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By Bernard E. Read[1]

There are 446 animal substances used in ancient Chinese medicine (Table 1). Each of these has a monograph in the great classic the *Pen-t'sao Kang-mu* (本草綱目) of Li Shih-chên (李時珍) written in A.D. 1597. These monographs give detailed descriptions of the animals concerned, their habitat and habits, the old folk-lore associated with them, and sub-headings of the various preparations and their uses. The *Pen-t'sao Kang-mu* stands as the finest encyclopedic record of the natural history of fauna and flora of China, of great value to the naturalist, the ethnologist and physician.

As a historical document it is to be compared with and has much in common with European pharmacopoeias of the sixteenth and seventeenth centuries, such as the *Augsburg Pharmacopoeia,* A.D. 1581, and the *London Pharmacopoeia,* A.D. 1618. Remedies similar to the Chinese, often identical both in form and use, were employed by the Egyptian, Greek and Roman physicians. The Arabs, though they introduced musk, hermes and bezoar into medicine (probably from China), were not largely interested in animal materia medica. The introduction of such into European medicine came in the later centuries, and one surmises that much of it must have come from China. In the seventeenth century Europe was using: gall-stones; the louse; pearls; blood of the bat, bull, cat, dog, frog, goat, goose, hare, man, partridge, pig, pigeon, stag and tortoise; brains of hares and sparrows; eggs of the ant, hen and ostrich; dung of the cow, dog, hen, horse, man, mouse, peacock, pigeon, sheep, swallow, wolf; fat from the badger, bear,

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TABLE I. ANIMAL DRUGS IN CHINESE MEDICINE

HERBALS		Insects 虫	Scaly Animals 鱗	Shelly Animals 介	Birds 禽	Mammals 獸	Man 人	Total
本經	B.C. 2837	29	7	8	5	15	1	65
炮炙論	A.D. 479	—	—	—	—	1	—	1
別錄	502	17	10	5	11	12	5	60
唐本草	620	1	1	2	2	8	1	15
食療		—	6	—	2	—	—	8
拾遺		24	28	10	26	15	8	111
海藥		1	—	2	—	—	—	3
蜀本草	951	—	—	1	—	1	—	2
開寶	960	2	11	2	1	4	1	21
嘉祐		—	1	8	13	1	4	27
圖經		2	—	1	1	1	—	5
日華		1	1	—	1	—	2	5
證類		2	—	—	—	1	1	4
衍義		—	—	—	—	1	—	1
日用	1280	—	—	—	—	1	—	1
食物	1368	—	—	—	10	1	—	11
食鑑		—	1	—	—	1	—	2
會編		1	—	—	—	—	—	1
蒙荃		—	—	1	—	—	1	2
綱目	1597	26	28	6	5	23	13	101
TOTAL		106	94	46	77	86	37	446

beaver, boar, bull, camel and 27 other animals; the bile of 10 different animals; the heart of the bullock, pig, stag and wether; saliva of a fasting man; moss from the skull of a man who had met a violent death; and a host of other bizarre remedies.[2] All of which is in marked contrast with the very small list of fifteen articles of animal origin in the *British Pharmacopoeia* of 1898: cantharides, cod liver oil, cochineal, honey, lard, leeches, musk, ox-bile, pepsin, spermaceti, suet, milk-sugar, thyroid gland, wax and wool-fat; from which leeches, musk and suet were omitted in 1914. This decline in the use of animal medicines was due to various causes, such as:

1. Their unesthetic character.
2. The failure of humeral pathology and the false philosophies which supported the use of such old remedies.
3. The exposure of quackery and the misuse of so many drugs.
4. The lack of a rational basis.

This is so different from the history of Chinese medicine which shows, from Shen-nung's Pen-ching (神農, 本經), 2837 B.C., which introduced 65 remedies, an increasing volume in the number of animal drugs used period by period, till in Li Shih-chen's time, A.D. 1597, some 446 were considered of recognized value. Their empirical value was not lessened in peoples' minds by their unesthetic character, the theories supporting their use were firmly held, and, lacking the experimental method, quackery was not exposed nor were the uses of the drugs put on a rational basis.

