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THE NEWER PHARMACOLOGY AND ITS RELATIONSHIP TO ANCIENT MEDICINE

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Former studies upon Ancient Materia Medica have been confined largely to the following lines of work:—

1. The trial of specifics for various diseases, especially as seen in the Indian field, where *Holarrhena*, *Butea*, *Alstonia*, *Adhatoda*, *Melia* etc., have received widespread attention.

2. The search for new active principles, especially neurotropic drugs of alkaloidal character, glucosides, tannins etc, such as ephedrine, of great variety as isolated by the plant chemist.

3. New sources of therapeutic agents of proven value, such as the various solanaceous plants used in the preparation of atropine, and new sources of santonin, ephedrine, quinine etc.

4. The finding of allied species of plants of known worth, such as the various species of *hydnocarpus* used in the treatment of leprosy, Japanese senega as a substitute for European senega, Japanese belladonna, native orange, gentian and various bitters etc.

These earlier studies (CHOPRA 1933, KUBOTA et al 1931, READ 1921, 1923,) were based upon ideas in therapeutics which have undergone radical changes in this generation. The modern scientific method which has produced these chemical results, has also in the physiological field produced what is almost a therapeutic nihilism, compelling the physician to review, adjust or entirely alter his attitude to old therapeutic methods. This change has brought a desire for a better physiological viewpoint in treatment so that instead of introducing into the human body mixtures of numerous foreign substances, the armamentarium of the modern physician is more and more being added to by glandular products, substances for the treatment of deficiency diseases, and means whereby the inorganic salts are adequately provided for, and the normal body processes built up to fight against or prevent disease.

This new point of view (MCLESTER 1934) is reflected in the changed attitude of the clinician toward the patient's diet; whereas

at one time emphasis was put upon establishing a limited diet, today the more usual thing is to consider what has been lacking in the patient's food. This is particularly so in China where there undoubtedly exists in many large groups dietary deficiencies of a serious character.

This calls for a new study of the old empirical methods to evaluate them by new standards, which emphasize deficiencies, improper balances, and faulty assimilation, and thereby to find fresh avenues for research which may yield results of value in modern medicine.

Furthermore in recent years with the great accumulation of facts concerning the action of drugs one may say there is a distinctly new viewpoint in pharmacology based upon accurate observation and deduction from the results of the experimental method only made possible by the highly technical skill of modern workers and a more fundamental knowledge of the principles involved, as made clear by the biologist, the chemist, the mathematician and the clinician.

A. ORGANO-THERAPY

It is of interest to note that the modern medicine of the 1909 British Pharmacopoeia only included 9 substances of animal origin, and those nearly all, quite innocuous things like lard and wax. Since then there has been an ever increasing interest in animal products leading to the use of numerous glands or their active principles, dried organs, sera and vaccines, and so many other new preparations of animal origin that no pharmacopoeia has kept pace with the output, some remedies being introduced, then discarded or replaced by more efficient ones before there has been official recognition of their worth, others have come into use for their diagnostic value, and the biochemist is actively seeking the chemical principles natural to the normal functioning of the body or is striving to establish the hormonal relationship of the several parts to the whole, thereby ushering in a new era of conceptions concerning the nature of disease, and the means whereby normal conditions may be reestablished.

While modern science is turning to liver, stomach, insulin from the pancreas, fibrinogen from the lung, vitamin A from the eye, adrenalin, thyroxin, parathormone etc., it is remarkable to find the use of so many animal tissues in ancient medicine. Table I shows the 26 parts of the six domestic animals used in old Chinese

medicine, there were 34 parts of the pig used including the head, meconium, tail, hoof, uvula, tongue, earwax, snout, gall and urinary bladders, neck, and flesh from the head, not included in the table, from which the following merit special comment:—

TABLE I

Chinese Animal Materia Medica.

