

The BULLETIN  
OF THE  
VANCOUVER MEDICAL  
ASSOCIATION

Vol. XII.

FEBRUARY, 1936

No. 5



*In This Issue:*

THE EARLY DIAGNOSIS OF BRAIN TUMOUR  
HEAD INJURIES  
THE PHYSIOLOGY AND CHEMISTRY OF THE  
FEMALE SEX HORMONES  
INCOME FROM MEDICAL PRACTICE

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# THE VANCOUVER MEDICAL ASSOCIATION BULLETIN

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VOL. XII.

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# VANCOUVER HEALTH DEPARTMENT

## STATISTICS—DECEMBER, 1935

Total Population (Estimated).....	244,329
Japanese Population (Estimated).....	8,037
Chinese Population (Estimated).....	7,803
Hindu Population (Estimated).....	276

	Number	Rate per 1,000 Population
Total deaths.....	225	10.8
Japanese deaths.....	8	11.7
Chinese deaths.....	5	7.5
Deaths—residents only.....	201	9.7
Birth Registrations—Male, 129; Female, 123.....	252	12.1

INFANTILE MORTALITY—	December, 1935	December, 1934
Deaths under one year of age.....	5	8
Death rate—per 1,000 births.....	19.4	31.7
Stillbirths (not included in above).....	5	3

### CASES OF COMMUNICABLE DISEASES REPORTED IN THE CITY

	November, 1935		December, 1935		January 1st to 15th, 1936	
	Cases	Deaths	Cases	Deaths	Cases	Deaths
Smallpox.....	0	0	2	1	1	0
Scarlet Fever.....	49	0	49	0	29	0
Diphtheria.....	0	0	0	0	0	0
Chicken Pox.....	148	0	76	0	71	0
Measles.....	10	0	24	0	45	0
Rubella.....	17	0	73	0	105	0
Mumps.....	83	0	111	0	216	0
Whooping-cough.....	9	0	1	0	3	0
Typhoid Fever.....	0	0	0	0	0	0
Undulant Fever.....	0	0	1	0	0	0
Poliomyelitis.....	0	0	0	0	0	0
Tuberculosis.....	17	21	26	17	27	--
Meningitis (Epidemic).....	0	0	0	0	0	0
Erysipelas.....	4	0	4	0	1	0
Encephalitis Lethargica.....	0	0	0	0	0	0
Paratyphoid.....	0	0	0	0	0	0

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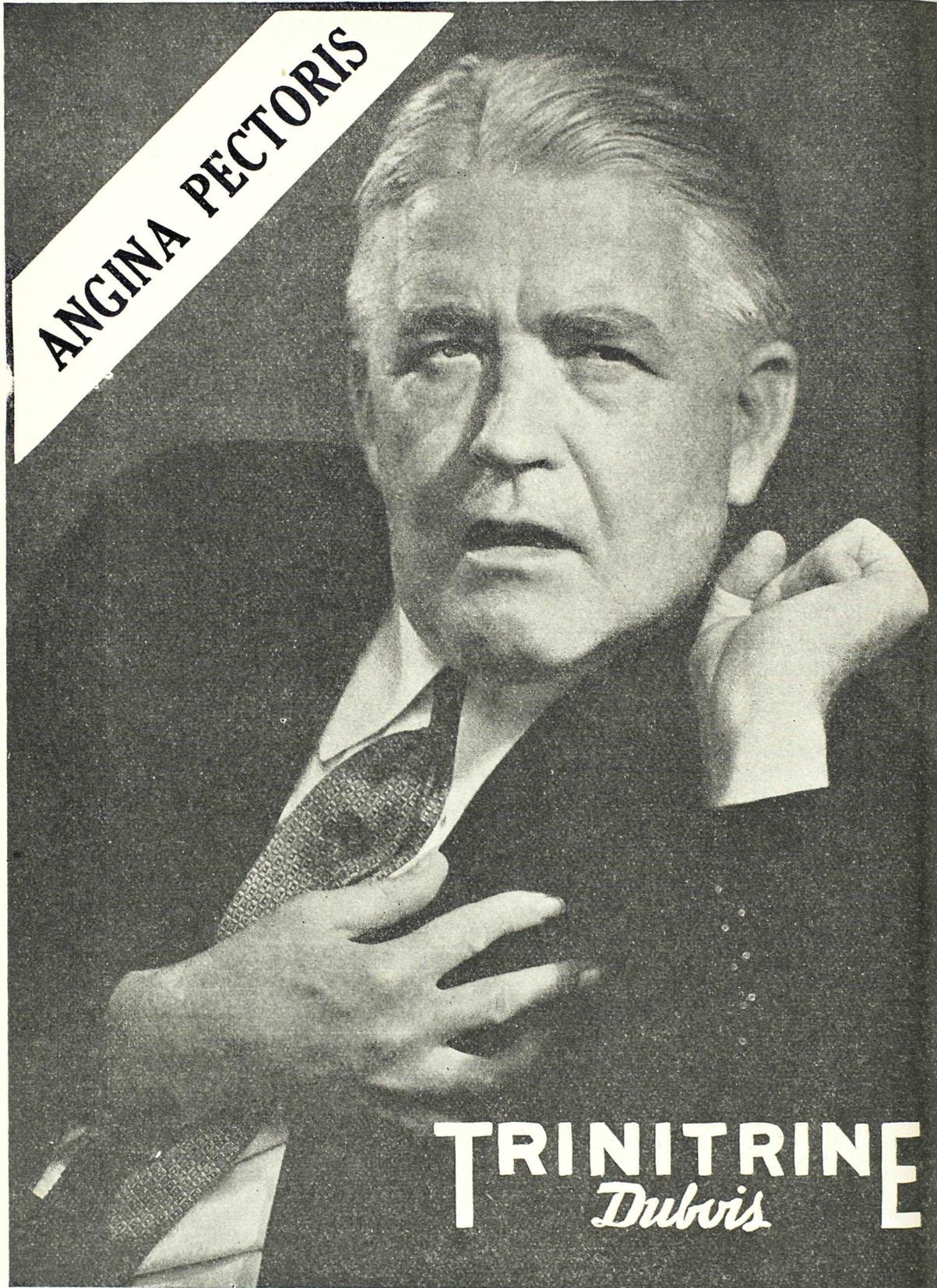
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# VANCOUVER MEDICAL ASSOCIATION

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## Programme of the 38th Annual Session

GENERAL MEETINGS will be held on the first Tuesday of the month at 8 p.m.

CLINICAL MEETINGS will be held on the third Tuesday of the month at 8 p.m.

Place of meeting will appear on Agenda.

General Meetings will conform to the following order:

8:00 p.m.—Business as per Agenda.

9:00 p.m.—Paper of the evening.

1935.

October 2nd—GENERAL MEETING.

DR. G. F. STRONG: "Cardiac Pain."

*Discussion opened by* DR. H. A. DESBRISAY.

DR. A. M. AGNEW: "Vaginal Plastic Surgery."

*Discussion opened by* DR. J. J. MASON.

October 15th—CLINICAL MEETING.

November 5th—GENERAL MEETING.

DR. J. R. NADEN: "Epiphyseal Injuries."

*Discussion opened by* DR. F. P. PATTERSON.

DR. J. H. MACDERMOT: "Early Medical History of the B. C. Coast."

November 19th—CLINICAL MEETING.

December 3rd—GENERAL MEETING.

DR. LYALL HODGINS: "Diabetes."

*Discussion opened by* DR. WALLACE WILSON.

DR. FRANK TURNBULL: "The Early Diagnosis of Brain Tumours."

*Discussion opened by* DR. F. W. EMMONS.

December 17th—CLINICAL MEETING.

1936.

January 7th—GENERAL MEETING.

DR. WALTER M. PATON: "Tumours of the Head and Neck."

*Discussion opened by* DR. H. H. PITTS.

DR. B. J. HARRISON: "Roentgenology of Cardiac Diseases."

*Discussion opened by* DR. G. F. STRONG.

January 14th—CLINICAL MEETING.

February 4th—GENERAL MEETING.

MR. J. W. DEB. FARRIS: "Medico-Legal Problems."

February 18th—CLINICAL MEETING.

March 2nd—OSLER LECTURE.