These 446 articles have many thousands of preparations; for example, the cow has 40 sub-headings including the nose-ring, cud, bolus from stomach, meconium, nasal secretion, epiglottis, hoof, etc., not included in Table II. This table shows 26 parts of the six domestic animals commonly used in ancient therapeutics. We are a long way from showing the real value of these preparations, and, lacking evidence, the scientific man is apt to scorn any possible specific value. However, as I have pointed out before,[3] our improving

[2] A. C. Wooton, *Chronicles of Pharmacy*, London, 1910.

[3] B. E. Read, *The Newer Pharmacology and its relationship to Ancient medicine* (*Trans. Far East. Assoc. Trop. Med.*, 1934, 2, 627-638).

TABLE II. DOMESTIC ANIMALS

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	*	*			*	

technique and scientific knowledge is yearly bringing forth increasing evidence for the real worth of some of these remedies.

DOMESTIC ANIMALS

Pig's liver. Pig's liver rich in vitamins A, B, C, D and E[4] was recommended in old Chinese medicine for night blindness, beri-beri, scurvy-like symptoms, emaciation and edema.[5] Some of these uses were also 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 and various eye troubles, gingival ulcers and chronic diarrhoea. The last mentioned is so similar to the modern use of liver soup for sprue.

Pig's pancreas or sweetbread. Pig's pancreas or sweetbread was regarded as the source of the three digestive principles. It was given with cinnamon and artemesia for symptoms of sprue. Oral administration of an alcoholic extract was favoured. It is of interest that Boldyreff in recent years obtained an effect on blood sugar by oral doses of alcoholic extracts.

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 mackeral were used for night blindness. Wald in 1934 isolated vitamin A, the specific remedy for night blindness, from the iris of sheep, pigs, cattle and frogs.

Ox-bile. The bile from the ox, sheep, pig, dog, chicken, bat and rat were given for night blindness and to clarify the vision. Similar to the modern use of ox-bile that of the sheep and pig were recommended as purgatives. These remedies among 148 others recommended for night blindness suggest some possible rich sources of vitamin A, see Mar's report, 1936.[6]

Pig's kidney. This was classed as a saline cold remedy, and if taken too often it was said to lessen the number of children. It was recommended as a diuretic, for chronic diarrhoea, alcoholism,

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[4] M. A. B. Fixen and M. H. Roscoe, *Nutrition Abstracts*, 1937-38, 7, 823.

[5] B. E. Read, *Chinese Materia Medica* (*Peking Nat. Hist. Bull.*, 1931).

[6] P. G. Mar and B. E. Read, *Chinese Remedies for night blindness* (*Chin. J. Physiol.*, 1936, *10*, 273-284).

tuberculosis and beri-beri, etc. Pig's kidney has been found to contain 340 international units per 100 grams of vitamin B the specific remedy for beri-beri, it also contains 14 mgm per 100 grams of vitamin C.

Dog-meat. This remedy Dr. Lim Boom-keng, in his Manson Memorial lecture, Hongkong 1925, claimed was a specific for tuberculosis. The *Pen-t'sao* says that from yellow dogs is best. Taken by pregnant women it is said the offspring will be dumb, and taken after a fever murder will be committed. It should not be eaten in the ninth lunar month. It is said to be aphrodisiac, beneficial to the respiration; warming to the back and general circulation. It is not eaten by Taoists.

Urine and feces. The excretions of animals are repeatedly quoted for the treatment of deficiency diseases. The fact that vitamin C and other compounds are titratable in the urine suggests a careful examination of the excreta of various species for the presence of certain vitamins. Various preparations including the excreta of rats and cats are used for plague buboes. It was claimed by the old physicians in Tientsin in 1911 when pneumonic plague swept Manchuria that the urine of cats contained an antitoxin, produced by the eating of plague infected rats.