PART USED	COW	HORSE	PIG	CHICKEN	SHEEP	DOG
1 Bezoar	*	*				*
2 Bile	*		*	*	*	*
3 Blood	*	*	*	*	*	*
4 Bones	*	*	*	*		*
5 Brain	*	*	*	*	*	*
6 Eyes		*			*	
7 Fat	*		*	*	*	*
8 Feces	*	*	*	*	*	*
9 Flesh	*	*	*	*	*	*
10 Hair	*	*	*	*	*	*
11 Heart	*	*	*	*	*	*
12 Intestine			*	*		
13 Kidney	*	*	*	*	*	*
14 Liver	*	*	*	*	*	*
15 Lungs	*	*	*		*	
16 Marrow	*		*		*	
17 Milk	*	*	*		*	*
18 Nails	*	*	*	*	*	
19 Pancreas			*		*	*
20 Saliva	*					*
21 Skin	*	*	*		*	*
22 Spleen	*		*			
23 Stomach	*		*	*	*	
24 Teeth	*	?	*		*	*
25 Testes or penis	*	*	*			*
26 Urine	*	*			*	

Pig's liver.—Pig's liver rich in vitamin A, B, C, D and E (MRC 1932) was recommended for night blindness, beri-beri, scurvy-like symptoms, emaciation, and edema. (READ 1931). Some of these uses were ascribed to the livers of the ox, sheep, rabbit, and chicken. Sheep's liver which contains even greater amounts of vitamins A, B and C was used for night blindness, ulcerated gums, and chronic diarrhoea.

Pig's pancreas.—Pig's pancreas was regarded as the source of the three digestive principles; they favored oral administration of an alcoholic extract. BOLDYREFF (1932) recently obtained an effect upon blood sugar by oral administration of alcoholic extracts of the pancreas.

Sheep's eyes.—The iris and lens of the sheep's eye were given for dimness of vision and conjunctivitis. The eyes of the hawk, parrot and mackerel were administered for night blindness. WALD (1934) has recently isolated vitamin A from the iris of sheep, pigs, cattle and frogs. The eye of the rat was said to enable one to see at night.

Sheep's bile.—The biles of sheep, pigs, cows, dogs, chickens, bats, and rats were given for night blindness or to clarify the vision; the first two were used as purgatives. These among 148 other old remedies for night blindness suggest some possible rich sources of vitamin A, LI SHIH-CHEN (1597).

Dog's brain.—When bitten by a mad dog the brain of the same animal is applied to the wound. This suggests a connection with modern Pasteur treatment and is worthy of investigation.

Ox marrow.—The marrow of both oxen and sheep is considered to be aphrodisiac.

Epiglottis of the sheep.—The Chinese term 懸 *yen* is usually translated as epiglottis. It is ill-defined and with the crude methods of dissection may refer to the neck tissues including the thyroid gland. The material from the Yak is very clearly specified as the tissue adjacent to the trachea, two doses of which are said to produce a miraculous effect in reducing goitre. That of the sheep and ox was given with seaweed for goitre. The material from the pig is defined as "a flat red piece of tissue the size of a jujube at the back of the throat", called 咽舌 *yen she*—the swallowing tongue; this clearly refers to the epiglottis; it is only used for neck abscess.

Testes and penis of horse.—Those from a white horse are said to be aphrodisiac. Those of other animals are similarly regarded. In spite of these being associated in one's mind with mimetic magic, the extensive use of unofficial testicular extracts suggests further investigation particularly with the animals specifically mentioned, such as the dog, rat and wild cat. The testes of the tiger were given for scrofula.

Deer horn.—The velvet horns of the Sika deer and other species are very highly regarded for their aphrodisiac properties. Recent studies by Russian workers show that the male sex hormone is present.

Urine and feces.—The excretions of animals are repeatedly quoted for the treatment of deficiency diseases. The fact that vitamin C is titratable in the urine of human-beings suggests a careful examination of the excreta of various species for the presence of vitamins. Various preparations including the excreta of rats and cats are used for plague buboes.

B. TREATMENT OF DEFICIENCY DISEASES

In the above section considerable reference has already been made to the vitamins, which will now be considered individually.

