LAMPIRAN 2.1

MASYARAKAT CINA DI NEGERI-NEGERI MELAYU BERSEKUTU, 1901 DAN 1911

(A) KOMPOSISI BERDASARKAN KUMPULAN DIALEK DAN JANTINA PADA 1 MAC 1901

KUMPULAN DIALEK	PERAK		SELANGOR		NEGERI SEMBILAN		PAHANG		JUMLAH	
	L	P	L	P	L	P	L	P	L	P
Kantonis	59,402	7,675	25,968	5,493	7,325	643	2,943	136	95,638	13,947
Hokkien	24,170	1,409	29,479	1,028	7,715	201	12	51	61,376	2,689
Hailam	2,425	66	3,328	68	5,920	15	782	5	12,455	154
Kheh	33,080	2,562	33,236	3,661	8,046	346	2,758	175	77,120	6,744
Cina Selat	1,691	1,707	1,016	888	278	283	119	74	3,104	2,952
Teochiew	13,257	270	3,982	188	980	57	414	25	18,633	540
Kwong Si	1,005	29	325	28	442	16	384	2	2,156	75
Lain-lain	81	6	74	6	594	40	13	2	762	54
JUMLAH	135,111	13,724	97,408	11,360	31,300	1,601	7,425	470	271,244	27,155

Sumber: Diubahsuai daripada *Population by Nationalities*, hlm. 89, CO,575/1/1904.

(B) KOMPOSISI BERDASARKAN KUMPULAN DIALEK DAN JANTINA PADA MAC 1911

KUMPULAN DIALEK	PERAK		SELANGOR		NEGERI SEMBILAN		PAHANG		JUMLAH	
	L	P	L	P	L	P	L	P	L	P
Kantonis	66,715	18,044	29,210	10,762	8,460	1,656	6,315	1,263	110,700	31,725
Kheh	56,585	10,387	44,703	10,662	9,329	1,250	4,740	722	115,357	23,021
T. Kheh	1,684	169	2,593	358	319	29	111	7	4,707	563
Hokkien	30,223	5,470	25,585	3,656	7,024	647	4,465	289	67,297	10,062
Hin Chua	3,321	19	7,326	65	840	9	1,193	5	12,680	98
Hok Chin	1,458	262	1,808	18	109	13	58	3	3,433	296
Teochiew	13,759	729	4,703	503	1,125	122	861	88	20,448	1,442
Hailam	5,624	105	6,799	120	9,212	82	1,885	26	23,520	333
Kwong Sai	1,122	89	904	105	233	18	1,911	17	4,170	229
Lain-lain	1,176	265	746	282	314	52	288	40	2,524	639
JUMLAH	181,667	35,539	124,377	26,531	36,965	3,878	21,827	2,460	364,836	68,408

Sumber: Diubahsuai daripada *Population by Nationalities*, hlm. 99, CO,575/9/1912.
Petunjuk: L – Lelaki P – Perempuan

(C) PERBANDINGAN KOMPOSISI MASYARAKAT CINA DI NEGERI-NEGERI MELAYU BERSEKUTU, 1901 DAN 1911

KUMPULAN DIALEK	PERAK		SELANGOR		NEGERI SEMBILAN		PAHANG		JUMLAH	
	1901	1911	1901	1911	1901	1911	1901	1911	1901	1911
Kantonis	67,077	84,759	31,461	39,972	7,968	10,116	3,079	7,578	109,585	142,425
Kheh	35,642	66,972	36,897	55,365	8,392	10,579	2,933	5,462	83,864	138,378
Hokkien	25,579	35,693	30,507	29,241	7,916	7,671	63	4,754	64,065	77,359
Teochiew	13,527	14,488	4,170	5,206	1,037	1,247	439	949	19,173	21,890
Hailam	2,491	5,729	3,396	6,919	5,935	9,294	787	1,911	12,609	23,853
Hin Chua	-	3,340	-	7,391	-	849	-	1,198	-	12,778
T. Kheh	-	1,853	-	2,951	-	348	-	118	-	5,270
Cina Selat	3,398	-	1,904	-	561	-	193	-	6,056	-
Hok Chin	-	1,720	-	1,826	-	122	-	61	-	3,729
Kwong Sai	-	1,211	-	1,009	-	251	-	1,928	-	4,399
Kwong Si	1,034	-	353	-	458	-	386	-	2,231	-
Lain-lain	87	1,441	80	1,028	634	366	15	328	816	3,163
JUMLAH	148,835	217,206	108,768	150,908	32,901	40,843	7,895	24,287	298,399	433,244

Sumber: Diubahsuai daripada *Population by Nationalities*, hlm. 89, CO,575/1/1904 dan *Population by Nationalities*, hlm. 99, CO,575/9/1912.
Nota: T. Kheh – Teochiew Kheh