The donkey. This animal is usually the object of much mirth or derision among Western peoples yet it holds an honourable place in Oriental medicine. The parts of the black variety are used. The fact that Peking used to have a "Donkey meat lane" indicates that at one time donkey meat was esteemed as an article of diet. It was said to quieten the mind and remove extreme depression, it was given as a tonic for the circulation and respiration, and was regarded as a cure for all forms of "wind" disease. Donkey gall stones are greatly prized. One was offered to the writer by a druggist at Chichow for $93. It weighed 31 ounces and when sectioned was well laminated like the genuine article. Recommended for convulsions. For insanity and dumbness and lack of recognition of people three pints of donkey fat were given with alcohol. The marrow was applied to the ear for chronic deafness. The blood and milk were given for fevers. The penis was regarded as a muscle tonic "improving the *yin*" (滋陰).

The placenta was given with wine for alcoholism. For all types of inflammation in the bones there was recommended a special prescription from the brown hair of the ass. One catty was roasted and steeped in ten pints of wine for three days. Before breakfast the patient sipped this preparation until intoxicated, and the inflammation was sweated out by lying in a warm place. The dung, bones, urine, ear-dirt, urinary sediments and the dirt from the proximal end of the tail were used. To stop a baby's ceaseless crying, it should be secretly carried to a donkey's stable by three women where they must lie down for a while. These remedies have been recited to indicate that much of this old medicine is folk-lore, and can probably never be put on a specific rational basis. Yet there are here and there things to arrest the attention. Donkey skin glue might appear to be just like ordinary glue or gelatin, yet Dr. T. G. Ni has published a series of researches to show that it has unusual properties. It increases the absorption and retention of calcium, its blood-forming property is superior to iron or milk, it is of value in circulatory failure encountered in severe hemorrhage and shock, it has been used successfully both in the curative and prophylactic treatment of experimental muscular dystrophy. Its action in preventing nutritional encephalomalacia in chickens and other dietary experiments suggest the presence of vitamin E or some similar active principle.[7]

WILD ANIMALS

Tiger. The *Pen-t'sao* lists 38 wild animals and 12 rodents, and their various parts. Among these the tiger is pre-eminent. Everyone is familiar with the use of tiger bones as a medicine for imparting strength and courage. A new born child bathed in a tiger bone bath is said to be free of infection, convulsions, devil possession, scabies and boils, and will grow up free from sickness. It is recommended for malaria, typhoid fever, hydrophobia, and numerous other complaints. Only just a few weeks ago I saw a letter from the South telling of the killing of a tiger near a modern hospital and every part of the animal was seized. The flesh is considered

[7] T. G. Ni, *Chinese J. Physiol.*, 1934, *8*, p. 21; 1937, *12*, 281; 1938, *13*, 229.

good for malaria and a talisman against 36 kinds of demons. The fat is given to stop vomiting. It is applied to hemorrhoids. The blood is said to strengthen the will-power. The stomach is considered to be sedative, the testes are used for scrofula, the whiskers for toothache, the teeth for genital sores, and the bile, eyeball, nose, claws, skin, feces, etc., are all old established remedies.

Yak. It is of special interest to note that the thyroid gland of the yak is recommended for goitre. Two doses are said to produce a miraculous effect. The Chinese term *yen* 腺 is usually translated epiglottis, but the detailed description of the tissue either side of the trachea leaves no doubt about this being thyroid, though that from the pig and sheep clearly refers to the epiglottis 咽 舌 *yen shê,* which is only used for neck abscesses. It is noteworthy that most animals have many parts used as medicines but this is the only part of the domestic yak introduced as a drug, and whilst there is no apparent reason why this animal should be chosen, the particular tissue has a specific scientific value.

Deer. Among the six kinds of deer given in the *Pen-t'sao,* the sika deer is of particular interest. There are listed for various uses the meat, bones, teeth, feet, fat, bone-marrow, brain, semen, blood, kidneys, bile, tendons, epiglottis, skin, feces, and horns. Whilst these animals may be seen grazing wild in large flocks on the Mongolian plateau, one often sees them in captivity for the purpose of securing the unbroken horns in the velvet stage. These are collected in the fourth and sixth lunar months and air-dried in the shade. In the early summer the male likes to feed on flagroot. It becomes very fat. Before the horns are shed the deer are caught by hunters and killed before the blood in the horns is shed, which is said to contain the essence. Those purple as an eggplant, tips like red agate, four to five inches long and saddle shaped, are considered the best and known as *lu jung* 鹿 茸. They are regarded as a great vitalizer, strengthening the mind, promoting the growth of permanent teeth, a great male aphrodisiac. Said to be diuretic, a cure for weakening diarrhoeas and dysenteries, a tonic for all kinds of weakness. These horns may often be seen mounted in the Chinese drug shops. They command the high price of $200 to $400 a pair. Russian scientists find they contain a large amount of

the male sex hormone, a strong nerve tonic stimulating the circulation. There is also a strong diuretic action.[8]