April 7th—GENERAL MEETING.

DR. C. E. DOLMAN: "Serum Therapy."

*Discussion by* DR. HOWARD SPOHN AND DR. A. Y. McNAIR.

April 21st—CLINICAL MEETING.

April 28th—ANNUAL MEETING.

## EDITOR'S PAGE

“THE King is dead: long live the King.” This is the one topic in men’s hearts, and on their tongues today. It is natural, or, at any rate, usual, for a great deal of insincere rubbish to be written and said when a monarch or a great ruler dies or comes to the throne. A certain code, a certain formal rule of officialdom, makes this necessary and unavoidable. We are all happy and proud to reflect that this is not the case with either George V, our late lamented and honoured King, or his successor, Edward VIII, the new Sovereign and Emperor, who succeeds him.

The great glory and pride of the British Royal Family, in the past generation at least, has been the attainment, by these two men, of a level of service to their people, and love and honour from their people, that can seldom have been equalled, and certainly has never been surpassed, by any royal father and son. Each, “in his separate star,” has reached the heights and kept them; and each has done his share in restoring to the title “royal” the meaning and distinction that this term should have.

A moving little story appeared in a news article recently that aptly illustrates one of the main reasons why we may as a race thank God for George V. Coming in from a drive, he was obviously moved and touched deeply by the warmth of the acclaim that had been given him by the crowd outside the Palace. “I can’t understand it,” he is reported to have said; “I am such an ordinary man.” No long analysis of his character, no minute research into his ways of life and his doings, could better reveal why his people loved, as well as honouring, their King. He *was* an ordinary man, made great by his humility, by his kindness, by his ungrudging giving of himself constantly and untiringly to his people, whom he ruled, not by force of arms, but by force of character and by the service he gave. In the Psalmist’s definition of a gentleman, we read, “He that setteth not by himself, but is lowly in his own eyes . . . shall never fail,” and in the greater words of a greater Man, “He that would be chief among you, let him be as one that serves.” And so he was. His life was a long service to his people, and so he ruled, and will always rule, in their hearts; and if the rulers of the world would be more like George V, the world would be a better and a happier place.

King George was that great thing, an ordinary man. It is the ordinary men that “maintain the fabric of the world,” that carry the load, that are the P. B. I. of humanity. They have no special gifts to make their road easy; they have no benevolently paternal governments or social service organisations to see that they eat without working, and have all their ills cared for at no cost to themselves. No—they do the work that will earn the money that will be paid as taxes that will support and feed and care for the lazy and the indigent and the unfortunates of society. “The Lord He lays it on Martha’s sons,” as Kipling says.

So it is very cheering and inspiring to them when one of their number, a man like themselves, shews to what heights an “ordinary man” can rise, through patience and courage and unselfishness and willingness to do his work without grudging or complaining. And no greater tribute could be paid to King George V and his beloved wife Queen Mary than the fact that they were an ordinary man and woman, grown to full stature through kindly and kingly service, loved of ordinary men and women, an example and an inspiration and a beacon to ordinary men and women everywhere.

And their son, Edward, now the eighth King and Emperor: he, too, has caught the fire of personal gift of himself to his people—and for

many years he has done work that has meant real, royal service to the world. His true sympathy for the downtrodden and oppressed, his simple devotion to duty, his courage, his complete willingness to give his whole being to his task as Prince, augur well for his future as King. The nations he rules, the world at large, can feel nothing but gratitude that such a man assumes this new rank and position, and we, as British subjects, will gladly tender to him our sincerest loyalty and devotion, not because we must, but because he is worthy of these things, because he will carry on the tradition that British royalty for hundreds of years has made their guiding rule of life, with few and rare exceptions.

"GOD SAVE THE KING!"

## NEWS AND NOTES

The new Executive Secretary of the B. C. Medical Council and B. C. Medical Association is our old friend Dr. M. W. Thomas of Victoria. Dr. Thomas has long been known as a staunch and loyal fighter for the medical profession, keenly interested in medical economics, and always somewhere in the thick of the fight. We welcome him heartily, and bespeak the support of every medical man for him in his work.

\* \* \* \*

Drs. Lavell Leeson and Colin Graham have left for California, to attend the mid-winter Clinical Post-Graduate Course at the University of Southern California. Here's hoping they get a little time out for innocent relaxation: since the old proverb about "all work and no play" is still as true as ever.

\* \* \* \*

Dr. Grant Lawrence left on January 7th on the *Wyoming* on a cruise to Central America and Panama. He will return about the middle of February.

\* \* \* \*

A most attractive photograph of Dr. J. M. Pearson has been donated to our Library. It is much more than a likeness of him—it is a picture of him—and reflects great credit on the artist who took it, Mr. Vanderpant.

\* \* \* \*

Dr. G. E. Seldon is back to work, and we hear good news of Mrs. Seldon, who sustained such severe injuries.

\* \* \* \*

Dr. Murray Meekison has recently returned to Vancouver.

\* \* \* \*

It is with great regret that we record the death of Dr. Walter Graham, of Vancouver. Dr. Graham was better known to the older generation of Vancouver medical men, as for some years he has not been greatly in evidence in this city, having been away a good deal. He was a very quiet, retiring man, doing his work quietly and well, and his record as a citizen was one to be proud of. He served in the Boer War and in the Great War, and won laurels in both. He had a very high sense of honour and of duty;

was a courteous gentleman, and a most dependable physician; and in all his dealings with fellow practitioners was the soul of punctiliousness.

\* \* \* \*

Still on the sick list are Dr. R. E. McKechnie, who, however, is considerably better; Dr. W. D. Brydone-Jack, Dr. W. T. Lockhart and Dr. A. M. Warner; and God speed their return to our midst.

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#### DEPARTMENT OF THE PROVINCIAL SECRETARY

The teeth of British Columbia school children are in a shocking condition, urgently requiring correction of defects, according to a statement issued today by the Honourable G. M. Weir, Provincial Secretary.

The Minister's statement was based upon a report presented to him by Dr. H. E. Young, Provincial Health Officer, describing a careful survey of dental conditions among school children in the city of Nelson. All of the children in the city's elementary and high schools, 1353 in number, were examined by a qualified dentist to discover the extent of dental defects, and it was found that 94.5 per cent of the total number required dental treatment.

Cavities were found in the teeth of 96.16 per cent of the pupils and the average number of cavities per child was 5.3. Nearly 22 per cent of the pupils required extractions, an average of 1.7 teeth per case. Nearly 40 per cent had missing teeth, an average of two per case. Thirty per cent of the children had crooked teeth that needed to be straightened.

According to Dr. Young's report, "This percentage (of defects) is very high and would not obtain in all schools, but . . . I think gives a very good idea of the dental defects existing in the children of British Columbia."

The report continues, "Toothache in children is annoying to the parents; defects are shown as existing and are accepted by the parents as a matter of course, but the parents have no idea of the after-effects in life of the persistence of such dental conditions. Each infected tooth acts as a focal point of infection. While the immediate results are not manifest, yet as the child grows up, the infection will develop in different ways in the child, and when these serious systemic results become manifest, it is too late to save the teeth and the only way to correct these results is to sacrifice the tooth. It is a pertinent fact that of late years the age when false teeth are required has been becoming earlier and earlier in life, owing to the fact that the medical men recognize the cause and also recognize the fact that palliative methods are of no use and the teeth must be sacrificed.

"Through other agencies and through the Provincial Board of Health, health education is being carried on, and there is evidence of an awakening of the public conscience in regard to this matter, but compared to the infection as a whole the preventive and remedial measures are most inadequate, and I would suggest that strong emphasis be laid on the existence of the condition, followed immediately by an intensive education of the parents as a whole regarding the seriousness of the existing condition.

"That something should be done under present economic conditions is imperative. People have not the money, or are afraid, to go to the dentist for fear of being forced to incur a large expense for remedial efforts."

The Minister pointed out that the Nelson survey was part of a dental

programme being carried out by the Provincial Board of Health this year in certain districts of the province, to make a beginning upon the discovery and correction of dental defects amongst school children.

"I have often had occasion to say," Dr. Weir concluded, "that there are more holes in the teeth of British Columbia children than there are in British Columbia roads. I think that a survey like this proves my point conclusively."