LAMPIRAN 2.2

MASYARAKAT INDIA DI NEGERI-NEGERI MELAYU BERSEKUTU, 1901 DAN 1911

(A) KOMPOSISI BERDASARKAN KUMPULAN DIALEK DAN JANTINA PADA 1 MAC 1901

KUMPULAN DIALEK	PERAK		SELANGOR		NEGERI SEMBILAN		PAHANG		JUMLAH	
	L	P	L	P	L	P	L	P	L	P
Bengali	3,341	324	1,120	111	380	39	289	20	5,130	494
Burma	42	25	7	3	-	-	-	-	49	28
Parsi	2	-	31	-	-	-	-	-	33	-
Tamil	22,647	8,329	12,255	3,221	3,866	1,241	786	132	39,554	12,923
JUMLAH	26,032	8,678	13,413	3,335	4,246	1,280	1,075	152	44,766	13,445

Sumber: Diubahsuai daripada *Population by Nationalities*, hlm. 70-71, CO,575/1/1904.

(B) KOMPOSISI BERDASARKAN KUMPULAN DIALEK DAN JANTINA PADA 10 MAC 1911

KUMPULAN DIALEK	PERAK		SELANGOR		NEGERI SEMBILAN		PAHANG		JUMLAH	
	L	P	L	P	L	P	L	P	L	P
Tamil	42,507	15,228	50,632	15,929	12,099	3,457	3,345	588	108,583	35,202
Telegu	3,689	1,972	1,889	1,196	602	164	238	75	6,418	3,407
Punjabi	4,101	592	1,246	115	494	46	1,251	74	7,092	827
Bengali	2,766	386	968	102	382	29	389	28	4,505	545
Malayali	1,105	93	862	96	624	72	264	4	2,855	265
Hindustani	480	115	298	75	170	11	192	13	1,140	214
Afghan	271	25	439	5	45	3	59	2	814	35
Gujerati	49	7	63	8	1	-	35	3	148	18
Mahratta	21	9	57	6	10	4	13	3	101	22
Burma	17	14	6	4	-	1	-	-	23	19
Lain-lain	73	19	59	12	20	14	34	1	186	46
JUMLAH	55,079	18,460	56,519	17,548	14,447	3,801	5,820	791	131,865	40,600

Sumber: Diubahsuai daripada *Population by Nationalities*, hlm. 100-101, CO,575/9/1912.
Petunjuk: L – Lelaki P – Perempuan

(C) PERBANDINGAN KOMPOSISI MASYARAKAT INDIA DI NEGERI-NEGERI MELAYU BERSEKUTU, 1901 DAN 1911

KUMPULAN DIALEK	PERAK		SELANGOR		NEGERI SEMBILAN		PAHANG		JUMLAH	
	1901	1911	1901	1911	1901	1911	1901	1911	1901	1911
Bengali	3,665	3,152	1,231	1,070	419	411	309	417	5,624	5,050
Burma	67	31	10	10	-	1	-	-	77	42
Parsi	2	-	31	-	-	-	-	-	33	-
Tamil	30,976	57,735	15,476	66,561	5,107	15,556	918	3,933	52,477	143,785
Telegu	-	5,661	-	3,085	-	766	-	313	-	9,825
Punjabi	-	4,693	-	1,361	-	540	-	1,325	-	7,919
Malayali	-	1,198	-	958	-	696	-	268	-	3,120
Hindustani	-	595	-	373	-	181	-	205	-	1,354
Afghan	-	296	-	444	-	48	-	61	-	849
Gujerati	-	56	-	71	-	1	-	38	-	166
Mahratta	-	30	-	63	-	14	-	16	-	123
Lain-lain	-	92	-	71	-	34	-	35	-	232
JUMLAH	34,710	73,539	16,748	74,067	5,526	18,248	1,227	6,611	58,211	172,465

Sumber: Diubahsuai daripada *Population by Nationalities*, hlm. 70-71, CO,575/1/1904 dan *Population by Nationalities*, hlm. 100-101, CO,575/9/1912.

