last for years
  • asymptomatic,
  • vague gastrointestinal distress,
  • dysentery (with blood and mucus).
• Most infections occur in the digestive tract
• other tissues may be invaded.
• Complications include
  • ulcerative and abscess pain and, rarely,
  • intestinal blockage.

http://media.eol.org/content/2011/10/06/00/42788_orig.jpg
Transmission of amoebiasis

Amebiasis is transmitted by

• fecal contamination of drinking water and foods,
  but also by
• direct contact with dirty hands or objects,
  as well as by
• sexual contact.
HEALTH CARE DELIVERY SYSTEM
Selected Publications in Health Care System Delivery

• **A Primary Health Care Project in Sarawak**

• **Thirty Years of Village Health Promoter Programme in Sarawak: Promoting Health in the Community**
  • Abdulhan Bin Mohamed. International Journal of Public Health Research Special Issue 2011 (Symposium), page 21

• **A study of patients admitted to Miri Hospital, Sarawak, by airborne medical evacuation.**
Health Care Delivery System:

Village Health Promoter Programme
## 35 years of Village Health Promoter Programme

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981</td>
<td>The Village Health Promoter Project was formulated and Tested as a pilot project in Tebakang in 1981</td>
</tr>
<tr>
<td>1983</td>
<td>Inaugurated as the VHP Programme</td>
</tr>
<tr>
<td>1985-1986</td>
<td>A major assessment and review of the programme was undertaken by the Institute for Medical Research and from which the 1987 VHP manual was produced.</td>
</tr>
<tr>
<td>1999/2000</td>
<td>The second evaluation conducted to assess the long-term impact of the programme on the health status of the communities involved</td>
</tr>
</tbody>
</table>
Village Health Promoters (VHPs)

These VHP from Bario have completed their training and are ready to go home to serve their communities.
A VHP attending to a patient
Health Care Delivery System:

Flying Doctor Service and MedEvac
FLYING DOCTOR SERVICE

An FDS clinic at a remote location.  FDS doing a medical evacuation of the seriously ill and other emergency cases.

FDS – introduced as a pilot project in Sept. 1973;
permanent service in May 1975
Source: Sarawak Medical and Health Department Annual Report 1975
Top five causes for MEDEVAC in 1986:

- Bronchopneumonia
- Accidental falls
- Gastroenteritis
- Peptic ulcers
- Appendicitis

7.8% of MEDEVAC patients died in hospital

63.6% of MEDEVAC were considered justified (based on pre-set criteria)

INDIGENOUS HEALTH
The availability of some household items among Penan households in the Lio Mato area

Semi-nomadic Penan with their utensils.
Paul CY Chen (2016). The Penan: Forest nomads of Sarawak in transition. p60
### Availability of 159 household items among Penans in Lio Mato area 1986

<table>
<thead>
<tr>
<th>Purpose of item</th>
<th>Items</th>
<th>% of households having at least one item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hunting</td>
<td>blowpipe</td>
<td>89.3</td>
</tr>
<tr>
<td></td>
<td>shotgun</td>
<td>31.7</td>
</tr>
<tr>
<td></td>
<td>Blowpipe or shotgun or both</td>
<td>95.0</td>
</tr>
<tr>
<td>Farming, gardening and cutting</td>
<td>Parang, axe, chainsaw</td>
<td>Parang 95.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Axe 90.0</td>
</tr>
<tr>
<td></td>
<td>parang bengkok, hoe, spade</td>
<td>15.0</td>
</tr>
<tr>
<td>Carrying, boiling and storing boiled water</td>
<td>Pail, kettle and water container</td>
<td>Pail: 58.5; Kettle: 62.1; Water container: 31.4</td>
</tr>
<tr>
<td>Cooking</td>
<td>Pot, kuali, ladle</td>
<td>Cooking pot: 1.6 per household; Kuali: 70.4; ladle: 76.6</td>
</tr>
<tr>
<td>Drinking and eating</td>
<td>Plate, cup, spoon</td>
<td>Plate: 83; cups: 46.5; Spoon: 67.3</td>
</tr>
<tr>
<td>Lighting</td>
<td>Damar, pelita, kerosene lamp, lighter</td>
<td>Damar: 61; pelita: 15.1</td>
</tr>
<tr>
<td>Disease prevention</td>
<td>Mosquito net, toothbrush</td>
<td>Mosquito Nets 32.7; 0.1 toothbrush per person</td>
</tr>
<tr>
<td>Telling time and getting outside news</td>
<td>Watch and radio</td>
<td>Watch: 35;2; Radio: 11.3</td>
</tr>
</tbody>
</table>
NUTRITION AND IODINE DEFICIENCY DISORDERS (IDD)
NUTRITION AND IODINE DEFICIENCY DISORDERS (IDD)

Nutrition studies by Dr AJU Anderson 1970s
Reports on nutrition research among Ibans by Dr AJU Anderson

- Food consumption of the Lemanak River Iban
- Nutrition of Iban children of the Lemanak River
- Nutrition of Iban children of the middle Mukah River
- Nutrition of Iban children of the Sut and Mujong Rivers (Kapit)
- Nutrition of Iban primary school children of Lubok Antu District
Reports on nutrition research among Kayan/Kenyah, Malay, Melanau and Penan by Dr AJU Anderson


• Nutrition of Malay Children of the Sarawak River Delta

• Nutrition Of Melanau Children Of The Tillian River

• Subsistence of the Penan in the Mulu Area of Sarawak
  • By A.J.U. Anderson, M.D. (Lond.) D.T.M. &H (Eng.)
  • Clinical Specialist (Nutrition), Sarawak Medical Service
  • Published in The Sarawak Gazette (30 Nov.):204-216, 1979
Reports on nutrition research among Land Dayaks by Dr AJU Anderson

- Food consumption of Land Dayaks in the Tebakang area
- Outline nutrition of Land Dayak Children – Final Report
- Summary nutrition of Land Dayak Children
General/summary reports on nutrition research by Dr AJU Anderson

- Notes on Food supply in Sarawak hill areas
- Malnutrition among Sarawak children and remedies
- Malnutrition among Sarawak children from four communities
Photographs taken during Applied Nutrition Programme (ANP) Nutrition Survey
Source: Sarawak Medical and Health Department Annual Report 1975

Rural life in Sarawak is centred around a village or longhouse. A longhouse is a village and may contain from 20 to 100 individual doors or families. Photo illustrated above shows the exterior of a typical longhouse.
Collecting sample of drinking water for chemical analysis at Payau Berus.

Requesting stool specimen for examination with respect to helminth ova.

Applied Nutrition Programme (ANP) Nutrition survey, 1975 showing school children being lined up for physical examination at Engkaroh.
Importance of Padi and Rice in Iban culture

• The great majority are padi farmers,
• rice being by far the most important food
  • having a leading place in the Iban religion,
    • followed by nearly all, but a small number of Christians.
• The tradition is that the gods themselves first taught the Iban how to cultivate padi,
  • and all the proper observances to avoid offending the spirits and secure a good crop.
• These aspects are described by Eric Jensen in
  • ‘The Iban and Their Religion’ (Clarendon, Oxford, 1974),
    • much of whose studies were of the Lemanak people.
  • AJU Anderson. Food Consumption of the Lemanak River Iban. Sarawak Health Department mimeograph document. 1977
Environment and Income

• Hills are usually quite steep,
  • serious erosion occurs with extensive loss of forest cover,
  • secondary jungle or coarse lallang grass (Imperata cylindrica).

• Padi is replanted before the soil can recover, resulting in very poor crops:
  • the 1976 harvest lasted only 3.5 months on average for 431 families
  • at five longhouses there was complete crop failure.

• Large proportions of money evidently have to be spent on buying rice or other foods.
  • There is some income from rubber and pepper,
  • otherwise men seek employment elsewhere,
  • leaving women and older men to carry on most of the farm work.

Food Habits

• Rice is preeminent as a food,
  • is eaten three times a day whenever possible.

• Other foods are subsidiary, or set as a relish,
  • or else as a poor substitute like tapioca and sago.

• Fish are caught by nets, lines and traps, with home-made spear-guns (the Iban – and others – are most ingenious in constructing such devices with limited materials), and
  • sometimes illegal tuba or poison.

• Fish and other aquatic foods figure prominently in diets, and
  • less often meat, usually from hunted or trapped animals or sometimes birds.

• Domestic pigs and chickens are occasionally eaten,
  • normally after being sacrificed for ceremonial or ritual purposes.

• For religious or customary reasons various foods may be banned to certain families, e.g. python meat is tabu to many.

Vegetables

- Vegetables are restricted and often seasonal,
  - being *planted with or among padi*.
- Tapioca leaves are important.
- Other semi-wild or wild items such as
  - *ensabi* (‘Iban mustard’) or
  - fern (*paku*) and
  - shoots, e.g. wild sago palm (*pantu*) or bamboo are often consumed.
- Fruit is similarly represented by a number of cultivated, semi-wild and wild varieties.
- The Iban frequently prefer to forage for wild sources rather than grow their own crops.