[The above extract will be of considerable interest to us as medical men. It is hard to believe that such a high percentage of serious defects can exist amongst children everywhere in the Province, but the above survey must be taken very seriously, and was an excellent piece of work.—Ed.]

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## RECENT ADDITIONS TO THE LIBRARY

Yearbook of General Medicine for 1935.

Surgical Clinics of North America. Lahey Clinic No.

HALLIBURTON, W. D.—Handbook of Physiology. 34th ed.

### BOOKS PURCHASED FROM THE NICHOLSON FUND

MACDERMOT, H. E.—History of the Canadian Medical Association: 1867-1921.

SEABROOK, W.—Asylum.

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The publishers of "The American Journal of Syphilis and Neurology" have announced that the name of this journal will be changed to "The American Journal of Syphilis, Gonorrhœa and Venereal Diseases." The editorial board will be headed by Dr. J. E. Moore, of Johns Hopkins. The new journal will be published bi-monthly instead of quarterly.

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## THE EARLY DIAGNOSIS OF BRAIN TUMOUR

By DR. FRANK TURNBULL

Tumours of the brain occur so frequently that every physician may expect to encounter them at some time or other in his practice. It is now recognized that the brain ranks with the breast, the stomach, and the uterus, among the commonest seats of new growth formation in the body. The exact incidence of any disease in a general population is difficult to determine, but the frequency of brain tumour has recently been the subject of an extensive and convincing study. Garland and Armitage analysed the records of 13,000 necropsies performed in the General Infirmary at Leeds during the past twenty years. As the brain was examined in any patient who showed cerebral symptoms during life it is evident that most of the cerebral tumours must have been discovered. The incidence of such tumours in the whole group of 13,000 cases was 2.02 per cent. These figures related to pathological masses within the skull, a number of which were tuberculomata. The incidence of actual cerebral neoplasm was 1.34 per cent.

A lack of appreciation of this frequency of brain tumours has hitherto contributed toward preventing their early diagnosis. If, for example, one compares the known true incidence of brain tumours with the vital statistics in our Province of British Columbia a very striking circumstance becomes evident. The Registrar General's report for the years 1931, 1932 and 1933 shows that during this period there was a total mortality of 18,885. Using Garland and Armitage's figure of 1.34 per cent, one may calculate that, of this total number, 253 had a cerebral neoplasm. But the cause of

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Read before Vancouver Medical Association, December 3rd, 1935.

death was attributed to brain tumour in only 61 cases. This is a discrepancy which is too great to explain on the basis of symptomless tumours or of diagnosed tumours which were not the direct cause of death. One must conclude that in many cases the possibility of brain tumour was not entertained after weeks or months of observation or even when the tumour eventually caused death.

There are three ways by which an intracranial tumour may first manifest its presence. It may cause a raised intracranial pressure and the symptoms thereof. It may give rise to periodical fits which are indistinguishable from those of idiopathic epilepsy; while finally, it may produce the signs of a slowly progressive local lesion, such, for example, as a gradually developing hemiparesis, defects in the visual fields, progressive speech defects or unilateral sensory changes.

Brain tumours most commonly betray themselves by the symptoms of raised intracranial pressure. This pressure typically results in the classical triad of headache, vomiting, and choked disc. It is unnecessary and frequently a fatal waste of time to wait until these symptoms become fully established before making a diagnosis of brain tumour.

The most constant evidence of increased intracranial pressure is choked disc, i.e., swelling of the head of the optic nerve at the back of the eye. The ability to recognize such a circumstance is within the scope of every practitioner. It only requires a few minutes' observation in a routine examination to satisfy oneself that the discs are normal. It might be considered blasphemous to say "sell your stethoscope and buy an ophthalmoscope"—but more would be gained than would be lost by this exchange—in the field of general medicine as well as neurology. The ophthalmoscope enables one to see directly the arteries and veins of the fundi and the optic nerves. It affords valuable information in diabetic, nephritic, anæmic, and arterio-sclerotic patients as well as in patients with increased intracranial pressure.

Choked disc may be present for a long time in a patient who has little or no headache and vomiting. A girl of twenty-one came under my observation in July of this year, complaining of almost total blindness. Six months previously she had undergone her first confinement. During convalescence therefrom she suffered from some severe headaches but these cleared up in a few days. After returning home she did not report back to her physician. Before leaving hospital, however, another symptom had appeared—blurring of her vision. The trouble with her eyesight slowly progressed and by July her vision was so bad that she had to be led around. The discs at this time were very grossly "choked." During the latter half of her illness she had begun to suffer from headaches of increasing severity, but the outstanding early symptom had been diminished vision, and there is no doubt that it was accompanied in those early stages by a choking of her optic discs. A large benign tumour was removed from beneath her right frontal lobe. By good fortune her sight improved slightly and total blindness was averted.

The headaches of cerebral neoplasm are rarely localized to any definite region, except when the growth actually involves the bone. They are usually worse on first waking, and are aggravated by coughing, sneezing, or straining. One must exercise great care before lightly making a diagnosis of migraine in any case of intermittent headache which occurs first in adult life, especially if no history of a familial tendency to migraine can be obtained. Nor should it be forgotten that a migrainous patient can develop an intracranial tumour. Repeated ophthalmoscopic examination is the best safeguard in such a case.

Vomiting which results from increased intracranial pressure usually does not differ from ordinary vomiting, e.g., that of sea-sickness. Occasionally there may be no nausea associated with the vomiting—a point which is of some significance. The distinction between projectile and non-projectile vomiting has absolutely no practical importance. In a child vomiting may be the earliest and for many weeks the only symptom of brain tumour. Persistent recurrent attacks of vomiting in childhood most frequently occur in the so-called benign "cyclic" vomiting, but such a diagnosis is never securely established until the possibility of tumour is definitely ruled out.

One further symptom which frequently results from increased intracranial pressure is some degree of mental disturbance. In a few patients the mental symptoms result from a tumour acting as a slowly progressive local lesion and in these cases there may be no increase of the intracranial pressure.

The association of brain tumour and epilepsy is a commonplace observation. What is not so generally known is that a cerebral tumour may give rise to localized or generalized epileptiform seizures for many years before any other signs indicating a tumour can be detected by physical examination. The epilepsy is caused directly by the tumour and not by the increase in pressure within the head. In April of last year I examined a woman of forty-three who had suffered from fits for five years. At first generalized convulsions had occurred without warning about once in every two months. Three years after their onset she began to have a slight warning before her attack—usually a twitching of the left side of her body or left hand. Six months later she commenced to drag her left leg and one month after this she noticed some weakness in her left arm. On admission to hospital she had an almost complete left-sided hemiplegia. There had been no headache or vomiting and there was no choking of her optic discs—i.e., she had no signs of increased intracranial pressure. At operation a large benign infiltrating glioma was resected from her right frontal lobe. Cases of this type are frequently encountered and illustrate the importance of a careful consideration of fits which have their onset in adult life.

The signs of a slowly progressive localized lesion of the brain is pathognomonic of neoplasm. The diagnosis in these cases is soon apparent, if one recalls that no other disease causes a non-febrile, steadily increasing, localized alteration in nervous function. A large group of patients, however, are just outside the borderline of this category, and here the diagnosis may frequently be puzzling. An example is the middle-aged or elderly man who begins to suffer from repeated episodes, vertigoes and transient palsies, which may or may not be associated with temporary loss of consciousness, and which gradually leave him enfeebled in various ways. The cause of these symptoms in the majority of cases is cerebral arteriosclerosis, in a few it is syphilitic arteritis, but a number of them are betraying the existence of a brain tumour. In middle and old age the local signs of tumour are frequently blurred, for the brain with vascular degenerative changes is not a clean slate on which fresh lesions will stand out. Caution should be exercised before accepting a positive Kahn test as a signal that the diagnostic battle is over. Syphilis does not spare us from the other ills of life. One's patient may have both syphilis and brain tumour. That has occurred many times.