LAMPIRAN 2.3

KOMPOSISI PENDUDUK MENGIKUT KAUM DI BANDAR-BANDAR UTAMA NEGERI-NEGERI MELAYU BERSEKUTU, 1901 DAN 1911

NEG.	DAERAH DAN BANDAR	MELAYU		CINA		INDIA		LAIN-LAIN		JUMLAH PENDUDUK	
		1901	1911	1901	1911	1901	1911	1901	1911	1901	1911
PERAK	LARUT:										
	Taiping	781	1,471	7,972	11,435	3,874	5,908	704	742	13,331	19,556
	KUALA KANGSAR:										
	Kuala Kangsar	167	712	514	788	441	666	35	48	1,157	2,214
	KRIAN:										
	Bagan Serai	386	420	652	743	884	943	20	28	1,942	2,134
	Parit Buntar	175	340	630	1,097	691	883	70	51	1,566	2,371
	Kuala Kurau	511	617	330	599	139	368	14	6	994	1,590
	KINTA:										
	Ipoh	1,359	2,441	9,067	16,390	1,917	4,295	448	852	12,791	23,978
	Kampar	378	393	5,056	9,952	411	1,162	62	97	5,907	11,604
	Batu Gajah	690	839	1,700	1,903	705	926	166	148	3,261	3,815
	Menglembu	10	60	3,105	3,352	67	577	11	10	3,193	3,999
	Lahat	27	43	2,397	1,282	99	83	7	8	2,530	1,416
	Gopeng	522	432	1,983	3,768	597	704	55	53	3,157	4,957
	Papan	51	104	2,211	2,156	165	115	14	14	2,441	2,389
	HILIR PERAK:										
	Teluk Anson	744	1,786	1,618	3,584	679	1,417	93	140	3,134	6,927
	BATANG PADANG:										
	Tapah	446	504	897	1,055	838	736	63	31	2,244	2,326
	JUMLAH	6,247	10,162	38,132	58,104	11,507	18,782	1,762	2,228	57,648	89,276

SELANGOR	KUALA LUMPUR:										
	Kuala Lumpur	3,727	4,226	23,181	31,152	4,435	9,068	1,038	2,272	32,381	46,718
	Sungei Besi	36	14	3,576	2,659	124	169	20	46	3,756	2,888
	HULU SELANGOR:										
	Serendah	405	243	4,564	2,985	251	213	138	25	5,358	3,466
	Rawang	219	-	3,639	-	106	-	51	-	4,015	-
	Kuala Kubu	368	661	1,851	2,942	381	521	43	124	2,643	4,248
	Rasa	75	72	652	861	43	35	5	20	775	988
	KLANG:										
	Klang	650	1,581	1,976	3,834	784	1,989	166	253	3,576	7,657
	HULU LANGAT:										
	Kajang	228	290	1,167	1,965	544	401	600	66	**2,539**	2,722
	JUMLAH	5,708	7,087	40,606	46,398	6,668	12,396	2,061	2,806	55,043	68,687
NEGERI SEMBILAN	SEREMBAN:										
	Seremban	873	1,080	2,379	5,414	1,256	1,570	257	603	4,765	8,667
	Mantin	113	168	934	745	14	43	7	8	1,068	964
	COAST:										
	Port Dickson	207	175	765	697	296	307	120	84	1,388	1,263
	JELEBU:										
	Kuala Klawang	497	128	339	271	83	62	18	15	937	476
	Titi	39	25	883	1,038	-	10	6	9	928	1,082
	KUALA PILAH:										
	Kuala Pilah	2,438	345	570	817	126	393	72	99	3,206	1,654
	JUMLAH	4,167	1,921	5,870	8,982	1,775	2,385	480	818	12,292	14,106
PAHANG	HULU PAHANG:										
	Kuala Lipis	370	237	439	394	286	304	47	37	1,142	972
	Raub	26	196	439	598	165	296	24	64	654	1,154
	KUANTAN:										
	Kuala Kuantan	465	518	226	1,321	27	190	7	73	725	2,102
	JUMLAH	861	951	1,104	2,313	478	790	78	174	2,521	4,228
	JUMLAH BESAR	16,983	20,121	85,712	115,797	20,428	34,353	4,381	6,026	127,504	176,297

Sumber: Data diubahsuai daripada *Census Taken on 1st March, 1901*, hlm. 74-75, CO,575/1/1904 dan *Census Taken on 10th March, 1911*, hlm. 104-105, CO,575/9/1912.

Nota: Angka yang dihitamkan adalah pembetulan dari angka asal yang diberikan oleh sumber iaitu 1,999.

LAMPIRAN 3.1

PENGELASAN TEORI AWAL TENTANG PUNCA BERI-BERI

I. BERIBERI AS A GROUP OF DISEASES, EACH ONE HAVING A SPECIFIC CAUSE
- Dürck, H.
- Luce, H.
- Nocht, B.

II. BERIBERI AS A SPECIFIC DISEASE
- Beriberi caused by physical agencies

- Beriberi an intoxication
  - Inorganic, without the agency of microorganisms
    - Arsenical poisoning (Ross)
    - Oxalate poisoning (Treutlein, Maurer)
    - Carbon dioxide poisoning (Ashmead)
  - Organic, without microorganisms or caused by hypothetical microorganisms
    - Absorption of a toxin produced by some free living germ outside the body (Manson)
    - Toxin produced in food outside the body
      - Ichthyotoxismus (Grimm, Miura)
      - Sitotoxismus – Lathryism
        Rice (Voderman, Braddon, Yamagiwa, Van Dieren)
    - An auto-intoxication (Dürck)