**Source:** AJU Anderson. Food Consumption of the Lemanak River Iban. Sarawak Health Department mimeograph document. 1977
## Nutrient Intakes Below 80% Adequacy (% Persons)

<table>
<thead>
<tr>
<th></th>
<th>Protein</th>
<th>Calories</th>
<th>Calcium</th>
<th>Iron</th>
<th>A</th>
<th>B₁</th>
<th>Ribo.</th>
<th>Nia.</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2 yrs.</td>
<td>53</td>
<td>90</td>
<td>88</td>
<td>100</td>
<td>37</td>
<td>90</td>
<td>90</td>
<td>94</td>
<td>33</td>
</tr>
<tr>
<td>Other age groups</td>
<td>6</td>
<td>22</td>
<td>90</td>
<td>65</td>
<td>41</td>
<td>39</td>
<td>90</td>
<td>24</td>
<td>12</td>
</tr>
</tbody>
</table>

Protein-calorie Malnutrition and Stunting among 4106 Sarawak Children under 9 Years Old by WHO Standard Weights and Heights

<table>
<thead>
<tr>
<th>Origin</th>
<th>Number</th>
<th>Severe 60% or Less</th>
<th>Moderate + Severe 80% or Less</th>
<th>‘Severe’ below 85%</th>
<th>Moderate + Severe below 90%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tiliian Melanau</td>
<td>485</td>
<td>6.6</td>
<td>74.2</td>
<td>9.8</td>
<td>42.9</td>
</tr>
<tr>
<td>Ulu Mukah Iban</td>
<td>562</td>
<td>11.0</td>
<td>82.5</td>
<td>16.7</td>
<td>54.2</td>
</tr>
<tr>
<td>Lemanak Iban</td>
<td>505</td>
<td>13.5</td>
<td>89.7</td>
<td>29.1</td>
<td>72.5</td>
</tr>
<tr>
<td>Sut &amp; Mujong Iban</td>
<td>502</td>
<td>9.6</td>
<td>86.1</td>
<td>18.3</td>
<td>63.1</td>
</tr>
<tr>
<td>Tebakang Land Dayak</td>
<td>696</td>
<td>8.3</td>
<td>85.2</td>
<td>12.5</td>
<td>52.7</td>
</tr>
<tr>
<td>Sarawak Delta Malay</td>
<td>516</td>
<td>8.7</td>
<td>83.9</td>
<td>9.3</td>
<td>48.4</td>
</tr>
<tr>
<td>Baram Kayan&amp;Kenyah</td>
<td>710</td>
<td>3.1</td>
<td>66.5</td>
<td>13.1</td>
<td>49.7</td>
</tr>
<tr>
<td>Mulu Area Penan</td>
<td>130</td>
<td>7.7</td>
<td>92.3</td>
<td>20.1</td>
<td>60.4</td>
</tr>
<tr>
<td>Mean</td>
<td>4106</td>
<td>8.4</td>
<td>81.0</td>
<td>15.5</td>
<td>54.7</td>
</tr>
</tbody>
</table>

Child Malnutrition in Developing Areas By Gomez Weight Categories

<table>
<thead>
<tr>
<th>Region</th>
<th>Severe 60% or less</th>
<th>Moderate 61-75% St. Wt.</th>
<th>Mod. + Severe 75% or less</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latin America</td>
<td>1.6</td>
<td>18.9</td>
<td>20.5</td>
</tr>
<tr>
<td>Africa</td>
<td>4.4</td>
<td>26.5</td>
<td>30.9</td>
</tr>
<tr>
<td>Asia</td>
<td>3.2</td>
<td>31.2</td>
<td>34.4</td>
</tr>
<tr>
<td>Total (173,000)</td>
<td>2.4</td>
<td>22.8</td>
<td>25.2</td>
</tr>
<tr>
<td>Sarawak (4,106)</td>
<td>8.4</td>
<td>55.1</td>
<td>63.5</td>
</tr>
</tbody>
</table>


**Nutritional status of children in Sarawak in 2015**

- Obese: 1.02%
- Normal: 91.75%
- Moderate malnutrition: 5.96%
- Severe malnutrition: 1.27%

Source: Nutrition Programme, Sarawak Health Department
# Weights and Heights of Iban and Other Adults 20-49 Years Old

<table>
<thead>
<tr>
<th>Origins</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>Wt (kg)</td>
</tr>
<tr>
<td>Lemanak Iban</td>
<td>47</td>
<td>50.6</td>
</tr>
<tr>
<td>Batang Ai Iban</td>
<td>129</td>
<td>49.1</td>
</tr>
<tr>
<td>Tebakang Land Dayak</td>
<td>54</td>
<td>49.2</td>
</tr>
<tr>
<td>Penan (Eastern)</td>
<td>44</td>
<td>51.2</td>
</tr>
<tr>
<td>Punan Busang</td>
<td>25</td>
<td>53.0</td>
</tr>
<tr>
<td>Malay soldiers/wives</td>
<td>1268</td>
<td>57.9</td>
</tr>
<tr>
<td>North American</td>
<td>-</td>
<td>59.3</td>
</tr>
<tr>
<td>Tribe</td>
<td>Mothers</td>
<td>Estimated Average Age</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>Melanau</td>
<td>106</td>
<td>31.3</td>
</tr>
<tr>
<td>Mukah Iban</td>
<td>118</td>
<td>29.5</td>
</tr>
<tr>
<td>Lemanak Iban</td>
<td>116</td>
<td>30.4</td>
</tr>
<tr>
<td>Sut &amp; Mujong Iban</td>
<td>107</td>
<td>33.6</td>
</tr>
<tr>
<td>Land Dayak</td>
<td>204</td>
<td>28.9</td>
</tr>
<tr>
<td>Malay</td>
<td>93</td>
<td>32.7</td>
</tr>
<tr>
<td>Kayan &amp; Kenyah</td>
<td>147</td>
<td>34.0</td>
</tr>
<tr>
<td>Penan</td>
<td>52</td>
<td>39.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>943</strong></td>
<td><strong>31.7</strong></td>
</tr>
</tbody>
</table>

**Maternal Mortality Ratio (MMR) and Toddler Mortality Rate (TMR) in Sarawak, 2014**

MMR = 16.2 per 100,000 Live births (7 maternal deaths)
TMR = 9.3 per 1,000 Live births

*Source: MCH programme, Sarawak Health Department*
Recommendations

• Family Planning
• Better agriculture
  • Use jungle leaf litter as fertiliser,
  • Plant Job’s tears
• Supplementary food
  • Eat midin
• Salt iodisation
• Child feeding
• Worm treatment
• School meals
• Weight and height monitoring
• State Food and Nutrition Policy
Shifting Cultivation for Hill Padi still being practised today, (Kapit 2016-09-05)
NUTRITION AND IODINE DEFICIENCY DISORDERS (IDD)

Iodine Deficiency Disorders
Selected Publications on Iodine Deficiency Disorders in Sarawak in early 1970s


• **Ogihara** T et al. Endemic goitre in Sarawak, Borneo Island: prevalence and pathogenesis. Endocrinology Japan 19 (3):285-293, 1972 (on upper Rejang Iban; iodine content of drinking water was very low)

• **Maberly** GF and C Eastman. Endemic goitre in Sarawak. SEAJTMPH 7(3):434-442, 1976 (On Iban in Ai Region; 99% with goitre; cretinism 4% found only at Ai)
Selected Publications on Iodine Deficiency Disorders in Sarawak from 1990s

- **Survey of Availability of Iodine-Enriched Salt in Sarawak.**

- **Iodization of Village Water Supply** in the Control of Endemic Iodine Deficiency in Rural Sarawak, Malaysia.

- **Iodine Deficiency Disorders** in Sarawak, Malaysia

- **Socioeconomic Correlates** of Iodine Status among School Children in Sarawak, Malaysia

- **Incidence of Thyroid Malignancy** among Goitrous Thyroid Lesions from the Sarawak General Hospital 2000-2004

- **Iodine Deficiency Disorder and Goitre among School Children** in Sarawak -A Nationwide Study
## Grades of goitre

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No goitre</td>
</tr>
<tr>
<td>1A</td>
<td>Thyroid lobe larger than end of thumb</td>
</tr>
<tr>
<td>1B</td>
<td>Thyroid lobe enlarged; visible with head tilted back</td>
</tr>
<tr>
<td>2</td>
<td>Thyroid enlarged with neck in normal position</td>
</tr>
<tr>
<td>3</td>
<td>Thyroid greatly enlarged; visible from about 10 m</td>
</tr>
</tbody>
</table>

Elderly woman with a huge, longstanding multinodular goiter

[http://www.thyroidmanager.org/chapter/the-iodine-deficiency-disorders/]
Goitre surveys and prevalence in Sarawak 1970s to 1980s

Findings:  

<table>
<thead>
<tr>
<th>Division</th>
<th>10–14 years</th>
<th>15 and above</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIV. I</td>
<td>273 (49.8%)</td>
<td>157 (52.2%)</td>
</tr>
<tr>
<td>DIV. II</td>
<td>147 (38.9%)</td>
<td>161 (80.7%)</td>
</tr>
<tr>
<td>DIV. III, VI, VII</td>
<td>252 (34.5%)</td>
<td>589 (55.2%)</td>
</tr>
<tr>
<td>DIV. V</td>
<td>20 (45.0%)</td>
<td>151 (45.0%)</td>
</tr>
</tbody>
</table>

Figure 1. Goitre surveys and prevalence in Sarawak (1970–1982). (○), main towns of divisions; ( ■ ), main towns in divisions II, III, V and VII studied by Polumin (1970); ( ▼ ), areas studied by Polumin (1970); ( △ ), areas studied by Ogihara (1971); ( ● ), areas studied by Maberly (1975), Anderson (1975 1978), Alexander (1979) and Chen and Lim (1982).

