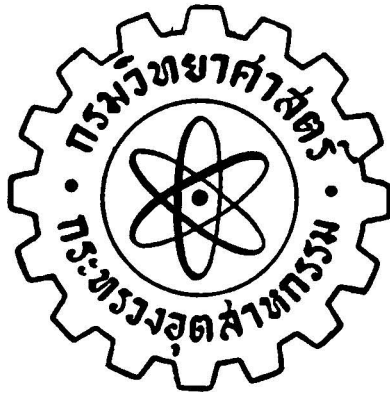


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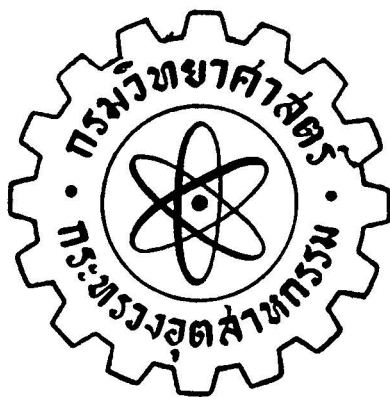
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Ministry of Industry, Bangkok, Thailand

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# A Milk Substitute for Infant Feeding, Prepared from Duck or Hen Eggs\*

Mrs. Vilai Devakul na Ayuthya  
Division of Biological Science, Department of Science  
and  
Pue Rochanapurananda  
Ministry of Industry

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The use of cow's milk as a substitute for mother's milk is practised all over the world including Thailand. Unfortunately, Thailand is not a milk producing country. She has to depend largely on imported milk, and this has certain disadvantages. In emergencies import goods cannot always be guaranteed and, furthermore, they must be purchased with foreign currency.

Dr. M. van Eekelen, Director of the Central Institute for Nutrition Research T.N.O., Utrecht, the Netherlands, who was appointed as an FAO Food Technologist to assist the Department of Science in 1955—56, suggested that a milk substitute could be made from eggs, both duck and hen eggs being abundant in Thailand. The nutritive properties of egg protein are excellent and comparable with those of milk proteins. The nutritive values of duck eggs, hen eggs, cow's milk and human milk are compared in Table I.

---

\* The paper was read at the Ninth Pacific Science Congress, Bangkok, on 28th November 1957.

Table I. Nutritive Values of Eggs, Cow's Milk, and Human Milk (per 100 g of edible portion)

Type of food	Water		Food energy	Protein	Fat	Carbo- hydrates	Minerals				Vitamins								
	%	Cal.					g	g	g	P	Fe	Ca	Na	K	Vit. A	Caro- tene	Thia- mine	Ribo- flavin	Nia- cin
			mg	mg	mg	mg													
Duck egg																			
2-1 Whole egg	70.8	189	13.1	14.3	0.8	195	2.8	56	100	150	0.18	0.06	0.18	(0.29)	(0.1)	—	—	—	
1- Egg yolk	47	383	17	35	—	400	7	150	50	150	0.51	0.17	0.60	0.40	0.1	—	—	—	
Hen egg																			
2-1 Whole egg	74	162	12.8	11.5	0.7	210	2.7	54	150	150	0.18	0.06	0.10	0.29	0.1	—	—	—	
2-1 Egg yolk	49.4	361	16.3	31.9	0.7	586	7.2	147	50	150	0.51	0.17	0.27	0.35	Traces	—	—	—	
3. Human milk	87.6	68	1.25	4.0	7.0	13	0.1	37	11	48	0.065	0.025	0.14	0.37	0.18	—	—	5.0	
2-1 Cow's milk	87	63	3.8	3.0	5.4	102	0.1	130	50	150	0.04	0.02	0.04	0.19	0.7	1.5	—	—	

A comparison of the nutritive values of diluted eggs and milk is shown in Table II.

Table II. Nutritive Values of Human Milk, Cow's Milk, and Diluted Eggs (one part whole egg + 4 parts water)

Type of food	Water		Food energy		Protein		Fat		Carbo- hydrates		Minerals						Vitamins			
	%	Cal.	g	g	g	g	g	g	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	Ascorbic acid	
																			Cooked	Raw
Human milk	87.6	68	1.25	4.0	7	13	0.1	37	11	48	0.065	0.025	0.14	0.37	0.18	—	5.0	—	—	—
Cow's milk	87	63	3.8	3.0	5.4	102	0.1	130	50	150	0.04	0.02	0.04	0.19	0.1	1.5	—	—	—	—
Duck egg (whole) diluted with 4 parts of water	94	38.0	2.6	2.9	0.16	39	0.6	11	20	30	0.04	0.01	0.04	0.06	0.02	—	—	—	—	—
Hen egg (whole) diluted with 4 parts of water	95	32.42	2.56	2.3	0.14	42	0.54	11	30	30	0.04	0.01	0.02	0.06	0.02	—	—	—	—	—

Tables I and II have been compiled from:

1. Nederlandse Voedingmiddelen (Dutch Food Table) July 1957.
2. Agriculture Handbook No. 34, U.S. Department of Agriculture, Composition of Foods Used In Far Eastern Countries by Woot- Tsuen Wu Leung, R.K. Pecot and B.K. Watt, 1952.
3. Physician's Handbook 1952 by M.A. Krupp and others.