- Beriberi an infection
  - By animal parasites
    - Protozoa
      - Plasmodium in blood (Glogner)
      - Protozoa in urine (Hewlett and Korte)
      - Haematozoa in blood (Fajardo, Voorthuis)
    - Nemathelmintae
      - Trichiuris trichiura (Erni, Kynsey)
      - Anchylostoma duodenale (Noc, Kynsey)
  - By vegetable parasites
    - Bacteria
      - Cocci in alimentary canal, etc. (Dangerfield)
      - Diplococcus in urine (Tsuzuki)
      - Diplococcus from blood, urine and organs post mortem (Okata and Kokubo)
      - Four kinds of cocci (Musso and Morelli)
      - Cocci in blood and air (Pekelharing and Winkler)
      - Bacilli and cocci (Lacerda)
      - Bacillus (Taylor)
      - Bacillus (Rost)
      - Bacillus (Ogata)
      - Three kinds of bacilli (Nepveu)
      - Bacillus (Eecke)
      - Bacillus in alimentary canal (Hamilton Wright)
    - Fungi – Mouldy rice (Hose)

- Beriberi due to some deficiency in the food
  - Deficient fat (Bremaud, Laurent)
  - Nitrogen starvation (Takaki)
  - Deficient vegetables combined with an infection (Fales)
  - Deficiency in organic phosphorus (Schaumann)
  - Deficiency of some yet unknown substance not phosphorus (Fraser and Stanton, Chamberlain and Vedder, Shiga, Funk, etc.)

Sumber: Dipetik dan disesuaikan daripada Robert R. Williams, *Toward the Conquest of Beriberi*, Cambridge: Harvard University Press, 1961, hlm. 14-15.

LAMPIRAN 3.2

THE ETIOLOGY OF BERI-BERI

The suggestion of a causal relationship between the consumption of white rice and the disease beri-beri was first formally made in this country by Braddon.[1] This observer also drew attention to the important fact that those who consumed rice that had been parboiled before husking remained free from the disease, as did also the native Malays who consumed rice prepared by primitive methods of pounding and winnowing.

A series of observations made by the writers[2] in 1907 on two parties of labourers, under conditions which excluded or adequately controlled the operation of factors other than diet, confirmed the correctness of this view of the causation of the disease. The prior observations of Fletcher[3] and Lucy[4] in this country and of Dubruel[5] in Indo-China and the recently published observations of Ellis[6] furnish further testimony, and it may now be claimed that the theory rests on a solid basis of evidence.

The mechanism by which the white rice was able to produce this result has remained obscure. Braddon suggested that "the cause of the disorder is not indeed ride, qua rice, or as an article of diet, but diseased rice; rice from which poison derived from decay, due perhaps to some fungus, or mould, or germ, or spore, originally perhaps growing upon the husk, has become mixed during the process of milling; or upon which such fungus may have grown and such poison have been produced after decortication". Eijkman[7] from experiments on fowls concluded that a definite poison exists commonly in rice and that for this poison or its effects something in the pericarp is an antidote. Dubruel conceived the ingestion of an organism associated with white rice, which organism multiplying in the body produced the disease.

Following the line of thought suggested by the poison hypothesis researches were undertaken to determine whether from white rices actually associated with outbreaks of beri-beri there could be extracted by means of various solvents any substance or substances recognisable by chemical methods as poisonous in character. These researches failed of their object, though it is admitted that accuracy of the poison hypothesis was not thereby disproved.

Certain results which emerged from chemical analysis and histological examination of the rices turned attention to the possibility of an explanation of the course of events on an hypothesis of a defect of nutrition. That this explanation was inadequate, if dietary constituents as estimated by the ordinary analytical methods were alone considered, had been shown in the preliminary investigation.

By a series of experiments on domestic fowls, the details of which will be supplied in a later publication, it was shown that these animals when fed on various kinds of rice were sensitive to differences between them. The fowls were confined in separate compartments and were in all respects under identical conditions.

By further and repeated experiments with rices known to have been associated with outbreak of beri-beri and with controls under identical conditions fed on parboiled rice, it was established that a certain reaction in fowls might be taken as an indicator of the beri-beri-producing power of a given rice when forming the staple of the diet in man. Whether the disease reduced in fowls be accepted or not as analogous to beri-beri in man, the validity of the argument here advanced remains unimpaired.

Rices were available that were known to have been associated with outbreaks of beri-beri, samples having been taken daily during the continuance of the preliminary enquiry in 1907.