IQ scores in three populations in Papua-New Guinea differing in iodine status

7.5% of newborns in Sarawak in 1993 had congenital hypothyroidism. (Kiyu et al, 1995)

Interventions to Provide Iodine to the Population in Sarawak

• **Salt iodisation** plant in Kuching and Sibu (from 1957)
  - Provide iodised salt to antenatal mothers during antenatal clinic visits
  - Iodise salt for salt merchants (voluntary) to sell to the public (from 1979)

• **Legislation for sale of iodised salt** in gazetted endemic goitre areas (Sarawak Public Health Ordinance 1983)

• **Iodination of gravity feed water supply system** (1990s)

• **Universal salt iodisation** (National Food Regulations 1985; Regulation 285 regarding Universal salt iodisation was added in 1990)
  - Took a number of years to take effect
Salt iodination plant, Sibu Central Pharmaceutical Laboratory and Store (CPLS); around 1970s
Wholesalers transporting iodised salt out of the Sibu Salt Iodisation Plant for distribution to various destinations
“Rhodiffuse” Iodinator For Piped Gravity-feed Water Supply

Villagers helping to install the iodinator into the village water supply system (1990s). “Rhodifuse” system of Rh93ne-Poulenc-Rorer-Doma (Antony, France)

The iodinator being attached to the village water system (1990s)
ENVIRONMENTAL HEALTH
ENVIRONMENTAL HEALTH

Rural Water Supply and Sanitation
Estimated Impact of Determinants of Health on Health Status of the Population

The river was the main source of water for cooking, washing and bathing for the rural communities (circa 1960s)
Piped gravity-feed water supply in village

A simple reservoir and intake point

Pipeline criss-crossing the entire length from source to the kampung

Waterfall provides a good source for a gravity feed water supply system

Former Chief Health Superintendent Sarawak, Mr. Jerome Runggol, instructing students on how to connect PVC pipes for gravity feed water supply.

The ‘convenience’ pipe gravity feed water supply system provides the householder
Domestic animals like these pigs were allowed to roam freely and scavenge under longhouses (early 1960s)
Sanitary latrines

Health Inspector, Richard Ibuh (2nd right) and a Rural Health Supervisor (extreme right) during a visit to Rh. Aji, Bakong to explain need for sanitary latrines
\( \frac{1}{3} \) of were fully functioning
\( \frac{1}{3} \) of were partially functioning
\( \frac{1}{3} \) of were not functioning
Latrine use in rural Sarawak, Malaysia.

Kiyu A¹, Hardin S.

56% households had pourflush latrines
- 91.3%, of latrines showed signs of recent use.
  - 90% of the women always used the latrine for defecation.
  - 86.5%, of the husbands always used the latrine for defecation
  - 47.6%) of the children below five years always used the latrine for defecation.

Most common reason for not using the latrine among adults
- lack of water to flush the latrines
- not being home when the need arises.

The reason for using the latrines were to
- keep the compound clean,
- convenience and
- health reasons.
ENVIRONMENTAL HEALTH

Healthy Settings
Evaluation of the Healthy Village Program in Kapit District, Sarawak, Malaysia

ANDREW KIYU², ASHLEY A. STEINKUEHLER¹, JAMILAH HASHIM², JOHN HALL¹, PETER F. S. LEE³ and RICHARD TAYLOR⁴

¹University of Sydney, School of Public Health, Sydney, Australia, ²Sarawak Health Department, Sarawak, Malaysia, ³Kapit Divisional Health Office, Sarawak Health Department, Sarawak, Malaysia, ⁴University of Queensland, School of Population Health, Queensland, Australia and ⁵World Health Organization, Global Programme on Health Promotion, Effectiveness, Geneva, Switzerland
Healthy City Kuching
(Launched in 1994)

The Right Honourable Chief Minister of Sarawak (2nd from right) launching the Healthy City Kuching Initiative in February 1995. With him are (left to right): Datu Awang Ehsan Joini, Mayor of Kuching North; Datuk Song Swee Guan, Mayor of Kuching South; and, Datuk Dr Stalin Hardin, Sarawak State Health Director.
Villagers of Rumah Jeffery Nundong worked with clinic staff to transform their longhouse under the Healthy Longhouse Initiative in Kapit
ENVIRONMENTAL HEALTH

Effects of Transboundary Haze on Hospitalisation
1997 Transboundary Haze (API >800)


http://www.angelfire.com/myband2/adofcool/memorable/hazy/kchwaterfront_me02_big.jpg
Cardiorespiratory hospitalizations associated with smoke exposure during the 1997 Southeast Asian forest fires

Joshua A. Mott\textsuperscript{a,\ast}, David M. Mannino\textsuperscript{a}, Clinton J. Alverson\textsuperscript{a}, Andrew Kiyu\textsuperscript{b}, Jamilah Hashim\textsuperscript{b}, Tzesan Lee\textsuperscript{c}, Kenneth Falter\textsuperscript{c}, Stephen C. Redd\textsuperscript{a}

\textsuperscript{a}Air Pollution and Respiratory Health Branch, Division of Environmental Hazards and Health Effects, National Center for Environmental Health, Centers for Disease Control and Prevention, 1600 Clifton Road NE, MS E-17, Atlanta, GA 30333, USA
\textsuperscript{b}Sarawak Health Department, State of Sarawak, Malaysia
\textsuperscript{c}Biometry Activity, Division of Environmental Hazards and Health Effects, National Center for Environmental Health, Centers for Disease Control and Prevention, Atlanta, GA, USA

- The time-series analyses
- statistically significant fire-related increases were observed in respiratory hospitalizations,
- specifically those for chronic obstructive pulmonary disease (COPD) and asthma.
Findings of the study

- persons over age 65 years with
  - previous hospital admissions for any cause
  - any cardiorespiratory disease
  - any respiratory disease or
  - COPD

- were significantly more likely to be rehospitalized during the follow-up period in 1997
  - than during the follow-up periods in the pre-fire years of 1995 or 1996.

- The survival functions of the exposed cohorts resumed similar trajectories to unexposed cohorts during the post-fire period of November 1, 1997 to December 31, 1998.

Findings of the study

• Communities exposed to forest fire smoke during the Southeast Asian forest fires of 1997
  • experienced short-term increases in cardiorespiratory hospitalizations.

• When an air quality emergency is anticipated,
  • persons over age 65 with histories of respiratory hospitalizations
    • should be pre-identified from existing hospitalization records and
  • given priority access to interventions

Haze from Indonesian fires may have killed more than 100,000 people – study

Monday 19 September 2016 07.56

Harvard and Columbia universities estimate tens of thousands of premature deaths in areas closest to blazes clearing forest and peatland

They estimated there were 91,600 premature deaths in Indonesia, 6,500 in Malaysia and 2,200 in Singapore.

https://www.theguardian.com/world/2016/sep/19/haze-indonesia-forest-fires-killed-100000-people-harvard-study

A MI-17 helicopter run by the Indonesian National Disaster Mitigation Agency water-bombs a fire in South Sumatra province. Photograph: Abdul Qodir/AFP/Getty Images. Agence France-Presse
VIRUS INFECTIONS

Hand, Foot and Mouth Diseases
Hand, Foot and Mouth Disease (HFMD)
Selected Publications on HFMD relating to Sarawak

• Isolation of Subgenus B Adenovirus During a Fatal Outbreak of Enterovirus 71-Associated Hand, Foot, and Mouth Disease in Sibu, Sarawak.

• Deaths of Children during an Outbreak of Hand, Foot, and Mouth Disease in Sarawak, Malaysia: Clinical and Pathological Characteristics of the Disease.

• Adenovirus type 21-associated acute flaccid paralysis during an outbreak of hand-foot-and-mouth disease in Sarawak, Malaysia.

• A human adenovirus species B subtype 21a associated with severe pneumonia.
  • Elias Hage, Daniela Huzly, Tina Ganzenmueller, Robert Beck, Thomas F. Schulz, Albert Heim. *Journal of Infection* (2014) 69, 490e499 [http://dx.doi.org/10.1016/j.jinf.2014.06.015](http://dx.doi.org/10.1016/j.jinf.2014.06.015)
1.0. INTRODUCTION

Hand, foot and mouth disease (HFMD)

• a common acute viral illness that primarily affects infants and young children,

• often occurs in clusters or outbreaks.