To improve the nutritive value of the diluted eggs, it is necessary to add a suitable carbohydrate, and to enrich it with calcium and sodium. As bananas are cheap and plentiful, banana extract was, therefore, employed as a carbohydrate source. Of the available varieties (local names: Namwa, Hom, Khai and Huk-muk), Hom and Namwa bananas [*Musa hybrids* (formerly *Musa paradisiaca*)] were chosen. The Namwa variety is very cheap and is available almost throughout the year.

The preparation of banana extract was done by cutting the banana, adding two parts of water, boiling for five minutes and filtering. In order to make the extract light-coloured, the pH value was adjusted to 5.0. The extract of banana was added, while stirring, to the liquid egg (four parts by volume of extract to one part of egg). The product was filtered to remove membranes and chalaza. Calcium was added as calcium lactate and sodium as sodium chloride. The resultant milk-like product was pasteurized at 75–80°C for five minutes. The milk substitute prepared in this manner can be kept for about forty-eight hours in a refrigerator.

In a number of cases, egg-yolk only was used instead of the whole egg. The preparation of the milk substitute was the same, only the volume was made up to ten times the original volume of the yolk, this having about twice the amount of dry matter as compared with that of whole egg.

In Table III, the nutritive values of the two milk-substitutes are given.



Table III. Nutritive Values of Two Milk Substitutes, Prepared from Duck Eggs and Banana Extract (per 100 g)

Composition of substitute	Water		Food energy		Protein		Fat		Carbo- hydrates		Minerals				Vitamins							
	%	Cal.	g	g	g	g	g	g	mg	P	Fe	Ca	Na	K	Vit. A	Caro- tene	Thia- mine	Ribo- flavin	Nia- cin	Ascorbic acid		
																				Cooked	Raw	
A. Whole duck egg, 20 g; Banana (Hom) extract, 24 g banana; sugar, 3 g; Ca, 84 mg; Na, 10 mg.																						
Total volume, 100 ml.	88	71	2.9	2.9	8.8	45.7	0.7	97.1	30.5	126	0.04	0.06	0.05	0.07	0.2	—	2.4					
B. Duck egg yolk, 10 g; Banana (Namwa) extract, 27 g banana; sugar, 2 g; Ca, 100 mg; Na, 25 mg.																						
Total volume, 100 ml.	86	74	2.0	3.6	9.4	48	0.9	117	30.5	123	0.05	0.02	0.07	0.05	0.2	—	2.7					

The milk substitutes described above were fed to several infants at the Women's and Children's Hospitals. The results are summarised in Table IV-A and Table IV-B.

Table IV-A. Whole Duck Egg with "Hom" Banana Extract (composition; see Table III:A.)

Infant Number	Age of Infant when experiment began	Weight of Infant (g)						Reason for termination of experiment	
		Original	1st week	2nd week	3rd week	4th week	5th week		6th week
1	3 months	3500	3570	—	3560	3560	3560	—	Changed to new formula with duck yolk (see Table IV-B)
2	1 month	2660	2740	2800	2800	2710	—	—	Changed to new formula with duck yolk
3	3 months	3500	3500	3520	3500	—	—	—	Diarrhoea
4	6 months	4000	4040	4040	4140	—	—	—	Returning home
5	4 months	3730	3800	3940	3940	3940	3960	4000	Changed to other milk food
6	3 months	3900	3960	3960	3980	4000	3840	3790	Changed to other milk food
7	2 months	3600	3820	3820	3640	3700	—	—	Changed to new formula with duck yolk
8	2 days	2680	2700	2650	2560	—	—	—	Returning home

Table IV-B. Duck yolk with "Namwa" Banana Extract (Composition as shown in Table III : B.)