Also through the courtesy of Dr. J. D. Gimlette and Dr. G. D. Freer we were enabled to procure white rice which was being consumed prior to an outbreak of beri-beri among Malays at the Kuala Lumpur Police Depot, which outbreak ceased on changing the rice supplied to the parboiled variety. It was shown that these rices when fed to fowls constantly produced a certain disease in a large proportion of them, while parboiled rice as constantly failed to produce this result in groups under identical conditions. This disease is characterized by paralysis of the legs, followed by paralysis of the wings in the more severe cases. In cases showing a moderate degree of paralysis the gait resembles very closely that seen in Beri-Beri. The nerves of fowls suffering from this disease show typical Wallerian degeneration.

It is our belief that this disease, polyneuritis gallinarum, is truly analogous to beri-beri in man, similar in its etiology, in its clinical manifestations and we have shown them to be identical in their pathological effects, and that its occurrence should be held as important confirmatory testimony of the connection between white rices and beri-beri. It is desirable, however, to emphasize the point that the acceptance or non-acceptance of this opinion is immaterial to the argument; for this purpose the occurrence of the disease is employed only as a reaction. The fact that certain white rices when forming the staple of a diet in man produced beri-beri rests on quite other testimony than that supplied by experiments on domestic fowls.

The commercial varieties of white rice are numerous, but in this country, apart from the grading as to quality, two varieties are in common use and are known respectively as Siam and Rangoon.

From epidemiological considerations and from experimental evidence it appears that Siam rice is considerably more potent in its beri-beri-producing powers than Rangoon rice.

The proteins, fats, carbohydrates, and such were determined for the different varieties of rice which had been employed in the experiments, with the following percentage results calculated on dried material.

	Proteins	Fats	Carbohydrates	Ash
White rice (Siam)	9.07	0.17	90.11	0.65
White rice (Rangoon)	8.44	0.81	89.90	0.65
Parboiled rice	9.48	0.51	89.12	0.89

A comparison of these results shows that the only marked difference among the rices was in respect of fats, which was most abundant in the variety known as Rangoon, less abundant in parboiled rice, and still less abundant in Siam rice. These observations, taken in conjunction with the experimental results in fowls, excluded the possibility of an explanation of the origin of beri-beri on the group of a deficiency in fat. It will be noted that these analyses did not include an estimation of the relative proportions of the inorganic salts composing the ash, nor did they take account of the manner of combination, organic or inorganic, in which these substances originally existed in the rice grain.

By a method devised in this laboratory, sections of the various rice grains were obtained of sufficient thinness to permit the examination in detail of their histological characters. By suitable staining methods it was shown that in parboiled rice remnants of the pericarp remained attached to the rice grain whereas in Siam rice the pericarp and the layers subjacent to it (subpericarpal layers) had been polished away. It would appear that parboiling renders the grain tough and non-friable, in consequence the subpericarpal layers cannot be removed so readily as in the untreated grain. It was further demonstrated that the layers so retained in parboiled rice contained the most of the aleurone and oily material present in rice grain. Rice as prepared by primitive methods (Malay rice) was similarly examined, and, as might have been expected from the pounding to which this rice had been subjected, parts of the subpericarpal layers were chipped off to a varying extent, but on the whole these layers were retained to a greater extent than is the case with white rice.

Early in the course of the experiments the observation was made that parboiled rice subjected to exhaustion with hot alcohol and thereafter carefully dried in the sun to free it from alcohol, produced when fed to fowls a disease indistinguishable from that observed in fowls fed on white rice, though such parboiled rice in its original state was incapable of producing this result however long continued.

The association of the observations referred to in the two preceding paragraphs seemed to point a way to a solution of the problem. It has been shown that white rice as prepared in the mills of this country produced the same results in fowls as white rice known to have been associated with beri-beri. If now a substance or substances residing in the outer layers which are polished away in white rice and are retained in parboiled rice could be added to white rice and so prevent its harmful effects it was conceived that the nutritive hypothesis would thereby be supported.

In accordance with this idea the following experiments were initiated. A rice mill in Singapore was visited and there was obtained (A) a quantity of the grain deprived of the husk, (B) a quantity of the rice from the same lot of grain, that is the grain from which the subpericarpal layers had been polished off, (C) a quantity of the polishing, that is the material removed subsequent to the separation of the husk and includes the pericarp with the subpericarpal layers. The miller estimates that 40 parts of padi produce 25 parts of white rice, 5 parts of polishings and 10 parts of husk. The polishings are sold as food for cattle and the husks are burned as fuel in the mill.

Experiment A. Twelve fowls were fed on the husked grain for five weeks.

Result. All remained healthy.

Experiment B. Twelve fowls were fed on the white rice alone.

Result. In five weeks six had developed polyneuritis; two were dead, one having suffered from polyneuritis and one from a disease other than polyneuritis, five fowls remained healthy.

Experiment C. Twelve fowls were fed on rice taken daily from the same bag as that used in Experiment B; in addition, polishings in the form of emulsion, in amount equal to that milled from the quantity of rice consumed, were fed by a tube passed into the crop daily. This quantity was subsequently diminished week by week until only 3 grammes of polishings per kilogramme of body weight were being given daily. This amount sufficed to maintain the fowls in health and in constant weight.