In 1921 there was admitted to the P.U.M.C., Peking, a patient who was a cretin, 17 years old, weight 46 lbs, height 39 inches. He was given thyroid treatment for one month after which, showing little improvement, he left the hospital and was treated by an old physician who gave him a prescription of deer horn, tiger bone and tortoise shell. After three months the patient showed a gain of about 12 lbs in weight and 3 inches in height.[9]

The use of musk has gone out in the West except as a component of certain expensive perfumes, but one cannot ignore the recent work of Takayama showing its strong tonic action on the heart and its central constrictor action on the blood vessels. It was regarded as a circulatory stimulant benefitting the muscles and bones and used for numerous complaints.

Bear. The bear has figured largely in old western medicine and has numerous preparations in Chinese materia medica. The paws which are one of the eight greatly esteemed articles of diet are recommended as a vitalizer and to ward off colds. Bear's fat was used to cure baldness, promote hair growth, for feverish colds and to promote longevity. The gall was used for various eye troubles, chronic dysentery, jaundice, and for clearing the mind. Said to be anthelmintic and antipyretic. The meat was given for rheumatism and as a general tonic. The bones, blood and spinal cord were also used for similar purposes.

Cat. The Chinese character *mao* 貓 given for this animal originates from the combination of the animal radical with the phonetic for crops, which the cat is able to protect from the ravages of rodents. Cat flesh was used to treat rat-bite, worm toxemia and fatigue. Plague buboes attributed to the poisonous saliva from rat bites were treated with the ashed cranium of the cat and the eye of the fox. The brain was applied to buboes and to swollen neck glands. The teeth with those from the dogs, pig and human were given for smallpox. The eyes, saliva, hair and feces are given in various prescriptions for scrofula. The liver of a black cat taken

[8] S. M. Pavlenko, *Pantocrine,* Moscow, 1935.

[9] Recorded in the *Journal of Endocrinology,* 1922, Vol. 6, p. 596.

in wine at midnight on the 15th day of the month was given for tuberculosis and as a warm medicine. A little of the ashed placenta mixed with mercury sulphide held under the tongue was said to be very effective in stopping vomiting and nausea.

Rabbit. There are many fables concerning the rabbit so it is not surprising that this monograph contains many absurdities. Licking the hair of the male is said to cause the female to become pregnant. A pregnant woman is warned not to eat rabbit meat, such is said to cause the offspring to develop a hare-lip, and delivery will take place through the mouth of the mother instead of in the usual manner. There is said to be no spleen in a rabbit, and there are nine orifices in the anal region. The meat is recommended for diabetes, rheumatism, toxic fevers and as an antidote to cinnabar poisoning. It is said to strengthen the spleen, cool the blood, and increase peristalsis. The blood and bones are similarly used. The brain is given with the marrow for deafness and difficult labour. The liver and feces are both given to clear the vision and various eye troubles. The cranium, skin and fur have a number of uses associated with childbirth, smallpox and diarrhoea. Some of these various uses interpreted more accurately into modern scientific language might find a rational basis, when one considers the fact that rabbit liver has been found to contain 9,300 units of vitamin A per 100 grams; the brain, heart, liver, lung and kidney contain relatively large amounts of vitamin B_2; the muscle, blood, brain, kidney, liver, lung, heart and suprarenal contain vitamin C, the last tissue about four times greater than orange juice.[10]

The Hedgehog. The hedgehog in Chinese folk-lore is one of the five supernatural animals, the others are the fox, rat, polecat and snake, hence some people do not like to have them killed. However, the skins have an extensive sale on the drug markets, and the flesh, fat, heart, brain, liver and bile are old remedies both here and in the West. The flesh was used for nausea and lack of appetite and for piles. The fat for deafness, flatulence and diarrhoea; it was also applied for eczema, scabies and baldness. The ashed skin with its spines was highly valued as a styptic both

[10] M. A. B. Fixen and M. H. Roscoe, *Nutrition Abstracts*, 1937-38, 7, 823.

internally and externally, and used for piles, nose bleed, nausea, bloody dysentery, and rupture.