Infant Number	Age of Infant	Weight of Infant (g)								Reason for termination of experiment
		Original	1st week	2nd week	3rd week	4th week	5th week	6th week	7th week	
1	4 months	3560	3700	3910	4000	4060	4200	4260	4480	Changed to other milk food
2	2 months	2710	2660	--	--	--	--	--	--	Diarrhoea
7	3 months	3700	3640	3840	4000	4060	--	--	--	Returning home
9	3 months	4600	4730	4820	5060	--	--	--	--	Returning home
10	4 months	3650	3600	3600	3710	3780	--	--	--	Returning home
11	3 months	3460	3520	3580	3580	3640	--	--	--	Changed to other milk food
12	3 months	3900	3940	3880	4000	--	--	--	--	Changed to other milk food
13	6 months	4140	4140	4260	--	--	--	--	--	Changed to other milk food
14	21 days	2640	2560	2760	2960	2910	2860	2940	3040	Returning home

Although the flavour of the substitutes was not always satisfactory as judged by the grown-up, the babies readily accepted the drinks. However, the weight gained was not satisfactory. Moreover, the faeces were more bulky than normal. Although the substitutes with egg yolk gave better results than those prepared from whole egg, cow's milk was definitely superior.

Further experiments were, therefore, made with other preparations. Instead of banana-extract, dextri-maltose (No. 1, 2 and 3, Mead Johnson & Co., U.S.A.) was used as a carbohydrate source. In order to imitate human milk more closely, more sodium and less calcium salts were added. Potassium was added as potassium chloride. Instead of dextri-maltose, saccharose or glucose was sometimes used. The nutritive values of some of the substitutes are given in Table V.





Table VII. Feeding with Milk Substitutes of Different Compositions

Infant Number	Composition of milk substitute	Age of Infant	Original	Weight of Infant (g)							Reason for termination of experiment			
				1st week	2nd week	3rd week	4th week	5th week	6th week	7th week		8th week	9th week	10th week
23	Duck yolk dextrin-maltose	3 months	3100	3300	3400	3900	3960	3960	3940	4040	4140	4100	4180	Returning home
24	..	7 days	2340	2360	—	—	—	—	—	—	—	—	—	Returning home
25	Duck yolk + glucose	3 months	2500	2460	2470	2360	2280	2400	2480	—	—	—	—	Changed to other milk food
26	Hen yolk + glucose	10 days	3020	2860	2980	2760	—	—	—	—	—	—	—	Changed to other milk food

Table VIII. Feeding with Powdered Cow's Milk

Age of Infant	Weight of Infant (g)							Remarks	
	Original	1st week	2nd week	3rd week	4th week	5th week	6th week		7th week
1 15 days	2520	2580	2600	2860	3040	3000	3080	3120	—
2 21 days	2800	2900	3100	3180	3300	3480	3500	3600	—
3 3 months	3900	3960	3960	4100	4300	4300	4440	—	—
4 3 months	3680	3880	3900	4160	4180	—	—	—	—
5 3 months	3020	3060	2900	2980	2980	3100	3120	—	—
6 5 months	3500	3560	3660	3900	3920	4000	—	—	—

Start diarrhoea



In some experiments dextri-maltose was replaced by glucose or saccharose. Glucose proved to be unsatisfactory: the weights gained were lower than normal, and cases diarrhoea were observed. Saccharose was a little better, but not as good as dextri-maltose.

Lactose was not tried because this sugar must be imported, and there were no possibilities of manufacturing it here in the near future. Furthermore, the use of lactose probably has to be restricted to young babies with sufficient lactase at their disposal.

Looking again through Tables IV-A, IV-B, VI and VII, it is evident that, for a limited period, milk substitutes from eggs offer certain possibilities, if mother's milk and cow's milk are not available. The best substitute is prepared from hen egg yolks and dextri-maltose. Satisfactory results were obtained with infants of about two months and older. Allergy, sometimes caused by eggs, especially by egg-white, was not observed in these experiments.

The authors feel that the number of infants engaged in these experiments was not sufficient to form a final judgement. Further work, here or abroad, should be done to study the problems involved in the use of milk substitutes.

### *Acknowledgement*

The authors wish to express their thanks to Dr. Charng Ratanarat, Director-General of the Department of Science, for his interest and support, to Dr. M. van Eekelen, Director of the Central Institute for Nutrition Research T.N.O., the Netherlands, who was appointed a Technical Expert of FAO to assist the Department of Science during 1955-56, for suggesting this study and for his advice. Thanks are also due to Dr. Sem Pring Puang Keo and Dr. Orawan Kunawisan of the Women's and Children's Hospital for their cooperations in the feeding experiments.