Result. The experiment was continued for seven weeks and all remained healthy.

This result was subsequently confirmed for rice from known outbreaks of beri-beri.

It will be understood that these three experiments were in progress simultaneously and that the fowls were in all respects under identical conditions.

Experiment D. Part of the original padi was taken and milled by a Malay woman by primitive methods into the finished product as eaten by Malays. Eight fowls, fed for five weeks on the rice prepared from the original padi by the Malay method, remained healthy. Eight fowls only were used for this experiment as the quantity of padi then remaining sufficed only for this number for the time it was estimated the experiment would last.

Attention is drawn to the important point that the products used in these experiments were all derived from the same lot of padi, and the results force us to the conclusion that it is the polishing process which is essentially at fault; the polishing of white rice removes from the seed

some substance or substances essential to the maintenance of the normal metabolism of nerve tissues.

To elucidate the point as to whether rice when freshly milled is less harmful than that which has become stale, an assistant was stationed in Singapore who sent daily to the laboratory by the most expeditious route a quantity of rice milled on the day of dispatch. Twelve fowls were fed on this and five developed polyneuritis in four weeks. This result, which is similar to that obtained in other experiments, when fowls were fed on rices milled from four weeks to two years previously, disposes of the suggestion that the harmfulness of white rice is due to its staleness or to the development in it of a poisonous substance or substances subsequently to its being milled. The root of the evil lies in the milling process itself. The result further indicates the inadequacy of preventive measures founded by the poison hypothesis in regard to the use of freshly milled rice.

An experiment was now planned o determine whether a parboiled rice proved harmless could by exhaustion with hot alcohol be reduced to such a condition that it would produce polyneuritis when fed to fowls, and whether the substances so ? when fed to fowls with a white rice proved harmful could prevent the development of polyneuritis. For this purpose parboiled rice was repeatedly exhausted with hot alcohol. The alcoholic extracts were concentrated in vacuo at a temperature of 32 C, freed from alcohol and the residue emulsified in ? water. Experiment with these products showed that fowls fed on the exhausted parboiled rice contracted polyneuritis, and that fowls fed on a white rice proved harmful by previous experiment remained healthy if they received in addition a quantity of the extract.

Having by these and other experiments, the details of which are submitted so as not to encumber the argument, arrived at the point ? it was clear that the essential cause of beri-beri was to be sought for in a nutritive defect, further efforts were made to determine by chemical methods precise differences between various rices. Such differences, if they are to furnish an adequate explanation for the origin of beri-beri, must be in accordance with clinical observations and the experimental results in fowls.

In view of the important role played by phosphorus compounds in the metabolism of nerve tissues the amount of phosphorus in various kinds of rice was determined as phosphorus pentoxide. The result of a large series of observations showed that the amount of phosphorus pentoxide obtained from rice was directly related to the probability of the rice producing beri-beri in other words the higher the phosphorus content of a rice the less was the liability of that rice to produce the disease, and vice versa.

Thus a sample of parboiled rice which was fed to fowls over many weeks all remaining healthy was found to contain .469 per cent. P2O5 and a sample of white rice which produced polyneuritis in fowls yielded .277 per cent. P2O5. The rice polishings employed in Experiment C yielded 4.2 per cent. P2O5.

From a series of observations it was determined that a fowl under the conditions of our experiments weighing from 1,200 to 1,400 grammes required 60 grammes of parboiled rice daily to maintain it in health and in nutritive equilibrium. In Experience C it was determined experimentally, the chemical analysis being then unknown, that when fed on white rice a fowl of this weight required the addition of about 3.5 grammes of polishings to preserve it in nutritive equilibrium. From the data given above it may readily be calculated what amount of polishings added to white rice is required to raise the phosphorus content of the white rice diet to that of the parboiled rice diet. Thus

60 grammes of parboiled rice	0.3120 grms P2O5
60 " white "	0.1662 "
Difference	0.1458 " P2O5

Polishings contain 4.2 per cent phosphorus pentoxide.

Calculated from the phosphorus content therefore 3.47 grammes of polishings added to the 60 grammes of white rice supplied to a fowls of 1,200 to 1,400 grammes weight should preserve it in nutritive equilibrium. From experimental observation 3.5 grammes of polishings had been shown to accomplish this result. This can scarcely be regarded merely as a coincidence but its exact significance and importance cannot yet be estimated.

Fowls receiving nothing but water do not develop polyneuritis while fowls receiving only polished rice and water do. No satisfactory explanation of this observation ha as yet been obtained but further researches are in progress. Meanwhile the amount of phosphorus estimated as phosphorus pentoxide contained in a given rice may be used merely as an indicator of its liability or otherwise to procure beri-beri.