• major causative agents of HFMD are:
  • coxsackievirus A16 (CVA16),
  • human enterovirus 71 (HEV71) and
  • coxsackievirus A10 (CVA10)
    • of the genus *Enterovirus* in the family *Picornaviridae*.
Asia-Pacific Countries Affected By EV71 Epidemics Since 1997

- Korea (2000)
- China (2007, 2008)
- Australia (Perth) (1999)
# Large Outbreaks Caused By EV71 Has Increased Since 1997

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
</table>
| 1997   | Outbreak in Sarawak began in early April 1997;
          | From 1 June through 30 August 1997:
          | • 2628 cases were reported;                                           |
          | • 889 children were hospitalized for observation;                     |
          | • 39 patients had aseptic meningitis or acute flaccid paralysis;      |
          | • 29 died                                                            |
| 1997:  | smaller outbreaks in Peninsular Malaysia & Singapore                  |
| 1998:  | Taiwan                                                               |
          | (estimated that there were more than one million cases)               |
| 1999:  | Perth, Australia (Same EV71 virus as in Sarawak 1997)                 |
| 2000, 2003, and 2006 | Sarawak                               |
          | (over 13,000 cases were reported in the 2006 outbreak).               |
| 2008   | China                                                                 |
          | (6,300 cases and 26 deaths till 4 May 2008)                           |
HFMD Sentinel data: 1998 - 2008

Outbreaks Due to EV71 in Sarawak Occur Every Three Years

Source: Prof Jane Cardosa
EV71 is not the only virus associated with HFMD

• Other viruses include Coxsackie virus A16, Coxsackie virus A10, etc

• Only EV71 causes very large outbreaks.
Many non-EV71 enteroviruses cocirculate pre and post outbreak
Different Enteroviruses Predominate at Different Times
Different sub-genogroups appear in different outbreak years.
VIRUS INFECTIONS

Japanese Encephalitis
Japanese Encephalitis in Sarawak

- Simpson DI, Bowen ET, Platt GS et al. (1970)

- Simpson DI, Bowen ET, Way HJ et al. (1974)

- Simpson DI, Smith CE, Marshall TF et al. (1976)

- In 1997, a pilot hospital-based surveillance study for JE was set up in Sibu Hospital in Sarawak, followed in 1998 by passive surveillance for all other hospitals in the state.
Japanese encephalitis (JE) admissions in Sibu Hospital between 1997 and 2006.

The bars represent the number of JE admissions in Sibu Hospital by quarter of the year over the 10-year study period, 1997–2006 (Q1 = January–March, Q2 = April–June, Q3 = July–September, Q4 = October–December).


Using leftover (surplus) vaccines ordered during the Nipah outbreak in 1998-1999
Effect of JE Vaccination in Sarawak

• Pre JE Vaccination:
  • the average annual incidence of JEV was 9.8 per 100 000 population under 12 years,

• Post JE Vaccination
  • The average annual incidence of JEV dropped to 4.3 per 100 000 population under 12 years.

VIRUS INFECTIONS

Dengue, Chikungunya, Zika
Dengue - updates
SYLVATIC DENGUE

Fever from the forest: prospects for the continued emergence of sylvatic dengue virus and its impact on public health

• Nikos Vasilakis*, Jane Cardosa‡, Kathryn A. Hanley§, Edward C. Holmes∥,¶, and Scott C. Weaver*

• *Department of Pathology, Center for Biodefense and Emerging Infectious Disease, Institute for Human Infection and Immunity, and Center for Tropical Diseases, University of Texas Medical Branch, Galveston, Texas 77555, USA

• ‡Institute of Health and Community Medicine, Universiti Sarawak Malaysia (UNIMAS), 94300 Kota Samarahan, Sarawak, Malaysia

• §Department of Biology, New Mexico State University, Las Cruces, New Mexico 88003, USA

• ||Center for Infectious Disease Dynamics, Department of Biology, Mueller Laboratory, The Pennsylvania State University, University Park, Pennsylvania 16802, USA

• ¶Fogarty International Center, National Institutes of Health, Bethesda, Maryland 20892, USA

First New Dengue Virus Type in 50 Years
http://news.sciencemag.org/health/2013/10/first-new-dengue-virus-type-50-years?rss=1

- By chance, researchers screening dengue viral samples found a virus collected during an outbreak in Malaysia's Sarawak state in 2007 that they suspected was different from the four original serotypes.

- They sequenced the virus and found that it is phylogenetically distinct from the other four types.

- "We discovered and characterized a new dengue serotype," announced Nikos Vasilakis, a virologist at University of Texas Medical Branch in Galveston, here today at the Third International Conference on Dengue and Dengue Haemorrhagic Fever.

- Vasilakis suspects that it is circulating, possibly among macaques, in the forests of Sarawak.


- The Third International Conference on Dengue and Dengue Hemorrhagic Fever 2013 (Dengue 2013) will be held on 21-23 October 2013 at The Imperial Queen’s Park Hotel in Bangkok, Thailand. The theme of this conference is “Global Dengue: Challenges and Promises”.
Bilangan Kes Demam Denggi di Sarawak yang Dilaporkan dari ME 01/2013 sehingga ME 39/2016

Chikungunya
Geographic distribution and spread of Chikungunya virus (CHIKV) and its two urban vectors, A. aegypti and A. albopictus (1958-2014).

Lark L. Coffey, Anna-Bella Failloux and Scott C. Weaver. Chikungunya Virus–Vector Interactions
Viruses 2014, 6(11), 4628-4663; doi: 10.3390/v6114628
Chikungunya Virus in Sarawak – Since the 1960s

Abstract

• 449 human sera collected in a Land Dyak village were tested for antibodies to 11 arboviruses.

• Japanese encephalitis and dengue virus antibodies were particularly prevalent.

• The rates of infection with these viruses were estimated to be 5.2% per annum for Japanese encephalitis, 8.8% for dengue 1 and 4.3% for dengue 2.

• **Chikungunya virus antibodies** were quite common with an annual infection rate of the order of 5% per annum.

• Infections with other Group A and B and Bunyamwera group viruses were generally at a low level.
Chikungunya outbreak 2009 - Affected Kampungs

- From 26.3.2009 to 10.6. 2009
- 8 localities
- 356 cases

Distance to each localities and mode of transportation from Betong Health Office:

1. Betong___74km___Pusa___Ferry(15min)___Beladin___8km___Semarang ___15km____Maludam
2. Pusa________45 minutes by boat _______Medang
3. Betong________96km___________Tuie (halfway is unpaved oil palm road)
“In the present on-going large outbreak due to chikungunya virus of Central/East African genotype,
a previous healthy sixty six years gentleman without co-morbidity
was noted to have severe systemic infection by the virus and involvement of his liver.

He subsequently passed away
due to cardiovascular collapse after 5 days of illness”

Zika Virus
Publications on Zika virus in Malaysia


### Seroprevalence to flaviruses among orangutans and humans in Sabah, 1996–1997

<table>
<thead>
<tr>
<th></th>
<th>Percent and number positive to</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dengue-2</td>
<td>Japanese Encephalitis</td>
<td>Zika</td>
<td>Tembusu</td>
<td>Langat</td>
<td></td>
</tr>
<tr>
<td><strong>Orangutans</strong></td>
<td>%</td>
<td>No. + to</td>
<td>%</td>
<td>No. + to</td>
<td>%</td>
<td>No. + to</td>
</tr>
<tr>
<td>Wild (from Eastern Sabah)</td>
<td>28</td>
<td>11/40</td>
<td>38</td>
<td>15/40</td>
<td>13</td>
<td>5/40</td>
</tr>
<tr>
<td>Semi-captive (from Sepilok)</td>
<td>32</td>
<td>10/31</td>
<td>16</td>
<td>5/31</td>
<td>3</td>
<td>1/31</td>
</tr>
<tr>
<td><strong>Humans</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Native Bornean</td>
<td>37</td>
<td>11/30</td>
<td>40</td>
<td>12/30</td>
<td>30</td>
<td>9/30</td>
</tr>
<tr>
<td>Migrants</td>
<td>74</td>
<td>59/80</td>
<td>29</td>
<td>24/83</td>
<td>49</td>
<td>40/81</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>50</strong></td>
<td><strong>91/181</strong></td>
<td><strong>30</strong></td>
<td><strong>56/184</strong></td>
<td><strong>30</strong></td>
<td><strong>55/182</strong></td>
</tr>
</tbody>
</table>

Adult humans, classified as either native-born Bornean or non-native-born Bornean (migrants), who lived or worked on the boundaries of the Sepilok Forest Reserve.

Seroprevalence to flaviruses among orangutans and humans in Sabah, 1996–1997

<table>
<thead>
<tr>
<th>Age range (yr)</th>
<th>Percent and number positive to</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dengue-2</td>
</tr>
<tr>
<td></td>
<td>%</td>
</tr>
<tr>
<td>21–30</td>
<td>33</td>
</tr>
<tr>
<td>31–40</td>
<td>24</td>
</tr>
<tr>
<td>≥ 40</td>
<td>60</td>
</tr>
<tr>
<td>Total</td>
<td><strong>37</strong></td>
</tr>
</tbody>
</table>

Adult humans, classified as either native-born Bornean or non-native-born Bornean (migrants), who lived or worked on the boundaries of the Sepilok Forest Reserve.