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# Anti-folic Acid Test of Two Benzimidazole Derivatives Structurally Analogous to Pterotic Acid<sup>1</sup>

Pradisth Cheosakul<sup>2</sup>, Rachel Parker<sup>3</sup>

and

Howard E. Skipper<sup>4</sup>

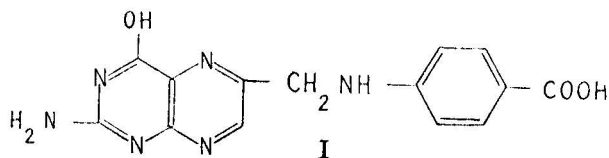
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## Summary

N-[4-(2-benzimidazolyl)-methyl]-aminobenzoic acid and N-[4-(2-benzimidazolyl)-methyl]-aminobenzenesulfonamide were synthesized for anti-folic acid test and subsequent antileukemic screening. The first compound slightly inhibited the growth of *Streptococcus faecalis* R., whereas the second compound had no effect on this organism.

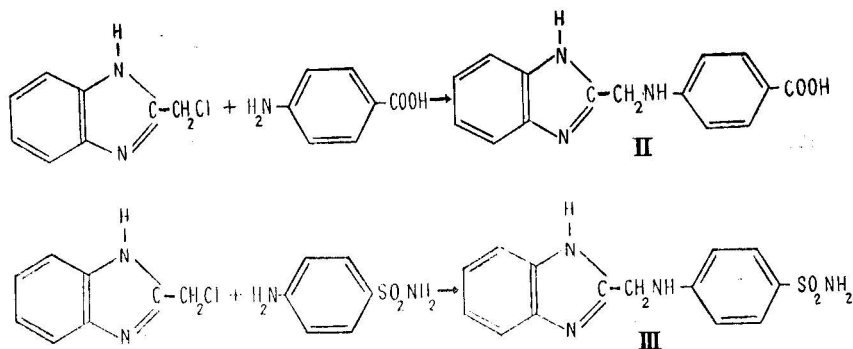
## Introduction

Certain derivatives of pteroylglutamic acid (folic acid)<sup>5</sup>, such as 4-aminopteroylglutamic acid (aminopterin)<sup>6</sup>, 4-amino-N<sup>10</sup>-methyl-pteroylglutamic acid (A-Methopterin)<sup>6</sup>, etc., inhibit the growth of *Streptococcus faecalis* R. and have a remarkable antileukemic action. Since pterotic acid (I) is a moiety of pteroylglutamic acid, it is interesting to investigate the effect of pterotic acid



analogs on leukemia. Two compounds of this type, namely N-[4-(2-benzimidazolyl)-methyl]-aminobenzoic acid (II) and N-[4-(2-benzimidazolyl)-methyl]-aminobenzenesulfonamide (III) were synthesized for this purpose.

By heating 2-chloromethylbenzimidazole and *p*-aminobenzoic acid with a small amount of sodium iodide in boiling alcohol, King, Acheson and Spensley<sup>7</sup> obtained a 57% yield of compound II. In the present investigation, it was conveniently prepared in better yield from 2-chloromethylbenzimidazole and *p*-aminobenzoic acid dissolved in one equivalent of sodium carbonate or sodium hydroxide solution. Similarly, compound III was obtained from 2-chloromethylbenzimidazole and sulfanilamide.



The activity of these two compounds on the growth of *S. faecalis* R. was determined in the same way as described by Mitchell and Snell<sup>8</sup> except the pH of the medium was adjusted to 6.8 after addition of each compound instead of before. According to the results in Tables I and II, the two compounds do not have any significant activity. The slight inhibitory action of N-[4-(2-benzimidazolyl)-methyl]-aminobenzoic acid is in good agreement with that reported by King, et al<sup>9</sup>.

The complete results of the studies on the anti-leukemic action of these two compounds have been reported elsewhere<sup>10</sup>.

Table I  
Effect of  
N-[4-(2-Benzimidazolyl)-methyl]-aminobenzoic Acid  
at 0.001  $\gamma$  Folic Acid

Concentration of Compound ( $\gamma$ /ml)	Acid Production (ml)		Turbidity	
	24 hrs	48 hrs	24 hrs	48 hrs
0	—	3.63	16.1	10.45
134 (5 x 10 <sup>-7</sup> mole)	1.93	3.34	14.6	10.3
268 (10 x 10 <sup>-7</sup> mole)	1.85	3.22	13.3	8.6

Table II  
Effect of  
N-[4-(2-Benzimidazolyl)-methyl]-aminobenzenesulfonamide  
at 0.001  $\gamma$  Folic Acid

Concentration of Compound ( $\gamma$ /ml)	Acid Production (ml)		Turbidity	
	24 hrs	48 hrs	24 hrs	48 hrs
0	—	3.63	16.10	10.45
151 (5 x 10 <sup>-7</sup> mole)	2.09	3.70	15.70	13.80
302 (10 x 10 <sup>-7</sup> mole)	2.05	3.75	15.70	14.50