We are greatly indebted to Mr. B. J. Eaton, Chemist in this Institute, for valuable assistance in the chemical part of this investigation, and to Dr. R. D. Keith for suggestion as to methods for the examination of the nerves.

Summary

1. Beri-beri is a disorder of metabolism and, as it occurs in this country, is associated with a diet in which white rice is the principal constituent.

2. White riceas produced in the mills here commonly makes default in respect of some substance or substances essential for the maintenance of the normal metabolism of nerve tissues. These substances exist in adequate amount in the original grain and in superabundant amount in the polishings from white rice.

3. The estimation in terms of phosphorus pentoxide of the total phosphorus present in a given rice may be used as an indicator of the beri-beri-producing power of such rice when forming the staple of a diet in man.

The prevention of beri-beri in this country will be achieved by substituting for the ordinary white rice a rice in which the polishing process has been omitted or carried out to a minimal extent, or by the addition to a white rice diet of articles rich in those substances in which such white rice now makes default. One such article which is cheap and readily obtained is the polishings from the white rice.

The use of parboiled rice as suggested by Dr. Braddon will acieve [sic] a like result, provide that the polishing process is not carried beyond the limited extent now customary.

---

[1] Braddon, W. L. "The Etiology of Beri-beri," Federated Malay States Medical Archives, 1901. "The Cause and Prevention of Beri-beri," 1907

[2] Fraser, H., and Stanton, A. T. "An Inquiry Concerning the Etiology of beri-beri," Lancet, 1909; "An Inquiry Concerning the Etiology of Beri-beri," Studies from the Institute for Medical Research, 1909.

[3] Fletcher, W. "Rice and Beri-beri," Lancet, 1907; "Rice and Beri-beri," Journal of Tropical Medicine and Hygiene, 1909.

[4] Lucy, S. H. R. "Address, British Medical Association, Penang, 1905."

[5] Dubruel "Le Beri-beri," 1903.

[6] Ellis, W. G. "Uncured Rice as a Cause of Beri-beri," British Medical Journal, 1909.

[7] Eijkman, C. "Polyneuritis bij Hoenders," Jaaverslag van Lab. v. Path Anat. en. Bakt., Batavia, 1896.

Sumber: Dipetik daripada "Report from the Institute Medical Research for the Period from October 1st 1909 to March 31st 1910", hlm. 1-11, CO,273/361/14508.

LAMPIRAN 6.1(a)

JUMLAH PESAKIT YANG DIRAWAT DAN KEMATIAN DI NEGERI-NEGERI MELAYU BERSEKUTU, 1896-1914

TAHUN	JUMLAH PESAKIT YANG DIRAWAT	JUMLAH KES KEMATIAN	PERATUS KEMATIAN (%)
1896	46,821	6,505	13.9
1897	44,407	6,196	14.0
1898	40,325	4,363	10.8
1899	39,729	3,966	10.0
1900	55,776	7,179	12.9
1901	55,644	7,602	13.7
1902	48,223	5,838	12.1
1903	47,884	5,873	12.3
1904	48,509	6,046	12.5
1905	55,516	6,379	11.5
1906	59,315	7,648	12.9
1907	71,297	9,121	12.8
1908	84,105	10,907	13.0
1909	73,192	6,800	9.3
1910	80,824	6,589	8.2
1911	97,162	9,299	9.6
1912	97,162	8,786	9.0
1913	100,660	8,651	8.6
1914	100,614	8,624	8.6
JUMLAH	1,247,165	136,372	10.9

Nota: Sumber bagi lampiran 6.1(a), 6.1(b) dan 6.1(c) adalah sama dan dapat dirujuk pada lampiran 6.1(c).

LAMPIRAN 6.1(b)

JUMLAH PESAKIT YANG DIRAWAT DI PERAK, SELANGOR, NEGERI SEMBILAN DAN PAHANG, 1896-1914

TAHUN	PERAK	SELANGOR	NEGERI SEMBILAN	PAHANG
1896	24,486	17,709	3,270	1,356
1897	23,024	16,608	3,324	1,451
1898	23,297	12,705	3,128	1,195
1899	22,276	12,371	4,007	1,075
1900	31,579	17,963	5,016	1,218
1901	27,293	21,351	5,280	1,720
1902	23,703	**18,173**	4,453	1,894
1903	26,201	14,425	5,250	2,008
1904	24,822	14,319	7,162	2,206
1905	29,226	16,382	6,924	2,984
1906	27,178	18,963	8,948	4,226
1907	30,751	25,602	10,401	4,543
1908	35,595	30,287	12,884	5,339
1909	33,725	22,889	12,050	4,528
1910	36,501	25,082	13,944	5,297
1911	39,521	31,637	20,635	5,369
1912	42,067	32,171	17,399	5,525
1913	45,349	32,173	17,064	6,074
1914	45,595	31,754	17,054	6,211
JUMLAH	592,189	412,564	178,193	64,219

Nota: Angka yang dihitamkan adalah angka sebenar berdasarkan *SAR 1902*, hlm. xxiv berbanding dengan 18,175 yang diberikan oleh *SMR 1908*, hlm. 2.