Vitamin A.—The long list of remedies for nightblindness in old Chinese medicine suggests that this vitamin is very widely

distributed in nature. SHERMAN (1929) has shown that incorporating 5 per cent of dried yellow day lily (*Hemerocallis fulva* L. 黃花菜) in a vitamin A deficient diet cured rats of xerophthalmia. The various legumes usually emphasized for their special proteins in nutrition here fill a definite therapeutic rôle. *Shepherd's purse* is an excellent example of a medicinal herb cast aside for its apparent lack of potent principles, which has been shown to be moderately rich in three of the vitamins and well justifies the old Chinese use of it for night-blindness, sore eyes, liver weakness, and a number of other conditions.

The walnut and other animal substances mentioned (see Table II) complete the list of those substances used in old medicine for nightblindness which have been scientifically examined and all found to contain vitamin A (MRC, 1932).

TABLE II
Remedies used for night blindness

NAME	Chinese	A	B	C	D	E
Yellow day lily <i>Hemerocallis fulva</i> , L.	黃花菜	++				
Mung beans <i>Phaseolus mungo</i> , L.	綠豆	+	++	±		
Soy beans <i>Glycine soya</i> , S & Z.	黃豆	+	+	0	?	+
Shepherd's purse <i>Capsella bursa-pastoris</i> , L.	薺	++	++	++		
Walnut <i>Juglans regia</i> , L. <i>sinensis</i> .	胡桃	+	++			+
Pig's liver	豬肝	++	++	++	+	++
Sheep's liver	羊肝	+++	++		0	
Ox liver	牛肝	+++	++			++
Butter fat	酥酪	++		?	++	++

Vitamin B.—The disease beri-beri was known as "Chiao-ch'i" 脚氣, for which 89 drugs were said to be of value. A few of these given in Table III have been tested and found to contain vitamin B. In the T'ang dynasty (620 A.D.) CH'EN T'SANG-CH'I mentions the bad effects of a constant diet of polished rice, causing weakness of the muscles, drowsiness and general lassitude; cats and dogs are unable to walk, horses develop swollen hooves, and taken with meat by pregnant women it is harmful to the foetus. In view of the present knowledge concerning the use of vitamin B from rice polishings this needs no further comment.

TABLE III
Remedies used for beri-beri

NAME	Chinese	A	B	C	D	E
Adlay. <i>Coix lachryma</i>	薏苡仁		++			
Rape. <i>Brassica campestris</i> .	芜菁	++	+	+++	++	
Onions. <i>Allium fistulosum</i> .	葱白		+	++		
Cow's milk	牛乳	+++	++	+	0 to +	+
Goat's milk	羊乳	+	+	+		

Vitamin C.—With the recent rapid and economical chemical titration methods for ascorbic acid we have been able during the past year to examine more than 120 Chinese foods and drugs for the presence of vitamin C (CHI and READ 1934). Dr. H. C. HOU has conducted biological tests upon amaranth, oranges, and capsicums, Mr. W. Y. LEE has followed the development of vitamin C in the sprouting soybean, and Dr. Y. F. CHI has studied modifications of the chemical titration methods. From this work I have selected those things of special mention in old therapeutics (see Table IV) in which we have some unusually rich sources of this vitamin. While old medicine did not recognise scurvy as a disease entity, the various symptoms described and treated were related to it. Of these 120 substances we have selected those mentioned in the Pen T'sao which are of special significance. *Pumelo* juice was found to be superior to orange or lemon juice. The cabbage family, the *Brassicas*, all show a good content of ascorbic acid; particular mention should be made of *mustard* leaves which have not been examined previously. European *iris* was found to be one of the best sources of vitamin C; of the three species examined locally that growing in Hangchow was the best. Special attention should be given to *willow*, *poplar* and *tea* leaves, their remarkably high results need confirmation biologically. Our titrations of fresh green tea leaves confirm the earlier claims of MIURA and TSUJIMURA which have been disputed by several workers.