### Experimental

#### N-[4-(2-Benzimidazolyl)-methyl]-aminobenzoic Acid (II)

To a solution of 8.5 g. (0.08 mole) of anhydrous sodium carbonate in 500 ml. of water was gradually added, with stirring, 22 g. (0.16 mole) of *p*-aminobenzoic acid followed by 25 g. (0.15 mole) of 2-chloromethylbenzimidazole<sup>11</sup>. The mixture was heated to boiling with stirring for one hour. The precipitate was filtered, washed with distilled water, dissolved in 500 ml. of 1 N sodium hydroxide and clarified with charcoal. To the solution was added dropwise, with vigorous stirring, 1 N acetic acid until precipitation

was complete. The flocculent precipitate was coagulated by heating, collected by filtration and washed with distilled water. The process of dissolution in sodium hydroxide and precipitation with acetic acid was repeated two additional times. The product had a cream-like color and melted at 277–278°C (corrected) with decomposition. Yield 32 g. (80%).

*Analysis*: Calculated for  $C_{15}H_{13}N_3O_2$ : C, 67.39; H, 4.91; N, 15.72. Found: C, 67.22; H, 4.78; N, 15.77.

### N-[4-(2-Benzimidazolyl)-methyl]-Aminobenzenesulfonamide (III)

In a solution of 1.4 g. (0.033 mole) of sodium hydroxide in 20 ml. of water was dissolved 5.7 g. (0.033 mole) of sulfanilamide. To the resulting solution was added 5 g. (0.03 mole) of 2-chloromethylbenzimidazole. On shaking, the mixture became hot and pasty. After addition of 20 ml. of water, the mixture was heated to boiling for half an hour.

On cooling, the precipitate was collected, washed with distilled water, dissolved in 100 ml. of 1 N sodium hydroxide, and clarified with charcoal. To this solution was added dropwise, with vigorous shaking, 1 N acetic acid until precipitation was complete. The precipitate was coagulated by heating and purified as above. The yellowish product melted at 230–232°C (corrected) with decomposition. Yield 9.5 g. (95.3%).

*Analysis*: Calculated for  $C_{14}H_{11}N_3O_2S$ : N, 18.55; S, 10.59. Found: N, 18.26; S, 10.40.

**Acknowledgement**—We wish to express our indebtedness to Mrs. Mathilde Ramsey and Miss Virginia Jackson for the microanalytical data.

### References

- (1) This research, conducted at the Southern Research Institute, Birmingham, Alabama, U.S.A. was supported in part by grants from the American Cancer Society, on recommendation of the Committee on Growth of the National Research Council, by Mr. Ben May, Mobile, Alabama,

by an anonymous gift from friends of the Institute; and by funds made available by the Board of Trustees of the Southern Research Institute.

- (2) Department of Science, Rama VI Road, Bangkok, and National Research Council, Bangkok, Thailand.
  - (3) Mrs. Rachel Parker Johnson, formerly Southern Research Institute.
  - (4) Southern Research Institute.
  - (5) Angier, R.B., et. al., *Science*, Vol. 103, 1946, p. 667.
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## ABSTRACTS

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### PERICARDIAL EFFUSION (*in Thai*)

*Tranakchit Harinasuta, M.B., D.T.M. & H., V.D.O. and Mukda Trishnananda, M.B., M.P.H., Department of Internal Medicine, Siriraj Hospital, Bangkok.*

*Siriraj Hospital Gazette, Vol. 10, No. 10, 1958, p. 574. Publication of the Faculty of Medicine and Siriraj Hospital, University of Medical Sciences, Bangkok.*

This is an analysis of 33 cases of pericardial effusion of which 28 cases were diagnosed clinically and 5 post mortem. The age of the patients ranged from 12 to 69, the male sex being more susceptible. Chief complaints included fatigue, difficulty in breathing, cough, fever, and edema. Findings arranged in descending order of frequency were enlargement of cardiac dullness, positive Rotch's sign, enlargement of the liver dullness, weakening of heart sounds and of the cardiac impulse, tachycardia, venous engorgement in the neck, pulsus paradoxus, edema, narrowing of the pulse pressure, positive Ewart's sign, shifting dullness, and cyanosis. Roentgenological examination was very helpful in diagnosis, but could be misleading. E.C.G. was of some value. Etiologically significant were pyogenic infections, tuberculosis, rheumatic fever, amebiasis, and malignancy, in that order of frequency. Cardiac compression was found in only 3 cases. Mortality rate in the clinically diagnosed cases was 25 per cent.