# Zika Virus in Africa and Asia

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1947</td>
<td>Virus first isolated in from a <em>rhesus monkey</em> in the <em>Zika Forest of Uganda</em>, Africa</td>
</tr>
<tr>
<td>1968</td>
<td>isolated for the first time from <em>humans</em> in <em>Nigeria</em>.</td>
</tr>
<tr>
<td>From 1951 through 1981</td>
<td><em>Human infection</em> was reported from other <em>African countries</em> such as Uganda, Tanzania, Egypt, Central African Republic, Sierra Leone and Gabon in <em>parts of Asia</em> including India, <em>Malaysia</em>, the <em>Philippines</em>, <em>Thailand</em>, Vietnam and Indonesia</td>
</tr>
</tbody>
</table>

First outbreak of Zika virus outside Africa and Asia

<table>
<thead>
<tr>
<th>Year</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007 (April)</td>
<td>The first outbreak of the disease outside of Africa and Asia on the island of Yap in the Federated States of Micronesia</td>
</tr>
<tr>
<td>2013-2014</td>
<td>Outbreaks in French Polynesia, New Caledonia, and other Pacific Island Countries</td>
</tr>
<tr>
<td>2015 (April)</td>
<td>A larger outbreak of Zika virus outside Africa and Asia was confirmed in Brazil.</td>
</tr>
</tbody>
</table>

https://en.wikipedia.org/wiki/Zika_virus
Phylogenetic tree of ZIKV showing the African and Asian lineages, including the strains that recently emerged in the Pacific and Brazil.

Acute Zika Virus Infection (in a 45 year-old woman in Heidelberg, Germany), after Travel to Malaysian Borneo, September 2014

Fever started 6 days after returning from Sabah

8-24 August 2014
In Sabah

Emerging Infectious Diseases • www.cdc.gov/eid • Vol. 21, No. 2, February 2015
Acute Zika Virus Infection (in a 45 year-old woman in Heidelberg, Germany), after Travel to Malaysian Borneo, September 2014

- Map of northern Borneo showing the itinerary through the Malaysian state of Sabah of a patient with Zika fever.
- The patient most likely became infected while staying in Keningau and southern villages (Papalungan), where she also took a boat trip on the Sungai Papalungan, a river through the rain forest.

No need to press panic button

From left: Dr Andrew, Dr Jamilah, Dr Sim, Dr Chua, and Dr Lee showing posters on eliminating breeding places of mosquitoes during the press conference.

Dr Sim says Zika virus not spread by passive contact, can be contained by destroying mosquito breeding places

September 15, 2016, Thursday

Daryll Law reporters@theborneopost.com
BACTERIAL INFECTIONS
BACTERIAL INFECTIONS

Cholera
Selected publications on Cholera in Sarawak

• **Cholera in Sarawak: A Historical Perspective (1873-1989)**

• **Detection of Vibrio Cholerae from Aquatic Environment in Sarawak**

• **Prevalence of Potentially Pathogenic Vibrio Species in the Seafood Marketed in Malaysia**
  - Elhadi N, Radu S, Chen CH, Nishibuchi M. J Food Prot. 2004 Jul; 67(7):1469-75

• **Factors Associated with Emergence and Spread of Cholera Epidemics and Its Control in Sarawak, Malaysia between 1994 and 2003**

• **Genomic Diversity of Cholera Outbreak Strains in East Malaysia**
  - Lesley Maurice Bilung, Yong Sy Fuh, Velnetti Linang, Adom Benjamin, Micky Vincent, Kasing Apun, Samuel Lihan, Chien Su Lin. Malaysian Journal of Medicine and Health Sciences (ISSN 1675-8544); Vol. 10 (2) June 2014: 19-26
History of Cholera in Sarawak

• Cholera has been in existence in Sarawak for many years.

• The concept of illness and injury among the Sea Dayaks is closely linked with religion and magic.

• Cholera to the Sea Dayak is the coming of a great spirit from the sea to kill and eat.


<table>
<thead>
<tr>
<th>Year Range</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1817-1824</td>
<td>The first known cholera pandemic originated in the Ganges River Delta, India, with the disease outbreak occurring in Calcutta</td>
</tr>
<tr>
<td>1829-1849</td>
<td>Similar to the first, the second cholera pandemic began with outbreaks along the Ganges River Delta, and from here the disease spread along trade routes to cover most of India</td>
</tr>
<tr>
<td>1852-1860</td>
<td>The third cholera pandemic is widely considered as the most deadly and again had its origins in India</td>
</tr>
<tr>
<td>1863-1875</td>
<td>The fourth pandemic began in the Bengal region of India, where Indian Muslim pilgrims visiting Mecca spread the disease to the Middle East</td>
</tr>
<tr>
<td>1881-1896</td>
<td>Again originating in the Bengal Region of India, the fifth cholera pandemic spread throughout Asia, Africa, South America and parts of France and Germany</td>
</tr>
<tr>
<td>1899-1923</td>
<td>The sixth pandemic again originated in India, killing more than 800,000 and spread rapidly to the Middle East, North Africa, Eastern Europe and Russia</td>
</tr>
<tr>
<td>1961-Present</td>
<td>The seventh pandemic originated in Indonesia and is still occurring today. The disease spread through Asia and the Middle East until it reached Africa in 1971</td>
</tr>
</tbody>
</table>

https://sites.google.com/site/waterrediseasecholera/the-seven-pandemics
### History of Cholera in Sarawak

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1873</td>
<td>• an epidemic of cholera occurred in Sarawak</td>
</tr>
<tr>
<td></td>
<td>• impossible to say how many died.</td>
</tr>
<tr>
<td>1873</td>
<td>• on board the vessel S.S. 'Hydaspes' between Aden and Suez the only son and daughter of H.H. the Raja of Sarawak died.</td>
</tr>
<tr>
<td></td>
<td>• Although the cause of the deaths were not confirmed, cholera was not ruled out.</td>
</tr>
</tbody>
</table>

Cholera Epidemic June 1902

- At this time an expedition had been organised to punish a group of Dayaks living in the interior of Simanggang District who were attacking and killing friendly neighbours.
- A force of some 12,000 loyal Dayaks including some Malays were assembled, and the expedition moved up the Batang Lupar to Simanggang in about 800 boats.
- On leaving Simanggang, all appeared well, but when the expedition proceeded some distance up the river, cholera broke out and spread rapidly.
- There were 1,000 deaths in the force (8.3%) which eventually had to retire without accomplishing its mission.
- The surviving sick and healthy members dispersed to their respective longhouses and villages.
- The outbreak started on about 10th June and lasted until 29th June.

Cholera Epidemic June 1902

- The report stated that the Batang Lupar was polluted with corpses and shields of members of the expedition.
- Cases of cholera thus appeared in several other areas and these were attributed to the dispersal of Dayaks after the break-up of the expeditionary force.
- Divisions I, II, III and IV had cases of cholera.
- The disease also occurred in Kuching town in a sporadic form during the months of June and July.
- Overall this epidemic caused about **1,500 deaths** but the number of cases was unknown.


Fig. 1: Distribution of Cholera Cases in Sarawak (1960 - 1988)
Cholera

Vibrios in seafood
Seafood samples obtained in seafood markets and supermarkets at 11 sites selected from four states in Malaysia were examined for the presence of nine potentially pathogenic species from the genus Vibrio between July 1998 and June 1999.

- Examined 768 sample sets that included shrimp, squid, crab, cockles, and mussels.

- Eight potentially pathogenic Vibrio species were detected,

- with overall incidence in the samples
  - V. cholera 4.6% ,
  - V. parahaemolyticus 4.7% ,
  - V. vulnificus 6.0% 
  - V. alginolyticus 11% , V. metschnikovii 9.9% , V. mimicus 1.3% , V. damsels 13% , V. fluvialis 7.6% ,
  - combined population of all of the above 52% .

As many as eight Vibrio species were detected in shrimp and only four in squid and peel mussels.

The overall percent incidence of any of the eight vibrios was highest (82%) in cockles (Anadara granosa) among the seafoods examined and was highest (100%) in Kuching, Sarawak.

Of 97 strains of V. cholerae isolated, one strain belonged to the O1 serotype and 14 to the O139 serotype.

The results indicate that the various seafood markets in Malaysia are contaminated with potentially pathogenic Vibrio species regardless of the season and suggest that there is a need for adequate consumer protection measures.

Cholera outbreaks in Sarawak in recent years

Bintulu 2012
• 110 confirmed cases
  • 63 were asymptomatic
    • 22 of the asymptomatic cases were food handlers

Limbang 2016
• two waves of outbreaks, from 3.3 to 17.6.2016
• 56 confirmed cholera cases of serotype Ogawa
  • First wave (6 weeks)
    • 16 cases, 6 localities
  • Second wave (8 weeks)
    • 40 cases; 17 localities.
Bintulu Regatta Camp site (on the opposite side of Bintulu town) from where cholera spread
2012-07-23
Hanging latrine next to Bintulu Regatta Camp site, at high tide, 2012-07-23
The period of Bazaar Ramadan made the control of cholera outbreak in Bintulu in July 2012, even more challenging.
Kampong Limpaku Pinang, Limbang – where a cholera outbreak occurred in 2016
Kampong Limpaku Pinang, Limbang – where a cholera outbreak occurred in 2016
Rain water catchment system, Kampong Limpaku Pinang, Limbang. It was dry as there was no rain for a few months.
BACTERIAL INFECTIONS

Leptospirosis
• Leptospirosis in the Rejang Basin

• Serological and Molecular Detection of Leptospira Spp. From Small Wild Mammals Captured in Sarawak, Malaysia.
  • Thayaparan S, Robertson ID and Abdullah MT.
  • Malaysian Journal of Microbiology, Vol 11(1) 2015, pp. 93-101
Leptospirosis in Humans in Rejang River Basin area

• 31 per cent of humans sampled were infected
• an association between certain daily activities, including farming and water activities with leptospirosis infection

Leptospirosis in small mammals in Sarawak

The samples of blood and kidneys of small rodents, bats and squirrels from 5 localities were analyzed.