LAMPIRAN 6.1(c)

JUMLAH KEMATIAN DI PERAK, SELANGOR, NEGERI SEMBILAN DAN PAHANG, 1896-1914

TAHUN	PERAK	SELANGOR	NEGERI SEMBILAN	PAHANG
1896	3,369	2,700	277	159
1897	3,075	2,644	284	193
1898	2,376	1,708	189	90
1899	2,282	1,437	184	63
1900	4,368	2,419	316	76
1901	4,207	2,797	366	232
1902	2,997	2,087	524	230
1903	3,366	1,872	414	221
1904	3,709	1,534	571	232
1905	3,620	1,856	553	350
1906	3,824	2,428	957	439
1907	3,969	3,354	1,346	452
1908	4,868	4,286	1,313	440
1909	3,077	2,475	881	367
1910	2,908	2,224	1,080	377
1911	3,519	3,255	2,198	327
1912	3,585	3,221	1,615	365
1913	3,670	3,152	1,451	378
1914	3,811	3,048	1,405	360
JUMLAH	66,600	48,497	15,924	5,351

Sumber: Disesuaikan daripada Laporan Tahunan dan Laporan Perubatan Perak, Selangor, Negeri Sembilan dan Pahang, 1896-1914: *PKAR 1903*, hlm. 32; *PKRDD 1904*, hlm. 12, dalam HCO,916/1905; *PKRDD 1905*, hlm. 11; *PKAR 1906*, hlm. xiv, dalam CO,438/3; *PKAR 1907*, hlm. xiv; *PKAR 1908*, hlm. xviii; *PKAR 1909*, hlm. xvii; *PKAR 1910*, hlm. xv; *PKAR 1911*, hlm. xiv; *PKAR 1912*, hlm. xiv; *PKAR 1913*, hlm. xiv; *PKAR 1914*, hlm. xiv; *SAR 1902*, hlm. xxiv; *SMR 1908*, hlm. 2; *SAR 1909*, hlm. xv; *SAR 1910*, hlm. xv; *SAR 1911*, hlm. xv; *SAR 1912*, hlm. xv; *SAR 1913*, hlm. xv; *SAR 1914*, hlm. xv; *NSAR 1900*, hlm. xvii; *NSAR 1905*, hlm. xix; *NSAR 1907*, hlm. xi; *NSAR 1909*, hlm. xv; *NSAR 1911*, hlm. xiv; *NSAR 1912*, hlm. xiv; *NSAR 1913*, hlm. xiv; *NSAR 1914*, hlm. xiv; *PHGAR 1900*, hlm. xii; *PHGAR 1905*, hlm. xvi; *PHGAR 1906*, hlm. xviii, dalam CO,437/3; *PHGAR 1907*, hlm. xii; *PHGAR 1908*, hlm. xii; *PHGAR 1909*, hlm. xi; *PHGAR 1910*, hlm. xi; *PHGAR 1911*, hlm. xi; *PHGAR 1912*, hlm. xi; *PHGAR 1913*, hlm. xi dan *PHGAR 1914*, hlm. xi.

LAMPIRAN 6.2

CARDINAL RULES FOR EUROPEANS TO MAINTAIN GOOD HEALTH IN THE TROPICS

Adult Europeans should not come out to the Federated States before they are twenty years of age, and should make up their minds to conform from the first to the cardinal rules for the preservation of health.

These may be shortly summed up as follows:-

Go to bed and get up early.

Avoid all excesses in eating and drinking.

Never go out between the hours of 8 a.m. and 4.30 p.m. without wearing a sun hat.

When possible, always wear flannel next to the skin.

Take exercise regularly and moderately, but not to excess, if avoidable.

Change clothes as soon as possible after exercise.

Avoid bathing in the middle of the day, or more than twice a day. In the evening, and after exercise, a warm bath is better than a cold one.

If doubtful about the purity of drinking water, always see for yourself that it is boiled, and do not take the servant's word for it. Filtering is often insufficient.

When traveling, drink as little as possible during the heat of the day, and always avoid roadside stalls.

The water of a young coconut is the best on these occasions, if obtainable.

Sumber: Dipetik daripada Lenore Manderson, "Race, Colonial Mentality and Public Health in Early Twentieth Century Malaya", dalam Peter J. Rimmer & Lisa M. Allen, *The Underside of Malaysian History: Pullers, Prostitutions, Plantation Workers ...*, Singapore: Singapore University Press, 1990, hlm. 197.