Any of the foregoing signs and symptoms raise the suspicion of cerebral neoplasm and call for a neurological examination. No physician hesitates to examine the chest when the symptoms suggest a lesion of the lungs, or the abdomen when the complaints are of a gastro-intestinal nature, but there

seems to be a widespread reluctance to attempt any sort of a neurological investigation. A cursory examination of the pupils and of the major reflexes is no more an examination of the nervous system than is palpation of the neck an adequate investigation of thyroid activity, but on the other hand in the average case when first seen in general practice there is no call for an elaborate two or three-page form of examination. There need be little fear that one has missed what should be apparent if a simple standard method of neurological examination is adapted for all such occasions and is completely executed.

When the case history suggests the possibility of brain tumour and neurological investigation yields negative or intangible findings one may establish a truce but never an armistice with the demons who guard the storeroom of correct diagnoses. Rather than dismiss the patient with a clean bill of health or the label of neurosis, one classifies him as a brain tumour suspect. Having thus classified a patient it is incumbent on the medical attendant to continue observation from this point of view until the diagnosis is proven or until no possibility of neoplasm survives.

The physician's responsibility in these cases of potential brain tumour is considerable. All intracranial tumours are liable to become cases of urgency, no matter how mild their symptoms may be. One's patient may pass suddenly into a critical state of unconsciousness without any warning. Furthermore, apart from their immediate danger to life, brain tumours are also urgent on the score of failing vision. Because the patient with a suspected intracranial tumour is free from headache it is never safe to assume that his case is not urgent, for he may some day wake up almost blind. Patients with brain tumours occasionally go blind from optic atrophy without ever experiencing any headaches.

Certain mechanical aids in the diagnosis of brain tumour cannot be omitted from any discussion of this subject. There is occasionally a tendency to overestimate their worth. X-ray plates of the skull are frequently valuable, and occasionally diagnostic, but they must be used as an adjunct and not as a substitute for the clinical examination. Ventriculography may be employed to confirm the presence of tumour, or if localizing signs are too vague to determine the site for surgical exploration. This procedure is based on the fact that if fluid in the cerebral ventricles is replaced by air the ventricles are clearly outlined in x-ray plates. Any distortion or alteration in size of the ventricles by a tumour will thus be demonstrated. It is of particular value when the patient is comatose. A considerable element of danger is inherent in this procedure and it is not performed unless the operator is prepared to proceed with the major operation within a few hours should definite signs of tumour be found.

In conclusion, one might quote the hope that has been expressed by an outstanding neurosurgeon that "the earlier recognition of a brain tumour as well as a less pessimistic attitude on the part of the family physician will bring into the realm of brain surgery the same situation that has developed with breast tumours; namely, that patients with neurological signs and symptoms will come early to have the presence or absence of a brain tumour determined, rather than wait for all cardinal signs and symptoms to develop, thereby missing the opportunity of complete eradication of the lesion." (Reichert.)

#### REFERENCE:

GARLAND, H., and ARMITAGE, G.—*Jour. Path. and Bact.*, 1933, 37:461.

## HEAD INJURIES

DR. W. CONE

A considerable part of this lecture was devoted to emphasizing the pathological lesions which could result within the brain by the mechanism of "brain-shift." The "water cushion" of cerebrospinal fluid which surrounds and partly protects the brain is particularly shallow over the tips of the temporal lobes and inferior surface of the frontal lobes. In a very common type of head injury where the victim falls on the back of his head, the resultant sudden shift of the brain forward against the base of the skull causes bruising of the above-mentioned areas. The only neurological sign of this injury may be partial or complete loss of the sense of smell.

Fatal hæmorrhages within the brain may result from trauma in which there was no fracture of the skull. Not uncommonly multiple small hæmorrhages in the mid-brain region are found at postmortem. These may or may not have shown appropriate clinical signs. Multiple hæmorrhages within the corpus callosum may cause prolonged stupor and eventually death.

All lacerated wounds of the scalp should be carefully inspected and examined with a probe before closing. Closure of these wounds is effected better by using a "block" anæsthesia—i.e., blocking the supraorbital, auriculo-temporal, or occipital nerves—than by a local anæsthesia. In simple depressed fractures elevation of the depressed fragment is not necessarily an emergency measure. Wounds of the scalp are treated by washing with soap and water, then applying 70 per cent alcohol, ether, and 7 per cent aqueous solution of iodine—this latter being carefully washed off after three minutes with alcohol. Dr. Cone inserts a drain through a stab-wound before closing most of these cases—this drain to be removed after twenty-four hours.

A careful history of the exact manner of the accident is of great help in deciding what type of damage was suffered by the brain. As soon as possible a history of antecedent illnesses should be obtained. This may be of immense value in evaluating subsequent symptoms. Often at a later date the patient or his relatives may have reasons for withholding valuable information.

If there is a cerebrospinal leak from the ears or nose, Dr. Cone advises giving large doses of urotropin to help prevent meningitis.

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## BRAIN ABSCESS

The prognosis for brain abscess is infinitely better today than ten years ago. Improvement in treatment has followed a better understanding of the pathology of brain abscess.

Fundamentally the pathological changes which take place in brain abscess are the same as in abscess elsewhere. In the early cases no capsule can be demonstrated. There is merely a spreading cellulitis. Encapsulation occurs by virtue of the work of the microglia. Microglia are analogous to reticulo-endothelial cells such as the Kupfer cells of the liver. The microglia occur normally in large numbers throughout the white matter of the brain and in the perivascular spaces. When local damage occurs

in the brain adjacent microglia enlarge and become rod cells. Shortly thereafter these rod cells assume an amoeboid form and become actively motile. Certain of these amoeboid cells at the periphery change to a fibroblast type of cell and form the abscess capsule. The neurones and glial cells within the abscessed area disintegrate and become part of the liquid contents.

Under certain conditions brain abscesses may heal spontaneously. The contents may be completely absorbed or partially absorbed and partially calcified. These calcified abscesses may subsequently cause epilepsy.

The danger of scalp infection as a potential cause of intracranial suppuration is very real. A direct communication exists in many places from the scalp veins via emissary and diploic veins to the underlying dural venous sinuses, and thence to the brain.

Contrary to a long-accepted teaching regarding the treatment of brain abscess, Dr. Cone does not wait until a thick capsule has presumably formed before he operates to drain the abscess. The important "walling-off" process which takes place after drainage has been established takes place in the tract from the surface of the brain down to the brain capsule. This process, which must take place in non-infected brain, is obviously just as effective in acute as in chronic abscesses. The abscess capsule is well exposed, opened by a crucial incision, the contents sucked out, and a large rigid rubber drainage tube inserted. A considerable part of the abscess wall will turn "inside-out" into this large drainage tube. When the tube thus fills up, the sutures which hold it to the scalp are cut and it is gradually extruded. Subsequently the abscess capsule which is now on the surface of the brain may slough off or be surgically excised. By this means of treatment one avoids leaving an abscess capsule within the brain which will subsequently cause scarring and distortion of the surrounding brain and resulting epilepsy.

Dr. Cone has never seen epilepsy follow an abscess of the temporal lobe, but it is not an uncommon complication of abscesses of the frontal lobe. Several of these latter cases have been cured a year or more after the abscess has healed by partial resection of the involved lobe.

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### SPINAL-CORD TUMOURS

1. Intraspidal—within the cord.
2. Intradural—outside the cord but within the dura.
3. Extradural—inside the spinal canal of the vertebrae but outside the dura.

Intraspidal tumours constitute about 14 per cent. They are largely benign. About two-fifths of them are ependymomas which can often be shelled out of the cord without undue damage to the nervous pathways.

Intradural tumours are nearly always benign fibroblastic nodules. These may arise from the meninges or from the sheaths of the nerve roots. About 66 per cent of spinal-cord tumours are of this type.

Extradural tumours may be of many types—myeloma, chordoma, chondroma, angiomas, etc. They comprise about 19 per cent of the spinal-cord tumours and generally speaking the prognosis of tumours in this area is poor. Metastatic lesions must be ruled out very carefully when extradural tumour is suspected.

The most important laboratory method for the diagnosis of spinal-cord tumours is lumbar puncture with the Queckenstedt test. A water

manometer is attached to the lumbar puncture needle and readings of the spinal-fluid pressure are obtained before and after compression of the jugular veins. (This latter procedure raises intracranial pressure. If the subarachnoid pathways from the brain to level of the spinal needle are patent the rise in intracranial pressure will be transmitted down the spinal-fluid pathways of the cord and be indicated on the spinal manometer. If the usual rise does not occur there is a condition of "block" which is very suggestive of spinal-cord tumour.) Dr. Cone used graded jugular compression by means of a blood-pressure cuff around the patient's neck. Coughing or straining will raise the pressure in a lumbar manometer. This may be used as a localizing test. Thus: A patient with a high cervical tumour may have a positive (abnormal) Queckenstedt response but a normal cough response. A tumour in the region of the tenth dorsal spine may show no response to coughing but a definite rise in pressure on straining.