Monkeys. With the monkeys are listed elves, dryads and naiads. In this collection of folk-lore, one's attention is arrested by the old custom of keeping a female macaque in a horse's stable to ward off sickness. The menstrual discharge shed on to the straw and eaten by the horse was said to give a lasting immunity against infectious disease.

Human Medicines. Under 37 headings there is so much of an unesthetic character that there is little to be gained by dwelling at length upon this phase of the subject.[11] Fourteen pubic hairs from the husband ashed and taken with lard in the form of a pill is not likely to replace modern assistance in difficult labour, nor to find even a remote rational base for its old use. There are better methods of treating cold and weakness in the lower extremities than having young boys and girls breathing into the patient's navel. The human skull cooked in boy's urine was given for devil possession, malaria and nightsweats.

Bird Drugs. The 77 species of birds used included 23 of the aquatic type, 23 from the plains, 17 forest and 14 mountain birds.[12] These include the bats which are not birds, the mythological phoenix, the ostrich now extinct in China, and the extinct aepyornis. What has been already said regarding the wild animals and certain of their tissues may apply to some of these remedies.

Chickens. The chicken has 25 sub-headings including cock's eggs said to be good for affections of the eye, though more often used in the magic arts. Which reminds one of the case cited in Frazer's *Golden Bough* at Bale in Europe, A.D. 1474, when an aged cock laid an egg. It was sentenced to death in the regular courts on a charge of sorcery. Ordinary eggs are rich in vitamin A, about 8,000 units per 100 grams, tested biologically, and rich in vitamins B_1 and B_2, and D. Ducks' eggs are similarly rich and also contain some vitamin C. Chicken liver is very rich in vitamin A, and has a good amount of vitamin C.[13] These facts may account for the

[11] B. E. Read, *Man as a Medicine* (*Peking Nat. Hist. Bull.*, 1931, 6, 77-102).
[12] B. E. Read, *Avian Drugs* (*Peking Nat. Hist. Bull.*, 1932).
[13] M. A. B. Fixen and M. H. Roscoe, *Nutrition Abstracts*, 1937-38, 7, 823.

reputed value of these preparations for eye diseases and various conditions which might be due to nutritional deficiencies, but why chicken excrement should revive a suicide from hanging or cure a cold one cannot say.

The excreta of Birds. Four kinds of excreta are commonly found in the drug stores, those of the pigeon, sparrow, bat and flying fox. The last mentioned called 五靈脂 is very famous as an eye remedy for night blindness and has been found to have a good content of vitamin A.[14]

Dragon and Snake Drugs. The story of the Peking man, *Sinanthropus pekinensis,* will stand as a classic. It started in a Peking drug store when a tooth was found in a packet of dragon's teeth. Dragon's bones and teeth as so commonly used are the fossil bones of a great variety of prehistoric animals including man. The remote zoological relationship of the animals brought together in this chapter of the *Pen-t'sao* emphasizes their close cultural relationship,[15] it includes dragons, snakes, crocodiles, lizards, etc. There is more of value to the student of folk-lore and symbolism than to the student of modern medicine. Dragon's brains for diarrhoea and dragon's saliva as a sexual stimulant do not command serious attention from the physician, they are cultural curiosities providing entertaining research in other fields.

For some strange reason the frogs and toads are classed among the insects. The dried secretion of the parotid gland of the toad used as a heart medicine is of great scientific interest, for the chemical structure of its active principles and their physiological properties are almost identical with those of the renowned heart drug digitalis. This with the active principles from the puffer fish and the salamander, are some of the very few animal remedies with such strong action that marked toxic or fatal effects may be seen.