Dandelion and amaranth greens are worthy of considerable study. BENNETT (1934) has recently drawn attention to the excellent qualities of *dandelion* greens which contain 15.7% protein and only 9.79% of fibre; the calcium and phosphorus contents are better than spinach, mangold and lettuce, and the magnesium is higher than lettuce and cabbage. *Amaranth*, erroneously called 'green spinach' by OLIVEIRO (1934), is a common vegetable in the Far East, with which most foreigners do not seem to be acquainted. There are five common species of amaranth in China, of which the white (or green),

as long ago as A.D. 420, was stated by T'AO HUNG-CHING to be of superior value in medicine. Later HAN-PAO-SHENG (A.D. 960) described the different kinds of amaranth pointing out the inferior value of the red species. Our titrations for vitamin C definitely confirm this difference in the species, and OLIVEIRO, in his report of feeding experiments places it at the head of a long list of foods examined. This plant also shows a better content of both calcium and iron than spinach (see Table VI).

TABLE IV

Remedies rich in Vitamin C.

NAME	CHINESE	VITAMIN C.	USES AND REMARKS
Amaranth, white	莧菜	+++++	Root for toothache
Bamboo leaves	竹葉	++	Bleeding gums
Brassicas	白菜同類	2 to 5 X +	Decidedly active
Dandelion	蒲公英	+++	Carious teeth
Iris, Hangchow	玉蘭	8 X +	Wasting diseases
Loofah	絲瓜	+	In reduced form
Lotus root	藕	+	Antihemorrhagic
Mango	芒果	++++	Antiscorbutic
Mustard leaves, black	芥葉	+++++	Toothache and tonic
Mustard seed, black	芥子	+++	Bleeding swollen gums
Pig's liver	豬肝	++	Gumboils and diarrhoea
Poplar leaves	楊葉	++++	Decayed teeth and necrosis of bones
Pumelo	柚	+++++	Stronger than lemon
Tea leaves	茶葉	8 X +	Fresh green
Willow leaves	柳葉	8 X +	Toothache, swollen gums and pain in knees

Lotus seeds, apples and mustard seed are moderately good.

Feeding experiments by OLIVEIRO (1934) of Singapore and other workers confirm the relative value of a number of these results.

Vitamin D.—It has been recently stated on good authority (Ed. 1934) that, "in ordinary dietary mixtures there are present adequate amounts of appropriate accessory food factors for the promotion of the satisfactory utilization of calcium and phosphorus", and that there is a general lack of calcium in American diets. Remedies in

this country while they are often associated with elementary folklore including the use of tiger bones, human skulls, dog bone, sheep's tibia, ivory and many others show that in the treatment of bone deficiencies attention is paid to supplying greater amounts of lime.

However MAXWELL (1923) has shown the need for vitamin D in the treatment of osteomalacia in this country, so it is of interest to note the old use of hen's eggs, butterfat, and marrow.

Vitamin E.—Native remedies claiming to have power to increase human fertility are often associated with magical ideas but in view of the increasing volume of recent scientific work in this field it is hoped that information may be forthcoming whereby these claims can be properly evaluated. Present knowledge justifies to some extent the claims for human placenta, rat's feces, pork, etc. and suggests further enquiry into the reasons for the use of pig's pancreas, male rat meat, and boar's fat as galactagogues; ox-dung for pain during pregnancy; sheep and ox marrow, and ox kidneys, mutton, dog meat, and deer horn as aphrodisiacs; and rat's feces for amenorrhoea, and numerous plant remedies.

TABLE V

FLAVONE containing drugs

NAME	CHINESE	PRINCIPLE	USES
Scutellaria	黃 芩	baicalin	For boils and carbuncles.
Rosa	薔 薇	multiflorin	Foul sores, skin diseases.
Alpinia	高 良 薑	kampferid	Various.
Rhus cotinus, L.	黃 檗	fustin	Various.
Quercus	橡 實	quercitrin	Foul sores.
Soybean	黃 豆 油	isoflavon	Eczema.
Tamarix	檉 柳	quercetin compound	Foul ulcers.
Rhamnus	鼠 李 子	rhamnetin	Eczema
Myrica rubra	楊 梅	myricitrin	Scaly skin diseases, ulcers, wounds.
Citrus trifoliata	枸 橘	kikokunetin	Skin rash.
Iris tectorum	鳶 尾	tectorigenin	Various.
Gingko	銀 杏	flavon	Eczema.
Gooseweed	薦 蒿	flavone	Itching skin.
Ailanthus	椿 櫟	flavone	Skin eruptions.