<table>
<thead>
<tr>
<th>Blood samples</th>
<th>Kidney samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 47.0% (73/155) wild small animals had antibodies to different serovars of leptospires</td>
<td>• 11.0% (17/155 individual animals) positive for <em>Leptospira</em> on a molecular study</td>
</tr>
</tbody>
</table>

Seroprevalence rate for:
• Rats: 57.9%;
• Squirrels: 42.9%;
• Bats: 40%;

Positive results were from
• Plantain squirrels: 53%;
• Müller’s rat: 35%;
• Brown spiny rats: 12%;

BACTERIAL INFECTIONS

Melioidosis
Bakun Hydroelectric Dam, Belaga District, Sarawak

Fast facts:
• second highest concrete faced rockfill dam in the world.
• Bakun dam is 207 metres high
• Reservoir surface area of nearly 70,000 hectares, about the size of Singapore.
• The main civil works began in 2002.
• A workforce of just over 3000 are on site at the peak of construction activity.
• Source: http://www.bakundam.com/home.html
Bakun islands to be tourism draw

Borneo Post 15 December 2011, p11, col. 1-5

- More than 10 major islands will become permanent features of the Bakun hydroelectric dam area covering an area almost the size of Singapore.
Burkholderia pseudomallei

http://latimicrolancewheeler.wikispaces.com/History+of+burkholderia+pseudomallei+and+melioidosis
Don’t laugh off the spirits —Dr Elli

by Zoee Hillson reporters@theborneopost.com. Posted on August 10, 2011, Wednesday

KUCHING: The belief that deaths in Murum and Bakun area were caused by angry ancestral spirits should not be laughed off because it is part of the anthropological culture of the community there.

Bakun Community Safety Committee (BCSC) chairman Dr Elli Luhat said

“Although I myself as a field scientist do not believe in ghosts and angry spirits, it does not mean I have to rule out their anthropological belief.

Selected Publications on Melioidosis related to Sarawak

• Seroepidemiology of Melioidosis among the Indigenous Communities and Environmental Surveillance for Burkholderia Species in the Periphery of Loagan Bunut National Park, Sarawak

• Reliability of Automated Biochemical Identification of Burkholderia Pseudomallei is Regionally Dependent

• Burkholderia pseudomallei Isolates from Sarawak, Malaysian Borneo, Are Predominantly Susceptible to Aminoglycosides and Macrolides
PARASITIC INFECTIONS
PARASITIC INFECTIONS

Malaria
Malaria in Sarawak and Brunei (1956)
Population of Sarawak

> The population of Sarawak, according to the 1947 census—the last available—is 546,385. The country is inhabited by a variety of racial and cultural groups, their distribution according to the 1947 census being as follows:

<table>
<thead>
<tr>
<th>Racial or cultural group</th>
<th>Population</th>
<th>Percentage of total population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sea Dayak</td>
<td>190,326</td>
<td>34.8</td>
</tr>
<tr>
<td>Chinese</td>
<td>145,158</td>
<td>26.6</td>
</tr>
<tr>
<td>Malay</td>
<td>97,469</td>
<td>17.9</td>
</tr>
<tr>
<td>Land Dayak</td>
<td>42,195</td>
<td>7.7</td>
</tr>
<tr>
<td>Melanau</td>
<td>35,560</td>
<td>6.5</td>
</tr>
<tr>
<td>Other indigenous</td>
<td>29,867</td>
<td>5.5</td>
</tr>
<tr>
<td>Other non-indigenous Asian</td>
<td>5,119</td>
<td>0.9</td>
</tr>
<tr>
<td>European</td>
<td>691</td>
<td>0.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>546,385</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

JULIAN DE ZULUETA. MALARIA IN SARAWAK AND BRUNEI. Bull. Wld Hlth Org. 1956, 15, 651-671
Malaria in Sarawak and Brunei (1956)
Malaria Endemicity

• Most of the information was collected between July and December 1952, but a few records from 1953 have also been included.

• Surprising finding:
  • The data show that in most places comparatively low spleen- and parasite rates were found

• 92% of the people live in hypoendemic areas,
  • where the spleen-rate in children 2-9 years old is below 10%.

• 8% of the population living in highly malarious or hyperendemic areas,
  • where the spleen-rate in children 2-9 years of age is above 50%

• JULIAN DE ZULUETA. MALARIA IN SARAWAK AND BRUNEI. Bull. Wld Hlth Org. 1956, 15, 651-671.
Malaria Prevalence In Sarawak And Brunei, Based On Results Of 1952-53 Survey

PARACHUTING CATS AND CRUSHED EGGS

The Controversy Over the Use of DDT to Control Malaria

Patrick T. O'Shaughnessy, PhD

Tom Harrisson with a native of Sarawak, Indonesia, in 1945. 

(On 25 March 1945, he was parachuted with seven Z Force operatives from a Consolidated Liberator onto a high plateau occupied by the Kelabit people.)

A Sarawak Malaria Eradication Project worker spraying a longhouse in 1962.

Source: Heritage in Health: The Story of Medical and Health Care Services in Sarawak. Sarawak Health Department, 2012. p184
• “In the early 1950s, there was an outbreak of a serious disease called malaria among the Dayak people in Borneo.

• The World Health Organization tried to solve the problem.

• They sprayed large amounts of a chemical called DDT to kill the mosquitoes that carried the malaria.

• The mosquitoes died and there was less malaria.

• That was good”
“However, there were side effects.

- One of the first effects was that the roofs of people’s houses began to fall down on their heads.
- It turned out that the DDT was also killing a parasitic wasp that ate thatch-eating caterpillars.
- Without the wasps to eat them, there were more and more thatch-eating caterpillars.
- Worse than that, the insects that died from being poisoned by DDT were eaten by gecko lizards, which were then eaten by cats.
- The cats started to die, the rats flourished, and the people were threatened by outbreaks of two new serious diseases carried by the rats, sylvatic plague and typhus.

- To cope with these problems, which it had itself created, the World Health Organization had to parachute live cats into Borneo”
Finding the cause:

Roof collapse traced to disappearance of parasitic wasp which had controlled thatch-eating caterpillars.

http://www.life.umd.edu/classroom/bsci124/img/parasitoid.jpg
Effect of DDT Use in Borneo

In the early 1950's the people in Borneo, suffered from Malaria the World Health Organization had a solution, kill the mosquitoes with DDT. This is what happened.

Byproduct 1:
Eliminated the natural predator for the thatch eating caterpillar

Byproduct 2:
Biomagnification of DDT poisoning in cats caused an outbreak of sylvatic plague.
Marabunta or Spider Wasp (Family Pompilidae) solitary wasp at nest in thatched roof


55. The drop also included “4 cartons of stout for a recuperating chieftain”!

Plasmodium knowlesi or Monkey malaria
History of discovery of 5 species of malaria parasites

• 1900 (116 years ago)
  • *Plasmodium vivax*,
  • *P. falciparum*, and
  • *P. malariae* were discovered

• 1918
  • *P. ovale* discovered

• 2010
  • *P. ovale* was shown by genetic methods to consist of two subspecies, *P. ovale curtisi* and *P. ovale wallikeri*.

• Francis EG Cox. History of the discovery of the malaria parasites and their vectors. Cox Parasites & Vectors 2010, 3:5
  http://www.parasitesandvectors.com/content/3/1/5


  doi:10.1016/j.ijpara.2009.03.003. [PMC 2722692](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2722692)
<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1927</td>
<td>Giuseppe Franchini (an Italian) probably the first person to see P. knowlesi when he was examining the blood of Macaca fascicularis (long-tailed macaque)</td>
</tr>
<tr>
<td>1932</td>
<td>• Robert Knowles and Das Gupta described the species in detail;</td>
</tr>
<tr>
<td></td>
<td>• showed that it could be transmitted to man by blood passage;</td>
</tr>
<tr>
<td></td>
<td>• but failed to name it.</td>
</tr>
<tr>
<td></td>
<td>• Sinton and Mulligan named the parasite after Dr Knowles.</td>
</tr>
<tr>
<td>1930s to 1955</td>
<td>From early in the, P. knowlesi was used as a pyretic agent for the treatment of patients with neurosyphilis.</td>
</tr>
<tr>
<td>1957</td>
<td>Garnham et al. suggested that P. knowlesi could be the fifth species capable of causing endemic malaria in humans.</td>
</tr>
<tr>
<td>1965</td>
<td>the first case of a naturally occurring infection of knowlesi malaria in humans was reported in an American man who had returned after working in the jungle in peninsular Malaysia.</td>
</tr>
</tbody>
</table>

- Francis EG Cox. History of the discovery of the malaria parasites and their vectors. Cox Parasites & Vectors 2010, 3:5 http://www.parasitesandvectors.com/content/3/1/5
- https://en.wikipedia.org/wiki/Plasmodium_knowlesi
History of discovery of malaria parasite 

*Plasmodium knowlesi*

2004: First report showing that

- there is a fifth species (now sixth) of Plasmodium causing human malaria
- cases are being misdiagnosed due to the morphological similarity between *P. knowlesi* and *P. malariae*
- Discovery made possible due to the development of molecular detection assays which could differentiate between *Plasmodium knowlesi* and the morphologically similar *Plasmodium malariae*
- Work with archival samples has shown that infection with this parasite has occurred in Malaysia at least since the 1990s
- now (2004) known to cause 70% of the malaria cases in certain areas of Sarawak

doi:10.1016/j.ijpara.2009.03.003. [PMC 2722692](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2722692)

Typical morphology of erythrocytic stages of *Plasmodium knowlesi*, *P. falciparum* and *P. malariae*

Man, Monkeys, Mosquitoes, Malaria

Anopheles albimanus mosquito feeding on a human arm – this mosquito is a vector of malaria, and mosquito control is a very effective way of reducing the incidence of malaria.

https://upload.wikimedia.org/wikipedia/commons/a/ae/Anopheles_albimanus_mosquito.jpg

The founding director of the Malaria Research Centre (MRC) Unimas, Professor Balbir Singh.