Shell-fish and Turtles.[16] The 29 headings include all of the common shell-fish, the main virtue of which appears to be the high content of lime in the shells. Oysters were recommended for

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[14] P. G. Mar and B. E. Read, *Chinese Remedies for night blindness* (*Chin. J. Physiol.,* 1936, *10,* 273-284).

[15] B. E. Read, *Dragon and Snake Drugs* (*Peking Nat. Hist. Bull.,* 1934).

[16] B. E. Read, *Turtle and Shell-fish Drugs* (*Peking Nat. Hist. Bull.,* 1937).

general debility, erysipelas, diabetes. They are given to assist menstruation and for their supposed antivinous property. The presence of considerable amounts of vitamins A, C and D, various heavy metals notably zinc, iodine, glycogen and other extractives, certainly gives to oysters a high nutritional value. The old prescriptions containing pearls and cowry shells are largely based on folk-lore. *Pao P'u Tzŭ* (抱朴子) states that large pearls when eaten will confer immortality. Certain cowries are said to be so strong that they make people when they go out at night able to overpower goblins and all wild beasts.

The turtle which is considered the archtype of all the 360 scaly animals known in olden days enjoys an extravagant reputation for its tonic properties. In the West the oil has come into vogue in the preparation of cosmetics. It has been found to be exceedingly rich in vitamin A, 38,400 units per 100 grams. Its use in old Chinese medicine is limited to the removal of white hairs. On the last day of the year these should be pulled out and turtle fat poured into the holes and then they will not grow again. If it is desirable to grow the hair again and if it does not do so, apply the milk from a white bitch.

Fish. With cod liver oil in almost every modern home as a sovereign remedy for chest complaints, introduced empirically into the *London Pharmacopoeia* as late as A.D. 1851, some consideration must be given to other fish oils and eel fat which have been cited in medical literature in China since Shen Nung, and in Egypt from the earliest times in the Papyrus Ebers. The sheatfish cited in the *Pieh Lu* (別錄) is also found in that ancient Egyptian document. There is an abundance of literature on the use of cuttlefish in Sancrit, Greek, Arabic and ancient Indian medicine. There was the old Greek practice called the "Amphidromia rite", when the naked father on the tenth day after the birth of a child runs round and round it and the child is presented with octopuses and cuttlefish, emblems of the goddess Aphrodite and hence are regarded as givers of life, health and good luck, which as Elliot Smith has shown is associated with their use as aphrodisiacs and for women's complaints.

Beside fish-meat which is universally eaten in the diet there are

TABLE III. VITAMIN CONTENT OF FISH[17]

FISH	Vit. A units per 100 gm.	B1 units per 100 gm.	B2 mg per 100 gm.	C mg per 100 gm.	D units per 100 gm.
Barbel liver	—	—	—	58.4	—
Carp flesh	1020	50—100	—	**	—
Catfish, liver oil	150,000	—	—	—	—
Catfish, yellow-headed	—	—	—	**	—
Dogfish, liver oil	—	—	—	—	300 to 2000
Eel	660 to 7930	—	0.18 to 0.51	**	4700 body oil
Flat fish, liver oil	2000	—	—	—	140,000
Herring	**	10	—	27.7	20,000
Herring roe	*	60	—	—	—
Prawn	trace	30	—	1.2	—
Puffer, liver oil	—	—	—	—	57,000
Rockfish, liver oil	—	—	—	—	150,000
Sciaenid	trace	—	—	14.1	—
Sciaenid, liver	—	—	—	59.1	—
Shark fat	426,777	—	—	—	**
Sheatfish	—	—	—	**	—
Skate, liver oil	***	—	—	—	2,500
Sturgeon, liver oil	2 million	—	—	—	—

[17] M. A. B. Fixen and M. H. Roscoe, *Nutrition Abstracts*, 1937-38, 7, 823.

prescribed the liver, eggs, scales, maws, oil, otoliths, head, bones, eyes, aqueous humor, guts, bile, brain, teeth, blood, skin, gills, tail, snout, mucous, jaws and their preparations.[18]

The known therapeutic values of fish centre around their content of vitamins, (see Table III). Of the fish examined by scientific workers[19] the carp has been shown to contain 50 to 100 units of vitamin B per 100 grams of flesh. The common carp was recommended for edema in the Liang dynasty and the black carp in the Sung dynasty specifically for beri-beri. In the Ming dynasty the golden-carp was given with mung beans to reduce edema.