*SPONTANEOUS PNEUMOTHORAX (in Thai)*

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*Siriraj Hospital Gazette, Vol. 10, No. 10, 1958, p. 584. Publication of the Faculty of Medicine and Siriraj Hospital, University of Medical Sciences, Bangkok.*

Between the year 1946 and 1955 eighteen cases of spontaneous pneumothorax were admitted; seven cases were of the valvular type, 1 case was fistular, 9 cases were closed, and 1 case was not identified. Chief complaints were dyspnea (17 cases), cyanosis (5 cases), chest pain (4 cases), and oppression in the chest with easy fatigue (1 case). The age of the patients ranged from the first to the eighth decades, 11 out of 18 being in the third and fourth decades. There were 15 men to 3 women. Eleven patients were admitted within 4 days of the onset; 2 of them died. The remaining 7 patients came for treatment after the seventh day; 6 died. The treatment ranged from simple rest (1 case), to single and multiple suction (9 cases), and continuous suction (8 cases). Seven cases also received antibiotics in addition. Complications included pleural effusion (4 cases), pyothorax (2 cases), mediastinal and subcutaneous emphysemata (1 case), and hemothorax (2 cases). The mortality rate appeared to be related to the type of pneumothorax, being high in the valvular (85.7 per cent) and low in the closed (11.1 per cent). It is also related to the duration of the affection before admission, as presented above. The use of antibiotics markedly reduced the mortality rate, which is 14.3 per cent in the group receiving treatment and 87.5 per cent in the other group.

(Five references)





## HEMOGLOBIN MEASUREMENT AND BLOOD CELL COUNT IN NORMAL THAI SUBJECTS (*in Thai*)

*Panit Athisuk, M.B., Kanchana Suebsanguan, M.B., D.C.H., D.T.M. & H., Sermsri Sindhuvanondh, M.B., Suporn Koedsawang, M.D., D.T.M. & H., V.D.O., L.M., and Avudh Srisukri, M.B., Department of Physiology, Siriraj Hospital, Bangkok.*

*Siriraj Hospital Gazette, Vol. 10, No. 12, 1958, p. 680. Publication of the Faculty of Medicine and Siriraj Hospital, University of Medical Sciences, Bangkok.*

Basal values for hemoglobin and blood counts were determined in clinically normal medical students, physicians and soldiers, in the age range 20 to 30 years. Hemoglobin was measured by the use of Sahli-Hellige hemometers, standardised against oxygen capacity (Van Slyke). Erythrocyte and leucocyte counts were made in certified (U.S. National Bureau of Standards) hemacytometers, while differential counts were made on Wright-stained thin films, using 4 slides from each subject, with 4 counters each counting 400 cells on one separate slide. Results for men were: hemoglobin (149 subjects)  $14.19 \pm 1.18$  gm. per cent; red cell count (102 subjects)  $4.93 \pm 0.57$  millions per c.mm.; leucocyte count (145 subjects)  $6874 \pm 1386$  cells per c.mm.; differential counts (62 subjects): polymorphs  $62.60 \pm 6.18$  per cent; lymphocytes  $32.05 \pm 5.54$  per cent; monocytes  $1.14 \pm 1.60$  per cent; eosinophiles  $3.54 \pm 2.78$  per cent; basophiles  $0.40 \pm 0.16$  per cent. For women the values were: hemoglobin (71 subjects)  $12.44 \pm 0.85$  gm. per cent; red cell count (61 subjects)  $4.34 \pm 0.44$  millions per c.mm.; white cell count (70 subjects)  $6466 \pm 1435$  cells per c.mm.; differential count (50 subjects): polymorphs  $60.30 \pm 7.0$  per cent; lymphocytes  $35.04 \pm 6.63$  per cent; monocytes  $1.38 \pm 0.93$  per cent; eosinophiles  $2.97 \pm 2.47$  per cent; basophiles  $0.31 \pm 0.34$  per cent. Compared to figures

from other countries the eosinophile count appeared to be higher than elsewhere; intestinal parasitism and allergy were excluded by faecal examination and case history, respectively. No explanation could be given to this finding.

(Five tables, 11 references.)



**THE CORRELATION BETWEEN CROWN DIAMETER  
AND HEIGHT, BASAL AREA, VOLUME OF SHOREA  
OBTUSA (in Thai)**

*Va-sone Vichaidit, The Royal Forest Department, Bangkok.*

*The Vanasarn, Vol. 17, No. 3, 1959, p. 29. The Royal  
Forest Department, Bangkok.*

The paper presents the result of a study on the correlation of crown diameter, height, basal area and volume of 200 trees of *Shorea obtusa* in Nakorn Rajasima Province. It was found that height, basal area and volume of *Shorea obtusa* bear definite relation with crown diameter. The relationship tends towards a straight line pattern in each individual case. These results can be used for indirect measurement for Forest Inventory in dry dipterocarp forest especially *Shorea obtusa* species if suitable scale aerial photographs are available.