Long-tailed macaques play a good host to the fifth malarial strain known to affect humans – P knowlesi.

FIG 1 Plasmodium knowlesi infections reported in humans and macaques and limits of natural distribution of mosquito vectors and of macaques. The numbers in parentheses represent numbers of P. knowlesi cases reported for each Southeast Asian country or region in Malaysia. (Adapted from reference 5 with permission from Elsevier.)
Malaria cases by Epidemiology Week in Sarawak from Epid. Week 1/2011 to Epid. Week 39/2016

the red line indicate number of P. knowlesi cases
CANCERS
Selected Publications on Cancers in Sarawak

- **Nasopharyngeal Cancer in Sarawak (Borneo)**

- **Epidemiology of Cancer in Sarawak**

- **Clinical Presentation of Nasopharyngeal Carcinoma in Sarawak Malaysia**
  - T S Tiong & K S Selva. Med J Malaysia Vol 60 No 5 December 2005

- **What Doctors Know About Cancer Pain Management: An Exploratory Study in Sarawak, Malaysia**

- **Reducing by Half the Percentage of Late-State Presentation for Breast and Cervix Cancer Over 4 Years: A Pilot Study of Clinical Down Staging in Sarawak, Malaysia**
Selected Publications on Cancers in Sarawak

- **Head and Neck Cancer: Possible Causes for Delay in Diagnosis and Treatment**

- **Acral Melanoma of The Extremities: A Study of 33 Cases Sarawakian Patients**

- **Incidence and Risk Factors for Breast Cancer Subtypes in Three Distinct South-East Asian Ethnic Groups: Chinese, Malay and Natives of Sarawak, Malaysia**

- **Brain and Spinal Tumour**
Epidemiology of Cancer in Sarawak 1981-1982

Based on histopathology records in the Central Medical Laboratory, Kuching, Sarawak, in 1981 and 1982.

- 8,219 patients from whom biopsies were taken
- 485 from whom marrow biopsies were taken.
- Out of these, 1,326 (15%) were reported malignant.

<table>
<thead>
<tr>
<th>most common cancer sites among males were:</th>
<th>most common cancer sites among females were:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. lymph nodes,</td>
<td>1. breast,</td>
</tr>
<tr>
<td>2. nasopharynx,</td>
<td>2. cervix and</td>
</tr>
<tr>
<td>3. skin and</td>
<td>3. lymph nodes</td>
</tr>
<tr>
<td>4. stomach,</td>
<td></td>
</tr>
</tbody>
</table>

Common cancers by ethnic groups in Sarawak 1981-1982

<table>
<thead>
<tr>
<th>Race</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinese</td>
<td>Nasopharynx</td>
<td>Breast</td>
</tr>
<tr>
<td>Sea Dayaks</td>
<td>Lymph nodes</td>
<td>Cervix</td>
</tr>
<tr>
<td>Malays</td>
<td>Skin cancers</td>
<td></td>
</tr>
<tr>
<td>Land Dayaks</td>
<td>Nasopharyngeal</td>
<td></td>
</tr>
</tbody>
</table>

- The pattern of cancers has not changed much since 1966
- The findings of the present study are very similar to the series from the Institute of Medical Research, Kuala Lumpur, in 1969 to 1971.

### Annual Age-standardised-rates per 100,000 for 10 leading cancer sites in males by ethnicity, Sarawak, 2001-2005

<table>
<thead>
<tr>
<th>Sites</th>
<th>Ethnic Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Iban</td>
</tr>
<tr>
<td>Trachea, bronchus, lung</td>
<td>18.9</td>
</tr>
<tr>
<td>Nasopharynx</td>
<td>13.8</td>
</tr>
<tr>
<td>Colorectal</td>
<td>8.1</td>
</tr>
<tr>
<td>Stomach</td>
<td>11.8</td>
</tr>
<tr>
<td>Lymphoma</td>
<td>6.0</td>
</tr>
<tr>
<td>Liver</td>
<td>6.4</td>
</tr>
<tr>
<td>Leukemia</td>
<td>3.4</td>
</tr>
<tr>
<td>Prostate</td>
<td>3.8</td>
</tr>
<tr>
<td>Skin (including melanoma)</td>
<td>4.5</td>
</tr>
<tr>
<td>Bladder</td>
<td>2.9</td>
</tr>
</tbody>
</table>

## Annual Age-standardised-rates per 100,000 for 10 leading cancer sites in females by ethnicity, Sarawak, 2001-2005

<table>
<thead>
<tr>
<th>Sites</th>
<th>Ethnic Groups</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Iban</td>
<td>Chinese</td>
<td>Malay</td>
<td>Bidayuh</td>
<td>Melanau</td>
</tr>
<tr>
<td>Breast</td>
<td>8.0</td>
<td><strong>29.9</strong></td>
<td>24.6</td>
<td>8.3</td>
<td>4.9</td>
</tr>
<tr>
<td>Cervix</td>
<td><strong>16.0</strong></td>
<td>13.6</td>
<td>11.2</td>
<td>13.1</td>
<td>8.2</td>
</tr>
<tr>
<td>Colorectal</td>
<td>5.5</td>
<td><strong>22.3</strong></td>
<td>7.7</td>
<td>9.7</td>
<td>3.2</td>
</tr>
<tr>
<td>Trachea, Bronchus, Lung</td>
<td>8.8</td>
<td><strong>9.0</strong></td>
<td>7.7</td>
<td>8.5</td>
<td>3.9</td>
</tr>
<tr>
<td>Ovary</td>
<td>6.4</td>
<td>7.8</td>
<td>7.1</td>
<td>6.8</td>
<td>4.2</td>
</tr>
<tr>
<td>Nasopharynx</td>
<td>5.9</td>
<td>4.2</td>
<td>3.2</td>
<td><strong>15.0</strong></td>
<td>1.5</td>
</tr>
<tr>
<td>Stomach</td>
<td>5.3</td>
<td>6.5</td>
<td>4.3</td>
<td><strong>12.5</strong></td>
<td>3.3</td>
</tr>
<tr>
<td>Lymphoma</td>
<td>5.0</td>
<td>4.1</td>
<td>4.5</td>
<td><strong>7.0</strong></td>
<td>2.0</td>
</tr>
<tr>
<td>Leukemia</td>
<td>3.4</td>
<td>3.4</td>
<td><strong>4.1</strong></td>
<td>2.3</td>
<td>2.0</td>
</tr>
<tr>
<td>Corpus Uteri</td>
<td>3.3</td>
<td><strong>5.2</strong></td>
<td>3.9</td>
<td>3.1</td>
<td>4.0</td>
</tr>
</tbody>
</table>

More than 40 research publications on CVD by authors from Sarawak

- Use of 64-row MDCT and Syngo Circulation as an Objective Coronary Imaging Tool Before Percutaneous Coronary Stenting.

- A novel approach to identifying culprit lesions in acute coronary syndrome by multidetector computed tomography.
More than 40 research publications on CVD by authors from Sarawak

- Carotid intima media thickness and high sensitivity C-reactive protein as markers of cardiovascular risk in a Malaysian population.

- Prevalence of asymptomatic atrial fibrillation in Malaysian patients with hypertension.

- Early detection of C-reactive protein and von Willebrand factor levels in Malaysian patients with acute coronary syndrome.

- Cytochrome P450 2C19 polymorphism and platelet aggregation in clopidogrel-treated patients among Malaysian multiethnic population.
ESOTERICA

Injury by Durian fruit
Penetrating Ocular Injury by Durian Fruit
S. Aziz, T. Asokumaran, G. Intan,

After surgical repair; Marks of durian spines can be seen on the patient’s face. The cornea appeared hazy with no view of the iris and the posterior segment due to hyphema.