Vitamin G.—Recent work of KUHN and WARBURG in Germany, summarised by ALEXANDER (1934), indicates that the *flavines* which apparently constitute vitamin B₂ or G exhibit enzymatic activity when brought into the colloidal state presumably by fixation on a colloidal carrier. The absence of these flavines or lyochromes which can be isolated from egg-albumin and cow's milk is said to be responsible for various skin disorders and pellagra. They are hydrogen acceptors—intermediate substances in cell respiration. It is suggested that in this unexplored field of medicine examination be made of the poplar containing chrysin used for discharging skin diseases, and the various preparations containing flavone complexes such as *Quercus*, *Scutellaria*, *Acacia*, *Tamarix*, *Rhamnus*, Cotton seed, *Myrica rubra*, etc. (see Table V).

C. INORGANIC MINERAL METABOLISM

While the standard daily requirements of the body of inorganic elements to sustain normal function are not for the most part known, SHERMAN (1932) allows 0.68 gram of *calcium*, 1.32 grams *phosphorus* and 0.015 gram of *iron*. It is well known that deficiencies of these elements may lead to serious disease, such as osteomalacia and anemia. Mr. R. G. CHEN has analysed over 100 substances in our laboratories, and found certain foodstuffs unusually rich in these elements (Table VI). While we call them foodstuffs, the Pen T'sao with its wonderful records discusses their use in the treatment of disease, there being no clearcut difference between foods and drugs. In view of the citation already made in this paper emphasising the primary importance of the mineral elements in food, and its frequent lack of them, it is of value to look at those substances unusually rich in them. The common vegetable *Amaranth* has already been discussed as a rich supply of vitamin C, it is also remarkably rich in iron and calcium. It is richer than spinach or cabbage, so that five ounces would care for one's daily needs and in case of deficiency disease may well make up what is lacking.

Copper is considered to be an important element in blood formation. ADOLPH (1933) recently made a survey of the content of copper in common Chinese foods. THATCHER'S hypothesis (1934) in plant nutrition may well apply to the human body; "the iron-manganese pair constitute the controlling catalytic factors in oxidation-reduction reactions of the oxygen exchange or hemoglobin type, and that copper and zinc act similarly in the hydrogen exchange or glutathione-ascorbic acid type of reaction." BERTRAND (1934) has shown that *zinc* is a necessary part of animal diet, though we are without much information concerning the amounts needed nor the sources. Some people suffer from a deficiency of iodine; seaweeds were used in China

TABLE VI
Basic Analyses of Chinese foods and Drugs, made by W. Y. Lee and R. G. Cheng