For the reduction of certain cervical dislocations by the method of skull traction, Dr. Cone has devised a simple means of inserting wires in the crown of the skull for the attachments of weights.

The value of puncture at several different levels to localize a lumbar tumour was emphasized. Dr. Cone uses lipiodol to localize spinal-cord tumours very rarely and believes that it should be all removed at the subsequent operation.

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## THE PHYSIOLOGY AND CHEMISTRY OF THE FEMALE SEX HORMONES

W. N. KEMP, M.D.  
Vancouver, B. C.

Possibly a better title for this paper would be "The Physiology of Menstruation," for that outstanding phase of the female sex cycle in humans is part of the female reproductive mechanism about which the female sex hormones "be and have their being." In that which follows it shall be my endeavour to present as well as I am able the best current opinion in regard to the endocrine physiology and chemistry of the female sex hormones. In gathering this data I have been greatly indebted to Dr. A. T. Cameron of Winnipeg, whose book, "Recent Advances in Endocrinology," has been an invaluable *vade mecum*.

The reproductive cycle of the female animal is divided into four periods: (1) the *anæstrum* (or *diæstrum*) or the period of quiescence; (2) the *proæstrum*, or period of "coming on of heat"; (3) the *æstrus* period of sexual excitement commonly known as "rut" or "heat"; (4) the *post-æstrum*, which, if fertilization of the ovum occurs, merges into pregnancy. As the reproductive cycle is revealed in rodents, in the anæstrum or resting phase the ovaries are quiescent, the uterus is lined with low columnar epithelium, the vagina by a thin layer of flat epithelial cells and the vaginal smear shows only leucocytes. In the proæstrum, the Graafian follicle grows, the uterine endometrium becomes deeper and the vaginal mucosa becomes stratified. In full æstrus the follicle has reached the height of its growth and it ruptures, freeing the ovum. The uterine endometrium has become deeper and the glands larger. The cornified cells of the vaginal mucosa are cast off and can be found in the vaginal smear. Their presence in the vaginal smear is the criterion of the efficacy of tested ovarian hormone in spayed

experimental rodents. In the rat or mouse no corpus luteum is formed in the absence of pregnancy, and the changes described above regress through postœstrum to anœstrum.

"Thus far" (quoting P. McCullagh) "the changes which occur in the rat and mouse are comparable to the changes which take place in the human being from the beginning of the growth of the follicle at the time of the menses up to the time of the bursting of the follicle at the mid-menstrual period. In rodents the occurrence of pregnancy is the signal for the formation and maintenance of a corpus luteum, whereas in the human, the corpus is normally formed after ovulation and maintained for some time. Those changes which are present in the genital tract of the rodent after fertilization of the ovum occur as a result of a hormone known as *progesterin* which arises from the corpus luteum. It causes a great thickening of the endometrium, the surface of which is thrown into deep folds in preparation for the nidation of the fertilized ovum. The glands of the endometrium become tortuous, dip deeply into the uterine structure, and take on the appearance of actively secreting glands. This is the progestational endometrium and is comparable to the type which normally forms in the human during the latter half of the menstrual cycle."

The ebb and flow of hormones that control and regulate the female reproductive cycle is a most fascinating study. Before attempting to correlate the neuro-hormonal mechanism which so wonderfully governs the sex cycle in the female, I propose to briefly discuss each of the more important sex principles or hormones.

OESTRONE (OESTRIN OR THEELIN).—Allen and Doisy were the first to aspirate fresh follicular liquor from hog ovaries and isolate the active principle, which they termed "theelin." The latter, when administered by injection, induced œstrus in immature animals, in ovariectomized adult animals, or in normal adult animals during an anœstrus period. Hypertrophy and distention of the uterus, some enlargement of the mammary glands, and changes in the cellular elements of the vaginal smear characteristic of œstrus were produced. Theelin (or œstrin) has been found in relatively large quantities in the placenta and in the urine of pregnant women and mares.

The results of Allen and Doisy have been amply confirmed by investigators in many countries. Many names have been used for the principle, such as œstrin, folliculin, feminin, ovarin, oophorin, thelkinin, menformin and prognon. Of these terms, œstrin has been the most widely used. Probably the best term is *œstrone*, since œstrin has two forms, tri-hydroxy-œstrin (theelol) and keto-hydroxy-œstrin (theelin).

Oestrone is formed in the ovarian follicles and most probably in the placenta. The latter contains large quantities of œstrone. It is present in the blood of the non-pregnant woman as well. According to Frank it is present in greatest amount in human blood about the first day of menstruation, after which it rapidly decreases. Zondek and Aschheim found very considerable amounts in human blood during pregnancy. In the latter months sufficient œstrone is present to give a positive test with 2 c.c. of blood. It rapidly decreases in amount after parturition.

Oestrone has been isolated in pure crystalline form by three independent groups of investigators almost simultaneously in 1929-30, Doisy, Butenand and Dindemanse. Chemically it is keto-hydroxy-œstrin and has the formula  $C_{18}H_{21}O(OH)$ . It is easily soluble in alcohol, acetons, chloroform and

benzene. It is only slightly soluble in pure water. It is easily oxidized and in alcoholic solution it is slowly changed to a non-crystalline brown resin.

**OESTRIOL (THEEOL).**—Oestriol was first isolated in 1930 and is now known to have a formula differing from œstrone only by the addition of three hydroxyl groups to the basic formula of the parent hydrocarbon,  $C_{17}H_{12}$ , instead of one. Hence it has been called tri-hydroxy-œstrin in contrast to œstrone, which is keto-hydroxy-œstrin. It may be noted here that emmenin, Collip's placental extract, is an ester of œstriol. The chemical inter-relationships of the sex hormones will be discussed in greater detail later.

Oestriol is only slightly soluble in ether, somewhat more soluble in methyl and ethyl alcohol, chloroform and acetone, and easily soluble in pyridine.

#### THE PHYSIOLOGY OF OESTRONE

Replacement therapy with spayed animals and injection experiments with immature animals have demonstrated conclusively that œstrone is the ovarian principle.

Subcutaneous injection is the most effective. It is usually stated that oral administration is inefficient. This loss of efficiency is not considered to be due to destruction by digestive enzymes. Oestrone is readily absorbed through the vaginal and nasal mucous membranes.

It would appear that the principal action of the ovarian principle, œstrone, is to induce growth in the tissues of the accessory genital organs. Injections cause corresponding changes in the immature young animal, leading to premature œstrus accompanied in the rat and mouse by premature opening of the vagina.

Precisely the same effects are produced on the secondary sex organs of the immature animal by injections of œstrone and by daily pituitary implants. If such animals are spayed, pituitary implants do not produce these effects, indicating that the pituitary principle must act through the ovary by stimulating the production of œstrone.

It is generally considered that while in the prepubertal stage the gonad-stimulating principle of the anterior pituitary gradually stimulates the production of œstrone, this principle, so produced, causes the gradual growth of the secondary sex organs, their rapid growth changes at the first œstrus, and also the corresponding development of the secondary sex characters such as differential skeletal development, fat disposition, etc., in the female.

The ovarian principle produces no effect on the heart, blood pressure, or general metabolism. It has no stimulating effect on the ovaries. There is evidence that it can inhibit follicular development. When it is injected into the normal adult female animal it accentuates and maintains growth in the accessory sex organs, and continued injection in large doses may completely eliminate the degenerative phase of the œstrus cycle in the vagina. According to Smith and Parkes, if it is injected into pregnant animals in sufficient dosage, pregnancy may be terminated. Doisy is not in agreement with this view.

During lactation, when the cyclic changes in ovaries and genital tract are suspended for some period, injection of the ovarian principle induces œstrus. Injections into old animals after sexual function has ceased lead to œstrus but the effect is only transient.