Note: the patient lost vision in the affected eye and four months after the initial injury, ocular prosthesis fitting was done for cosmetic reason.
Advice: wear a crash helmet when collecting durian.
ESOTERICA

Jering poisoning
Acute Anuric Renal Failure Following Jering Bean Ingestion
Jin Shyan Wong, Teng-Aik Ong, Hock-Hin Chua and Clare Tan,
ASIAN JOURNAL OF SURGERY VOL 30 • NO 1 • JANUARY 2007

https://upload.wikimedia.org/wikipedia/commons/b/b3/Jering_Archidendron_pauciflorum.JPG
http://mysarawak2.blogspot.my/2013/06/the-jering-tree.html
Urinary system

Normal System

Ureterovesical Junction Obstruction

Acute Anuric Renal Failure Following Jering Bean Ingestion

• Djenkol bean or jering (*Pithecellobium jeringa*)
• Jering contains 1-2% djenkolic acid, a sulfur-containing amino acid
• A healthy 45-year-old man presented with
  • colicky left loin pain,
  • dysuria,
  • frank haematuria and
  • foul smelling urine a day after ingesting jering.
• He developed oliguria and was anuric by the 3rd day

• Jin Shyan Wong, Teng-Aik Ong, Hock-Hin Chua and Clare Tan. Acute Anuric Renal Failure Following Jering Bean Ingestion. *ASIAN JOURNAL OF SURGERY* VOL 30 • NO 1 • JANUARY 2007
Acute Anuric Renal Failure Following Jering Bean Ingestion

• Initially, he was treated with intravenous hydration and frusemide, but urine output remained poor.
• Serum creatinine increased from 176 to 848 μmol/L over 3 days.
• Hence, urgent bilateral ureteric stenting was done, and thick “tomato sauce” sludge was found.
• The patient subsequently had good diuresis after the procedure.
• The stents were removed 4 days later.

ESOTERICA

Pufferfish (*Ikan Buntal*) poisoning
Case Report – Pufferfish Poisonings in Malaysia

• Pufferfish is not considered as “a delicacy” in Malaysia except in Betong, a district in Sarawak where various dishes of yellow pufferfish are consumed by the local community.

• ikan buntal kuning (Xenopterus naritus), this species of pufferfish is found in abundance along the Batang (River) Saribas in Betong, Sarawak

• Although rarely occurs, 4 cases of pufferfish poisonings with 5 fatalities were reported recently. Two of them took place in the peninsula, one in Sabah, one in Sarawak.

• Two deaths were reported upon consumption of salted pufferfish roes.

• It was reported that the victims purchased the salted pufferfish roes from a shop in a village in Saratok. Department of Health in Saratok took immediate action to confiscate and ban further selling of pufferfish products in that area.

• When screened, the salted eggs samples were found to contain high concentration of tetrodotoxin.

• Razak Hi Lajis, Che Nin Man, Nurjuliana Mohd Noor, Sazaroni Md. Rashid
National Poison Centre, University Sains Malaysia, 11800 Minden, Penang
Sri Aman pufferfish versus Japan’s Fugu

Preparing fugu, Japan's poisonous fish dish

S a k a i D a n a: Another Weekend In Bandar Sri Aman. sakaidana.blogspot.com

https://www.google.com/search?q=puffer+fish+preparation+Sarawak&client=firefox-b&biw=1900&bih=905&source=lnms&tbm=isch&sa=X&ved=0ahUKEwiz5Pyc4r7PAhVIpY8KHQ1_AdEQ_AUIBygC#tbm=isch&q=puffer+fish+betong+market&imgrc=5VhBsP3JxrKeM%3A
ESOTERICA

Tapioca poisoning
Tapioca, *Manihot utilissima*,

- contains several alkaloids,
- the poisonous substance is hydrocyanic or prussic acid (15 to 28 ppm).
- Acute poisoning presents with nausea, vomiting, abdominal distension, cyanosis, dyspnœea, apathy, collapse and death.

- Of the two children,
  - one developed more severe symptoms
    - since she ate more of the tapioca cake and
    - possibly the child's high gastric acid content resulted in increased hydrolysis of linamarin and free HCN.
- The patients responded to administration of sodium thiosulphate,
ESOTERICICA

Palang
Photos of Instruments used for inserting Palang (the instruments belonged to an old Kenyah man in Lio Mato in 1986)

Left:
Coconut husk used to protect the sharpness of a sharpened iron nail in Bamboo slivers to squeeze the glans penis

Top:
How the hole is made through the glans penis
Plate III. Calcinated encrusted mass on palang operated from an Iban male, 1964. The ends of the metal penis-bar just show at the top and bottom left. Scale in millimetres.
Modern Penile Implants

• **Bolitas culture: Penile implants and the Filipino male ego!**, 
  • by Kate Natividad. August 11, 2013 

• **Penile Implants among (Australian) Prisoners—A Cause for Concern?**
  • PLOS 1. Published: January 11, 2013. DOI: 10.1371/journal.pone.0053065
  • [http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0053065](http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0053065)
PLANTS
PLANTS

Bintangor Tree and Calanolides
This bintangor tree (Calophyllum sp.) has been tapped and the sap collected to investigate its medicinal properties, including potential AIDS treatment. Photographed in Kubah National Park, Sarawak, Malaysian Borneo.


The Bintangor tree, which produces a compound that fights HIV. Pharmaceuticals replicated the compound in the lab to avoid having to harvest rainforest trees. Photo: Dr. Doel Saefarto. Courtesy of Sarawak MediChem Pharmaceuticals http://www.terracompr.com/Projects/advancedlife.html
Selected Publications on Calanolide A related to Sarawak

• Antiviral Activity and Mechanism of Action of Calanolide A Against the Human Immunodeficiency Virus Type-1

• Sensitivity and Resistance To (+)-Calanolide A of Wild-Type and Mutated Forms of HIV-1 Reverse Transcriptase

• Calanolides, the Naturally Occurring Anti-HIV Agents
PLANTS

Sarawak Biodiversity Centre
Sarawak Biodiversity Centre
Sarawak Biodiversity Centre
https://www.google.com/maps
Selected Publications Related to Medicinal Plants from Sarawak

- **Photodynamic Activity of Plant Extracts from Sarawak, Borneo**
  - Wan Wui Jong, Pei Jean Tan, Fadzly Adzhar Kamarulzaman, Michele Mejin, Diana Lim, Ida Ang, Margarita Naming, Tiong Chia Yeo, Anthony Siong Hock Ho, Soo Hwang Teo, and Hong Boon Lee. Chemistry & Biodiversity – Vol. 10 (2013)

- **Identification of Traditional Medicinal Plant Extracts With Novel Anti-Influenza Activity**

- **Comparative Antimicrobial Activity of South East Asian Plants Used in Bornean Folkloric Medicine**

- **Building a Discovery Partnership with Sarawak Biodiversity Centre: A Gateway to Access Natural Products from the Rainforests**
Medicinal plants used as indigenous herbal medicines that showed the highest antimicrobial activities:

- Fibraurea tinctoria
- Pyrenaria jonquieriana
- Baccaurea lanceolata
- Goniothermalus tapisoides
- Polyalthia hookeriana
CLINICAL RESEARCH CENTRES
Clinical Trials

• The global market for clinical trials
  • estimated to reach USD14.2 billion in 2016
  • projected to reach USD22 billion by 2021

• In Asia,
  • the growth rate has outpaced the rest of the world
  • approximately 30% year-on-year growth.
Setting up Clinical Research Centres (CRC) to seize the opportunities in Clinical Research

• clinical research as part of national healthcare National Key Economic Areas.
• Many facilities and much resources have been made available by the Ministry of Health, over the last 10 years.
• CRCs function as the clinical research arm of the Ministry of Health
  • It currently has 33 branches located at major Ministry of Health hospitals;
    • three are based in Sarawak, namely
      • CRC Sarawak General Hospital
      • CRC Sibu hospital and
      • CRC Miri Hospital.
Performance of CRCs in Sarawak

• In 2015, Sarawak General Hospital was the most active CRC with 34 trials followed by Kuala Lumpur General Hospital.
  • It shows that Sarawak Health Department staff is fast becoming well-known to be actively engaging in research.

• There were 123 publications by Malaysian CRC staff in 2015,
  • with 20% published in Tier 1 (top 25% of the journal impact factor distribution) and
  • 88% appeared in international journals including the New England Journal of Medicine and the American College of Cardiology.

• Many of the publications were contributed by researchers from Sarawak.
New CRC Building at Sarawak General Hospital
<table>
<thead>
<tr>
<th>Phase</th>
<th>Primary Goal</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preclinical</td>
<td>Testing of drug in non-human subjects, to gather efficacy, toxicity and pharmacokinetic information</td>
<td>unrestricted</td>
</tr>
<tr>
<td>Phase 0</td>
<td>Pharmacokinetics particularly oral bioavailability and half-life of the drug</td>
<td>Very small, sub-therapeutic</td>
</tr>
<tr>
<td>Phase I</td>
<td>Testing of drug on healthy volunteers for dose-ranging</td>
<td>Often sub-therapeutic, but with ascending doses</td>
</tr>
<tr>
<td>Phase II</td>
<td>Testing of drug on patients to assess efficacy and safety</td>
<td>Therapeutic dose</td>
</tr>
<tr>
<td>Phase III</td>
<td>Testing of drugs on patients to assess efficacy, effectiveness and safety</td>
<td>Therapeutic dose</td>
</tr>
<tr>
<td>Phase IV</td>
<td>Postmarketing surveillance – watching drug use in public</td>
<td>Therapeutic dose</td>
</tr>
</tbody>
</table>
Penans of Ba’ Ajeng, near Lio Mato, Baram. Sunday, 6 April 1986
Katibas River, somewhere above Song, c2000