The liver oil of the sturgeon has about the largest content of vitamin A of any fish known. In the T'ang dynasty the liver of the sturgeon was given for skin diseases and blood poisoning. The sharks are known to contain large amounts of vitamin A. Shark skin and bile in the Liang, T'ang and Ming dynasties were specially recommended as anti-infective agents. The body fat of the eel has been reported as containing 9,980 to 74,230 international units per gram. The eel and eel fat are among the oldest of Chinese remedies for tuberculosis and infections. They are cited in ancient Egyptian and European medicine. It is said that Japanese on the first day of summer eat eels with the idea that they will prevent sickness for a whole year. It should be observed that eels are also rich in vitamins B_2, C, and D.

Macgowan long ago in 1872 pointed out the successful use by old Chinese of the shad (samli) with iodine-containing plants for tuberculosis. Whilst no examination has been made of the Chinese shad, or hilsa herring as it is also called, it is known that the herring family is rich in vitamins A and D, and also contains B and C. The shad since the T'ang dynasty has been regarded as a tonic for weak people. Recently Wang and Kan have shown that the liver oil of Akaje's sting ray has a high content of vitamins A and D. This fish was introduced into Chinese medicine in the T'ang dynasty and recommended for disorders of the genito-urinary tract. Flat fish which contain perhaps even larger amounts of these vitamins were

[18] B. E. Read, *Fish drugs* (*Peking Nat. Hist. Bull.*, 1939).
[19] M. A. B. Fixen and M. H. Roscoe, *Nutrition Abstracts*, 1937-38, 7, 823.

introduced in the T'ang dynasty as a tonic for weak people. Rockfish introduced in the Ming dynasty have an extraordinarily high content of vitamin D. They were said to prevent the growth of carbuncles and were used for scrofula.

Matsubara and Chuda (1937) have estimated the vitamin C in the tissues and organs of the carp, golden carp, yellow-headed catfish, barbel, eel, snakehead and sheatfish, and found the vitamin content was highest in the roe and lowest in the muscle. The liver, kidneys, gills, stomach and guts were all fairly rich in ascorbic acid. They consider that these fish eaten raw in Japanese style provide an important source of this vitamin in the diet. It is too lengthy a matter to cite all the old therapeutic uses of these fish, their tissues and organs; suffice it to say they have undoubted therapeutic value. The presence of lactoflavin in fish eyes is made the basis of a suggestion by Adler and Euler in 1938 that it functions as a photochemical agent. The flavines are related to vitamin G, and may give a basis for the use of carp's eyes as a skin remedy.

Whilst fish livers often contain large amounts of vitamin A, recent studies show that the guts are usually far richer. Part of the gut, the pyloric caeca, is the richest part of the fish so far examined by Edisbury and Morton. In the herring it has yielded an oil four times richer than cod liver oil. The stomach of the halibut yields an oil 4½ times richer than halibut liver oil. Hence there is some rational basis for the use of those parts of fish which are usually gutted away either at sea or when prepared as a food.

FUTURE OUTLOOK

Ancient animal materia medica cannot hope to sustain its same place in the modern world for the following reasons:

1. It is too unesthetic. There are available so many pure chemical principles that educated refined people will not support a system based on unscientific theories to start with, and its unesthetic character sustained because of superstitious beliefs.

2. Even the rational side is so intermingled with superstitious folk-lore that it is difficult to clarify and prove the real value of the preparations prescribed.

3. As practiced it involves cruelty to animals. This has been set forth in detail by Sowerby[20] in a recent article based upon his wide intimate knowledge of hunters and field work.

4. As carried on it must involve the killing off of some very valuable wild animals.

The history of the West is likely to be repeated in the East. The old unesthetic animal remedies will largely disappear, and will be replaced by pure principles synthesized by the chemist or by preparations made under proper hygienic conditions, used on a rational basis.

[20] A. de Carl Sowerby, *Blue Cross Magazine,* Shanghai, 1938, December.