Oestrone injections into adult males are said to produce testicular degen-

eration. Injections into immature males definitely inhibit normal gonadal growth, the testes remain infantile, no sperm being developed, and the descent into the scrotum being inhibited. Moore considers this to be due to the depressing effect on the anterior pituitary.

There is little qualitative difference physiologically between œstrone and œstriol. While the former is only slightly active by the oral route, Curtis and Doisy find that the latter is one-half to one-third as active orally as it is subcutaneously.

#### THE HORMONAL ACTIVITY OF THE CORPUS LUTEUM

The *corpus luteum* is formed chiefly by proliferation and hypertrophy of the cells of the *membrana granulosa* of the ruptured follicle, usually at the beginning of œstrus, or just preceding it. Some investigators believe that the development of the corpus luteum is controlled by a special hormone of the anterior pituitary termed the lutinizing principle. Others dispute this view, holding that there is only one gonad-stimulating hormone of the anterior pituitary. The corpus luteum continues to grow throughout the remainder of œstrus and postœstrus or throughout the first half of pregnancy if fertilization of the ovum takes place. During the first half of the gestation period it reaches a relatively immense size, but undergoes degeneration in the latter months. In the non-pregnant state its maximum development is reached at the end of the postœstrus period, its degeneration follows and is co-incident with the involution of the uterus to the anœstrus condition.

Parkes considers that experimental evidence shows that four functions are performed by the corpus luteum:

(1) The sensitization and endometrial preparation of the uterus for the nidation of the fertilized ovum or ova; (2) in event of pregnancy, the corpus luteum inhibits ovulation and œstrus changes in the accessory organs; (3) causes the development of the mammary glands from the condition in which they are found at œstrus to that characteristic of the end of the luteal phase; and (4) is responsible for the maintenance of pregnancy.

EXTRACTS OF CORPUS LUTEUM.—The earlier experiments led to conflicting results, many of which were probably due to œstrone, and not to any principle specific to the corpus luteum. It is now generally held that two endocrine principles are produced by the corpus luteum: (1) *Progestin* (Corporin of Hisaw), which is responsible for the progestational developments in the uterus consisting of glandular and endometrial development in preparation for the nidation of the ovum (the preliminary epithelial development being inaugurated by œstrone). The second principle of the corpus luteum, (2) *relaxin* (Hisaw), has the property of relaxing the pelvic ligaments of guinea-pigs, bitches, sows, mares and rabbits. To date its presence has not been demonstrated in the blood or urine of pregnant women. It is difficult to detect its action in the presence of œstrone.

Progestin is slightly soluble in water, more soluble (and decomposed) in alkaline solution, and soluble in acetone, alcohol, benzine, ether and chloroform. It is stable in non-oxidizing acids, and is not destroyed by heating its solutions in the absence of oxidizing agents. It is easily oxidized but its alcoholic solution is stable. It seems to be a fat-soluble compound somewhat resembling œstrone but differing in its instability in alkaline solution. Fevold and Hisaw claim to have obtained "corporin" (progestin) in crystalline form. Butenandt also claims to have obtained 20 mgm. of the active crystal-

line principle, progestin. Its formula is probably  $C_{16}H_{30}O_2$ . It, or a compound with very similar properties, has been prepared from stigmasterol, the sterol present in soy bean.

#### THE ENDOCRINE ACTIVITY OF THE PLACENTA

The placenta stores or elaborates three different sex principles: *œstrone*, *emmenin* (Collip) and the *anterior-pituitary-like principle* (A-P-L; Collip).

Oestrone is present in the placenta in large amounts. When it is remembered that it is excreted in the urine in large quantities during pregnancy, as Cameron suggests, the question at once arises: Can the follicular tissue of the ovary, the presumed source of this principle, prepare this largely increased output for placental storage and urinary secretion, or does the placenta itself take over this function?

Emmenin has been shown to be an ester of œstriol. One naturally asks, are they both prepared from œstrone, and if so, by what tissue? If œstrone itself is produced in the placenta it may well be in part transformed into emmenin there.

The anterior pituitary-like principle (A-P-L) behaves very similarly to the gonad-controlling principle of the anterior pituitary itself and appears to be identical with Zondek's "prolan" from pregnancy urine.

It is evident that there is a strong probability that the placenta itself is a gland of internal secretion. The fœtal portion of the placenta, the chorion ectoderm, is considered to be the active endocrine organ.

THE PHYSIOLOGICAL EFFECTS OF EMMENIN.—Emmenin produces its physiological effect when administered orally or by injection. Oral administration of an active extract of emmenin to immature rats 19 to 21 days old for three days produces œstrus in from three to five days. The minimum amount which produces this effect Collip terms the *oral day unit*. The ovaries are not definitely affected by the treatment.

The cycles of normal adult female rats are not affected by the continuous daily administration of ten or more units. No interference with the normal processes of pregnancy or lactation has been observed. In no case has the production of corpora lutea nor true hypertrophy of the ovaries been seen. There is no action on adult castrates unless very large doses are given, when the effect is possibly due to traces of œstrin. The time of appearance of normal puberty and maturity is not shortened.

It is apparent that emmenin differs from œstrone in action in two important respects: it has no effect on the adult castrate and it has an effect on the early production of œstrus in immature animals by the oral route.

THE PHYSIOLOGICAL EFFECTS OF A-P-L.—When immature rats 19 to 21 days of age are injected daily for three days with the A-P-L- principle in sufficient dosage, œstrus is manifested on the third to the fifth day. The minimum amount which consistently produces this effect is termed the *day unit* by Collip.

A dosage just sufficient to induce the positive vaginal smear of œstrus has little effect on the ovaries. When the dosage is doubled or trebled, the ovaries on the fifth or sixth day correspond very closely in appearance with those of unmated animals shortly after the appearance of spontaneous maturity. Normal young corpora lutea are present and also healthy maturing follicles. Increased and prolonged dosage rapidly results in ovaries similar to those of the normal adult, but, in contrast to the effect of the real gonad-stimulating principle of the anterior pituitary, *the normal adult size of the*

*ovaries is not exceeded.* By this dosage of A-P-L a succession of normal four or five-day cycles is produced. When normal adult female rats are given daily injections of from five to twenty units of A-P-L they are practically unaffected. They mate successfully and rear normal litters.

When adult male rats are given daily injections of A-P-L there occurs marked enlargement of the accessory genital tract structures, especially the seminal vesicles and prostate gland. Similar results are produced in immature males. The weight of the testes is not much affected. Collip concludes that the A-P-L principle stimulates the testes to work but not to grow.

When ten unit doses of emmenin are given young female rats orally every day, combined with daily injections of the A-P-L principle, the continuous œstrus vaginal reaction is broken and a prolonged period of diœstrus results. After three weeks of such treatment the ovaries of these animals are greatly enlarged and extensively luteinized, the *effect being exactly similar to that produced by repeated implantations of anterior pituitary tissue.* Such an effect is never produced when either emmenin or A-P-L are used alone.

#### THE PRESUMED PITUITARY PRINCIPLE FROM URINE

Zondek and Aschheim's earlier work showed that the effect of anterior pituitary implants on ovarian development was produced by glands from many species, including man, and from both sexes, and all ages, and was not produced by implants from other tissues. They put forward the theory that the anterior pituitary secretes two gonad-stimulating principles, one controlling and stimulating the ripening of the follicles and œstrus, and the other, the "luteinizing principle," stimulating the change of follicles into corpora lutea. These principles they termed prolan A and prolan B. In 1927 they gave up attempts to prepare prolan compounds from the pituitary, believing that the urine of pregnant women was a much better source, since such urine gave some thousand mouse units per litre, while a cow's pituitary only yielded some hundred mouse units. Wiesner and Crew also held this view that the pituitary produces two gonad-stimulating principles, which they term rho 1 and rho 2 and which they prepare from urine.

As Cameron states, their evidence for the existence of two gonad-stimulating hormones was not convincing. An intrinsic objection is the resulting differentiation that such a theory makes between the sexes; there being no evidence that different gonadotropic principles are produced in male and female pituitaries. It has been suggested that various results which led to the theory of these two principles may have been due to different treatment of extracts before injection, or to difference of dosage, or purity, or to combined effects of pituitary and ovarian principles, or to some luteinizing stimulus provided by the ovum itself. However, it must be stated that Fevold and Hisaw claim to have effected a partial separation of the two principles in question. It is doubtful if this problem will be finally settled until the isolation of the pure principle or principles.