**EFFECT OF GIBBERELLIN ON GROWTH OF CER-  
TAIN PLANTS (in Thai)**

*Samai Charoenratha and Wan Chaikaew, Department of  
Agriculture, Bangkok.*

*Kasikorn, Vol. 32, No. 3, 1959, p. 183. The Department of  
Agriculture, Bangkok.*

Gibberellin is the name given to a new hormone, a clear white crystal of Gibberellic acid which has been found able to

hasten the multiplication of living cells as much as 1,000 times. Sweet pea, strawberry, tomato, celery and snapdragon were sprayed a few times with 50-100 p.p.m. solution of this hormone, at Maecho agricultural station, Chiangmai. The treated plants showed much more rapid growth than the untreated plants. Although there was no marked increase of the number of fruits or pods, particularly in the cases of sweet pea and tomato, the pods of sweet pea became much longer and the plants healthier. The fruits of tomato were distinctly larger than those of the untreated plants. However, some fruits of strawberry, after being treated with the hormone, stopped growing.

The treated snapdragon produced more colourful flowers and twice as long as those of the untreated plants.

The result has indicated that Gibberellin definitely possesses a favourable effect on the growth of certain kinds of plants tested in this first trial.



### CASSAVA (*in Thai*)

*Manop Chimprapar, The Department of Agriculture, Bangkok.*

*Kasikorn, Vol. 32, No. 6, 1959, p. 489. The Department of Agriculture, Bangkok.*

Cassava is an important crop of Thailand. Its history, climatic requirement, composition and varieties are briefly given. The local methods of planting and harvesting are described. Fertilization is essential since most soils being sandy are easily exhausted of their fertility. It was found from field experiments made during the past 3 years, that the optimum amount of a chemical fertilizer of 8:8:4 was 65 kg. per rai and gave an average increase of 1,805 kg. per rai. Garbage compost or duck manure mixed with chemical fertilizers containing equivalent quantity of nutrient elements also gave almost the same increase of roots as when chemical fertilizers were used alone. A few prevalent diseases are mentioned.

*CASHEW (in Thai)*

*Terd Suwankiri, Department of Agriculture, Bangkok.*

*Kasikorn, Vol. 32, No. 6, 1959, p. 507. The Department of Agriculture, Bangkok.*

Cashew are found growing in the Southern Peninsular of Thailand. They are tolerant plants and can grow even in sandy soils along sea beach. They can stand draught better than many trees.

The seeds can either be placed directly into the ground or put in seed-bed to germinate until the seedlings are 6 months old and then transplanted. There should be eighty to one hundred plants in a rai of land. The plants can provide good shade because a 5-year old tree generally has a branch-spread covering 10 metres in circumference.

At the age of 4 years, they begin to bear fruits. The fruits can be harvested within 2 months from flowering time. It is estimated that a 5 to 10-year old plant can produce 1,000 to 2,000 fruits a year, and that from 2,500 to 3,000 fruits a year can be expected from a 10 to 15-year old tree.

There are two kinds of fruits, yellow and purplish red, which contain seeds of similar quality.

The uses of fruit, seeds, stem and gum of cashew as food and for other purposes are given.



## NALORPHINE TEST FOR OPIUM ADDICTION (in Thai)

*Banyat Prijyanonda, M.D., Department of Medicine, Siriraj Hospital, Nonglak Puranavej, M.D., Poonsakdi Sambhavaphol, M.D., and Komol Pengsritong, M.D., Department of Medical Sciences, Bangkok.*

*The Bulletin of the Department of Medical Sciences, Vol. 2, No. 1, 1960, p.1. The Department of Medical Sciences, Bangkok.*

Nalorphine tests were conducted in 41 suspects of opium addiction. All of them were male, aged 25-59. The method of the test described by Goodman and Gilman (1956), which is similar to that of Fraser (1957), was followed. The preparations used in the tests were "Nalline Hydrochloride" and "Lithidrone Hydrobromide." These two preparations showed no difference in activity.

Under such a test, those who showed either definite opium-withdrawal symptoms or an increase of 1 mm. or more in the size of the pupil, or both, were recognized as positive cases.

Among these 41 suspects, one demonstrated withdrawal symptoms of moderate severity together with 1 mm. increase in the size of each pupil. Eight others apparently showed no definite withdrawal symptoms, but the pupils dilated by 1 mm. The remaining 32 people gave negative responses.