Name**	Chinese name	Water %	Fibre %	Protein %	Fat %	Cbhyd. by diff.	Ash %	Ca mgm.	P mgm.	Fe mgm.	K mgm.	VITAMINS***					
												A	B	C	D	E	G
Amaranth, green	莧菜(綠)	91.30	0.10	1.80	0.33	4.59	1.89	320.0	86.5	8.3	—			5			
Amaranth, red	莧菜(紅)	85.02	1.59	3.50	0.24	6.56	3.09	463.8	73.7	23.5	546.2			2			
Spinach	菠菜	91.46	0.88	2.40	0.30	3.20	1.76	102.8	38.4	19.6	400.0	2	1	3	*		2
Mustard leaves (salted)	芥菜(鹹)	83.08	1.65	1.50	0.40	4.07	9.30	214.4	32.7	16.6	223.2			5			
Bamboo sprouts	竹筍	89.88	1.82	1.80	0	5.61	0.89	14.4	44.4	2.0	475.3			1			
Cabbage	白菜	95.93	0.61	0.94	0.12	1.67	0.73	45.2	29.2	0.6	285.6	2	2	3	1	1	2
Rape	油菜	95.20	0.53	1.20	0.19	1.57	1.30	180.5	39.5	7.03	329.3	2	1	3	2		2
Celery	芹菜	93.64	1.18	0.52	0.14	3.30	1.22	109.6	39.2	3.11	217.7	2	(1)	2	*		
Taro (Aroid)	芋頭	83.81	0.65	0.99	0.40	13.36	0.79	38.7	49.1	3.91	396.4						
Water bamboo	茭白	92.37	1.10	0.95	0.26	4.65	0.67	10.7	51.8	1.19	292.6						
Pumpkin	南瓜	86.51	0.56	1.70	0	10.18	1.05	30.9	39.8	1.07	478.7	2	(1)	1	*		
White gourd	冬瓜	96.91	0.59	0.40	0.05	2.13	0.28	18.7	5.6	0.40	123.7			1			
Cucumber	黃瓜	93.42	0.32	1.40	0.10	4.28	0.48	17.8	39.3	0.90	185.8	*	(1)	2	*		
Loofah	絲瓜	95.23	0.74	1.05	0.13	2.31	0.54	30.6	31.1	1.03	244.6			1			
Eggplant	茄子	92.82	0.91	1.00	0.31	4.38	0.58	16.9	29.5	1.41	253.0	1	(1)	1	*		
Chilies	辣椒	92.97	1.93	1.40	0.15	3.05	0.50	16.6	36.8	2.08	253.7	2	(1)	3			
Lablab bean	白扁豆	88.30	2.10	3.16	0.27	5.36	0.81	81.1	67.8	3.40	273.2						
Cowpea	豇豆	90.15	1.40	2.64	0.46	4.87	0.48	45.6	47.8	2.58	154.1	2	2			*	*
Horsebean	蠶豆	60.16	0.67	13.55	0.77	23.40	1.46	54.0	238.8	5.91	539.2			*			
Soybean fresh	黃豆(鮮)	64.14	2.00	15.20	7.10	9.74	1.82	99.6	219.0	6.40	734.0	1	1	0	*	1	1
Soybean curd	豆腐	87.29	0.07	6.90	3.30	1.33	1.11	272.5	95.5	2.15	185.1						
Soybean sprouts	黃豆芽	83.02	0.65	6.80	2.40	6.24	0.89	67.5	102.4	6.43	301.7	1	(2)	2	*		
Rice, white	白米	14.21	0.25	5.95	0.82	78.24	0.53	33.5	78.0	6.49	126.7	0	0	0	0	*	*

* The experimental data is indefinite.

** These are all cited in the Pen T'sao Kang mu for the treatment of disease.

*** These facts are taken from M R C 1932, and Chf and Read 1934.

many centuries ago in the treatment of goitre. It is apparent that these old remedies were often quite efficacious. The use of animal bones, often associated in the minds of people with the particular virtue of the animal used, provides a good source of calcium, and the use of mineral salts is more like modern treatment. SHERMAN (1932) says that, "we are not now much interested in the long debated question of organic versus inorganic iron," and "the ability of the growing body to gain iron at an optional rate depends not simply on the iron content of the diet but also on its nutritive value in other respects." This has been amply shown to be true for calcium, hence particular food mixtures may be of special value.

D. ANTITOXINS

The habit of keeping a female monkey in the stable as a protection against disease is said to depend upon the horses eating the hay upon which the menstrual fluid of the monkey has been shed. The white of an egg placed in a public latrine for one week is said to be able to protect a child from smallpox. The use of various bloods whilst bordering on the magical does suggest some specific value. Further extensive reference might be made to a host of other remedies but we consider enough has been cited here to show that science may progress by looking backward as well as forward, that probably the most suggestive path of progress may be gained by studying the records of old empirical medicine, that the scientist needs more than any other to keep an open mind regarding the claims of ancient medicine, so that with the aid of modern knowledge and modern technique an unprejudiced study may be made of the customs of our forefathers, who however much they may have believed in demonology and false philosophical theories, were engaged in the same life and death struggle against disease. In China there has been preserved for something between 30 and 50 centuries remarkably accurate records of human experience in the field of medicine. These records are not accumulations of divine intuitions but empirical findings which up to the present have only been sifted with the very coarse sieve of last century science. On account of the great political significance of ancient medicine both in China, India and the countries of the Far East there is need for a truer evaluation of its claims. This can only be done by the scientist and not by the layman or old practitioner untrained in modern scientific methods.

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