#### DIFFERENTIATION BETWEEN THE GONADOTROPIC AND A-P-L PRINCIPLES

There is steadily increasing evidence that Zondek's prolan and Collip's A-P-L principle are identical and that both are produced in the placenta. It appears that the A-P-L principle acts through stimulation of the pituitary gland because it produces in the basophile cells of the anterior lobe the histological picture of increased activity. A-P-L does not affect the genital apparatus of hypophysectomized dogs but it enhances the activity of an-

terior pituitary extracts injected into such hypophysectomized animals. Evans has advanced the interesting theory that the anterior pituitary elaborates a *synergic factor* which is distinct from growth and gonadotropic hormones and which acts as a complement to the A-P-L principle of the placenta.

If priority were followed the term "prolan" would have preference to "A-P-L", but it is so closely and, apparently mistakenly associated with the pituitary in the literature that it seems desirable to use the term "A-P-L principle" as a temporary name suggesting resemblance but not identity.

#### CHEMICAL INTERRELATIONSHIPS OF THE SEX PRINCIPLES

Oestrone, œstriol, emmenin and the male sex principles are chemically methyl derivatives of a four-ringed hydrocarbon,  $C_{17}H_{12}$ , itself a derivative of phenanthrene.

It is now recognized that cholesterol, ergosterol, calciferol (vitamin D) and other sterols, and all the cholic acids, are derivatives of this same four-ringed compound.

Girard has suggested that a cholic acid may act as precursor of the sex principles in the organism, and his views concerning the possibilities of such changes are supported by the observation that the hydrogenation of œstrone produces a mixture of compounds containing at least one which exhibits the biological action of the testicular principle.

A most important advance is due to Schwenk and Hildebrandt, who have shown that partial hydrogenation of œstrone with the addition of two atoms of hydrogen, produces a compound *dihydro-œstrone* (dihydrofolliculin) *which possesses four times the potency of œstrone itself*. It has therefore become the therapeutic agent of choice. The constitutional formula of this important compound is similar to that of œstrone with the addition of two atoms of hydrogen to the keto group.

#### THE MENSTRUAL CYCLE

When one stops to consider the endocrine and nervous mechanism that leads to the onset of puberty in the female and the equally marvellous mechanism that, in the great majority of women, insures the regular periodicity of the menses after puberty, one must surely conclude that we "are fearfully and wonderfully made." Modern research has gone far in the unravelling of the mysterious biochemical processes that govern the sexual cycle in the female. It is now reasonably well established that the gonadotropic hormone of the anterior pituitary stimulates follicular development in the ovary. The follicular cells (and possibly other ovarian cells) secrete œstrone which causes the regeneration of the uterine endothelium. After the ovum is released from the follicle, about fourteen days after the onset of menstruation, the corpus luteum forms and from it is liberated the hormone, progesterin, whose function it is to complete the development of the uterine endothelium and the submucous glands in preparation for the nidation of the fertilized ovum. If fertilization of the ovum fails to occur and the ovum dies or is expelled, *the secretion of progesterin ceases and menstruation occurs*. At this stage of our discussion it seems appropriate to remind you that true menstruation, as opposed to interval hæmorrhage, *involves the loss of uterine endothelium* as well as blood. The confusion of these two different sexual phenomena is a frequent source of experimental fallacy. For instance, transitory uterine bleeding can be produced by the sudden discontinuance of stimulation by œstrone, i.e., through castration or cessation

of injection. Also transitory uterine hæmorrhage can be produced by the injection of extremely large amounts of œstrone. In this case the bleeding is due to the production of cystic hyperplasia of the endometrium.

How are these phenomena of the female cycle so wonderfully regulated and how is the natural sequence of events normally maintained? What is the origin of the œstrus cycle?

The attempt to answer these questions is an interesting and fertile source of hypotheses. In my opinion, that of Schroeller is as satisfactory as any. According to this hypothesis, the female sex cycle is brought about by the joint action of the uterus, the ovary, the pituitary and the mid-brain. Schroeller postulates the presence of a "sexual centre" in the mid-brain, which, when the quantity of œstrone in the blood becomes low, stimulates the anterior pituitary to produce gonadotropic hormone, which, in turn, stimulates the ovary to œstrone production and ovulation. The œstrone thus secreted causes cell proliferation of the endothelial elements in the uterus. About the fourteenth day after the start of the last menstruation, ovulation occurs. Schroller suggests that the ripening ovum itself exerts a chemical stimulation on the ovary to cause the formation of the corpus luteum and its hormone, progesterin. The latter is responsible for the glandular and vascular development which the already œstrone-primed uterus now undergoes in preparation for the nidation of the fertilized ovum. If fertilization does not take place, the ovum dies and, as a result, the corpus luteum secretion ceases and menstruation follows. If gravidity occurs, the chorionic portion of the embryo, instead of the ovum, determines the production and continuance of progesterin formation and hence the continuity of pregnancy.

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## SOCIETY FOR THE STUDY OF RHEUMATIC DISEASES

The following letter from the Department of Pensions and National Health was handed to THE BULLETIN by the B. C. Medical Association with a request for its insertion.

Ottawa, January 13th, 1936.

DEAR DOCTOR:

Increasing world-wide interest is being shown in the problems involving the investigation and treatment of rheumatic diseases. This work is centralized at the Headquarters of The International League in Amsterdam, which has branches throughout most of the countries of the world.

The economic aspects of the subject are simply enormous—the loss of time from work; the cost of medical care and maintenance of the sick; the expenditures of Sick and Accident Insurance Companies; complications which arise in Workmen's Compensation Board injuries, and the permanent disabilities engrafted on young patients. In Canada, several enthusiastic individual doctors have set up local clinics, and are working against tremendous odds.

A small group of doctors, and representatives of organizations interested in the subject, met informally in Ottawa last February and formed a temporary Committee. A questionnaire was issued to some of the outstanding doctors throughout Canada, asking them, (a) Do you favour a comprehensive study of the problems associated with arthritis and allied conditions in Canada; (b) Do you favour the plan recommended by the British Medical Association Committee, on arthritis; (c) Do you favour forming

a voluntary Canadian organization, along the British Medical Association suggestions.

An overwhelming majority returned an affirmative answer to all questions, and added some very pertinent comments on the urgent need for some such action. The temporary Committee then presented the subject to the Executive of the Canadian Medical Association, and permission was given to proceed with the setting up of a branch of The International League in Canada, but which would be directly linked with the Canadian Medical Association and which would, eventually, hold an annual meeting on the day preceding the first day's meeting of the Canadian Medical Association—this is the arrangement existing between the American Medical Association and the American Society for the Study and Control of Rheumatic Diseases.

A meeting of all Canadian doctors interested will be held at Ottawa on February 14th at 2 p.m., in the Library of the Daly Building, where there will be a free and full discussion as to how best to approach the problems involved, officers will be elected, and committees struck. It is practically impossible to reach all the doctors in Canada individually, so a notice is being placed in the first number of the *Canadian Medical Journal*, and the temporary Committee will be very much obliged to you if you will contact all the doctors in your vicinity and extend them an invitation to be present, or to send their comments. Further particulars can be obtained from Dr. W. S. Barnhart, Medical Arts Building, Ottawa, Temporary Secretary.

Yours truly,

ROSS MILLAR, M.D.

*Temporary Chairman.*

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The Health Insurance Committee of the Council of the College of Physicians and Surgeons reports a meeting with Hon. G. M. Weir, Provincial Secretary, at Victoria on Jan. 23rd. They are satisfied that progress is being made in this matter, and are to meet further with members of the Cabinet at an early date, and probably again with Dr. Weir.

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## INCOME FROM MEDICAL PRACTICE

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*Reprinted from The Journal of the American Medical Association.*

Annual income twenty pounds, annual expenditures nineteen nineteen six, result happiness. Annual income twenty pounds, annual expenditure twenty pounds ought and six, result misery. —Dickens: *David Copperfield*.

[Tables and charts have been omitted for the sake of compactness.]