The changes in body temperature, pulse, respiration, and blood pressure noted in this series were not consistent, and none of them could be used as a diagnostic criterion.

Two 24-hour specimens of urine were also collected three days apart in each case. In addition, each suspect was asked to void his urine once more after each collection, and two more single specimens were thus taken. All of these four specimens were collected in the same week of the test, and were subjected to separate morphine determinations according to the method of Pierce and Plant (1932).

Morphine was found in all the four specimens of urine of each of the seven positive cases, in some specimens only of one case and in no specimen of the remaining positive case. It is probable that the last case was an addict of one or more narcotics other than opium or morphine.

Twelve out of the 32 negative cases had morphine in all the urine specimens, four in some specimens only, and 16 in no specimen.

Together with the findings of subsequent tests in another series of actual opium addicts, to be described later, it is concluded that the 16 cases of the first two groups above were either occasional opium smokers or those low grade opium or morphine addicts who responded negatively to the test. Low grade addiction to narcotics other than opium or morphine cannot be excluded among the remaining 16 cases of the last group.

Apart from those tests in the 41 suspects of opium addiction described above, a series of tests was also carried out in 21 actually known opium addicts, two of which were conducted twice 25 and 39 days apart. These people were admitted into two hospitals in Bangkok for the treatment of opium-withdrawal symptoms. They were also all male with the ages ranging from 27 to 59 years. Thirteen of them revealed positive responses, five of whom had smoked 1.7 grams of opium daily up to the day of the test; 3 still received 3 x 10 mg. daily injections of morphine, 3 others received 2 x 10 mg. daily, and the two remaining received only 5 mg. of morphine once daily. Eleven out of these 13 positive cases definitely revealed varying degrees of abstinence symptoms, and dilatation of the pupils was concomitantly observed in 8 of these 11 cases. The two remaining positive cases showed only dilatation of the pupils by 1 and 1.5 mm. They were respectively still addicted to 20 and 5 mg. of morphine daily.

Two of these patients who showed severe reactions to the tests were given injections of morphine in the hospital with gradually decreasing dosage. And after 25 and 39 days of such treatment, while they were still receiving 5 mg. of morphine twice daily, they were subjected to the second similar tests. By this time they revealed negative response.

Of the eight negative cases, two were still receiving daily 25 mg. of morphine, one case was receiving daily 20 mg., two cases 10 mg., and one case 5 mg. The seventh case had taken orally an unestimable amount of opium dross daily up to the day before the test, while the eighth case had stopped receiving morphine injection for 7 days.

It is thus apparent that low grade opium or morphine addicts may give either positive or negative reactions to the nalorphine test; and this is expected to hold true for those addicted to other kinds of narcotics.

Analysis of the urine for morphine was not conducted on the same day of the test in these patients, because it was expected to give positive results in all cases still receiving opium or morphine injections. In one patient whose test was performed 7 days after the stoppage of morphine injection, the examination of the urine collected 9 days later still revealed traces of morphine, indicating that morphine was still detectable in the urine of this patient 16 days after the last dose of morphine.

Three representative cases of mild, moderately severe, and markedly severe reactions to nalorphine tests were presented.

A part of this work, viz., the tests conducted on the actually known opium addicts, was supported by the Committee on Opium - Withdrawal Research of the Thai Ministry of Public Health.

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## ANNOUNCEMENT

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**This is the last issue of the Thai Science Bulletin. Since the reactivated National Research Council of Thailand, which has temporarily established its Secretariate in the Department of Science, Rama VI Road, Bangkok, is going to initiate a journal and publish original scientific papers, the Department of Science agrees to discontinue its publication of the Thai Science Bulletin as an economic measure.**

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## ALREADY PUBLISHED

### THAI SCIENCE BULLETIN

1937	Vol. I,	No. 1	} entitled <i>Siam Science Bulletin</i>
1938	Vol. I,	No. 2	
1939	Vol. I,	No. 3*	
1939	Vol. I,	No. 4	
1940	Vol. II,	Nos.1,* 2, and 3—4	
1941	Vol. III,	Nos.1, 2, and 3—4	
1947	Vol. IV,	No. 1 (only)	} entitled <i>Siam Science Bulletin</i>
1948	Vol. V,	No. 1 (only)	
1949	Vol. VI,	No. 1 (only)	
1952	Vol. 7,	No. 1 (only)	
1957	Vol. 8,	Nos. 1, 2	
1958	Vol. 9,	Nos. 1, 2	
1959	Vol. 10,	Nos. 1, 2†	

\* *Out of Print* † *Discontinued*