Perhaps, as he wrote the letter to Timothy in the first century A. D., Paul voiced a keen appreciation of the social and economic stress of the times when he said "the labourer is worthy of his hire." It may not be unreasonable to interpret this phrase as implying also a relative scale of values as applied to various types of service.

It is not possible in a brief statement to trace accurately through the centuries all the influences that have contributed to the present economic system, and although much of the early information on economics pertains to society at large and the lavish expenditures on wars, and certain public improvements achieved by unpaid slave labour, yet it is possible to catch a

glimpse of some of the economic peaks and canyons of our early professional confreres.

A few examples of physicians' fees and incomes may be given to show that centuries ago there were in the profession those whose incomes were well nigh fabulous, for the times, and at the same time there were edicts pronounced by the state which required physicians to give their services without pay. It would appear that some of the mandates of mediæval times brought "state medicine" more nearly to a reality than any laws now operating.

An inquiry into the incomes of the early Arab physicians shows that the favourite physician of Harun-al-Raschid, who reigned 786-802 A.D., was paid \$1500 annually for "bleeding and purging the Commander of the Faithful." Besides this amount he received a monthly salary of \$2500 and was the recipient of a New Year's purse of \$6500, a grand total income of \$38,000 annually. This physician estimated his total fortune in fees at \$10,000,000. On being recalled from banishment to heal El-Meiamun, he received a fee of \$125,000, one of the largest fees on record, certainly a very unusual fee for the times.

Physicians of those times were, of course, paid in the coin of the realm. The foregoing amounts and those given in the following references are the equivalent in dollars of the amounts received according to the period under consideration.

In Sicily, during the reign of Frederick II, in 1224, physicians were required, by edict, to treat the poor for nothing; for office practice and for patients living within the city, the fee was fixed at 35 cents. For calls outside the city the fee was \$3 when the physician bore his own expenses, but if the patient paid the expenses the fee was only \$2.25. It should be remembered, however, that at that time the purchasing power of money is said to have been from fifteen to twenty times that at present.

During the fifteenth and sixteenth centuries, physicians in ordinary of Henry VII, Henry VIII and Queen Elizabeth all received about \$200 annually. In Germany, at this time, the consultation fee for each physician was but \$2.50. The most lucrative phase of medical practice was in the treatment of syphilis. In this specialty physicians easily made small fortunes. Kneeling before the statue of Charles VIII at St. Denis, Thierry de Hery remarked to a priest: "Charles VIII is a good enough saint for me: he put 30,000 francs in my pocket when he brought the pox into France." Money at this time is said to have had about eight times the purchasing value of modern money.

During the eighteenth century, physicians' incomes over various parts of Europe seem to have ranged from \$3000 to \$90,000. The phenomenal fee for this period was \$50,000 for inoculating Catherine of Russia and her son against smallpox; an additional sum of \$10,000 was allowed for travelling expenses and the physician was granted an annual pension of \$2500 for life.

Over the period from which these few examples have been drawn, medicine, as it is known today, was gradually and gropingly evolving from magic. Centres of learning were few; training in the art of healing was for a long time individual and more closely resembled an apprenticeship. Because of the lack of organized courses in medicine as they are now known and because of the varying value of money, it is impossible to estimate accurately the financial investment involved. It seems safe to infer, however, that the investment in preparation was only a small fraction of that required

today. Moreover, success was undoubtedly more often dependent on chance than on logical use of appropriate curative measures.

In part, at least, the fees and incomes of the old practitioners, large as they oftentimes were, offer an interesting paradox when one considers the state of medical learning. The economic conditions surrounding these early followers of Hippocrates offer no safe premise on which to base a study of the present income of physicians. With the advent of scientific medicine, increasing requirements for the entrance on a medical course, lengthening of the years of preparation, increase in numbers of physicians and the proportion of specialists, the stern requirement of the state that recognition for licensure shall be granted only to those of specified ability and the ever increasing standards for social and professional standing, a new scale of ratios became necessary when considering reasonable incomes of physicians.

In the present study, the American Medical Association has endeavoured to secure from the medical profession sufficient data to show the magnitude of incomes under varying circumstances. The data used in this study were obtained from schedules that reached the profession by way of the *Journal*, the *American Medical Association Bulletin* and direct mail. That issue of the *Journal* in which the income schedule appeared reached 95,000 physicians. It is impossible to estimate the percentage of these physicians whose attention was caught even to the extent of reading the schedule; it is definitely known that many did not see it. The same schedule reached 65,000 Fellows of the American Medical Association in three different issues. Thus it will be seen that four possible exposures to the appeal for information were provided 65,000 physicians by way of the *Journal* and the *Bulletin*. The first contact through the *Journal* may be considered, theoretically, as a complete circularization of the American Medical Association members. Likewise the *Bulletin* appeal may be considered as, theoretically, a complete circularization of the Fellows on three separate occasions.

The incomplete or selected direct mail circularization comprised a list of about 25,000 physicians. These names were selected at random from the 1927 American Medical Directory by taking every fourth name in capitals. To what extent these 25,000 physicians may have been interested in the study or influenced to reply because of the *Journal* and the *Bulletin* appeals cannot be determined. It is known that 2500 reports were received from direct-mail contacts, representing a 10 per cent return. No follow-up letters, telephone calls or personal visits were used to encourage reports. All questionnaires were anonymous and called for a minimum amount of information on which to base the study. It will be seen in table 10 that response came from all parts of the United States with a scattering few sent from the insular and territorial possessions. The response was entirely voluntary and no explanation is available for the comparatively low percentage of returns in certain classifications.

The questions on which a statement has been sought are:

1. The number and average income of physicians according to years of preparation.
2. The number and average income of physicians according to years in practice.
3. The number and average income of physicians according to size of community.
4. The number and average size of income of physicians according to types of practice.
5. The relative number of physicians receiving all or a major part of their income from salary.
6. The correlation between gross and net incomes.

The total number of questionnaires returned was 6548. Of these, 220 were incomplete or otherwise not useful for the study. The magnitude interval by single thousands of dollars was arbitrarily discontinued at

\$30,499, since the number of incomes above that amount was somewhat scattering and, furthermore, because the relatively few above this point would unduly distort the average for the mass of the study owing to the large gross amounts reported for individuals.

It is not claimed that the findings of this study represent the true figures for *all* types of practice or in *every* size community. It is believed, however, that the amounts in most instances are significant. The distribution by place of practice shows that every state is represented, although in some instances the number of returns in proportion to the state membership or the total number of practicing physicians is disappointingly small.

The distribution of the 6328 reports by magnitude intervals according to years of preparation is given in table 1. It must not be inferred from this table that the number of physicians in the United States who would fall in each of the several years of preparation columns would be in exact proportion to the number here tabulated. A study of these reports, which were not specially selected, directs attention to the following observations:

1. It appears that there is still a large group of physicians who had only a four-year preparation, evidently with no subsequent internship.
2. In each successive column it is possible to trace (roughly and somewhat imaginatively) the gradual increase in medical school and state licensure requirements.
3. It is an interesting finding, for which no explanation is offered at this time, that those physicians who reported five, six and ten or more years of preparation have the highest average gross incomes in both the large group with incomes under \$30,500 and the total number reporting.

The table which gives the distribution according to years in practice (table 3) shows that the greatest interest in the study seems to have been taken by those physicians who have been in practice from twenty to twenty-four years. The average gross incomes for the group under \$30,500 increase and decrease almost as might be expected. The peak of average annual gross income seems to come during the period of fifteen to nineteen years in practice. The average annual gross incomes for the first period of less than five years in practice and for the period of fifty years and more in practice differ by only a few hundred dollars (table 4 and chart 1).

The number of reports that come from rural districts with urban centres of less than 10,000 population was 2214; this represents 35 per cent of the total returns. Cities ranging from 10,000 to 1,000,000 population furnished 2981 reports, or 47 per cent; and 1133, or 18 per cent, came from metropolitan areas of 1,000,000 or more. It will be seen that, in the group reporting gross annual incomes of more than \$30,500, 100, or 60 per cent, were from cities of 250,000 and over. Considering the heavier costs of maintaining a practice in cities than in rural areas, it is reasonable that larger average gross incomes should be found in the centres of greater population. It would appear, however, that even among cities there is an optimum size with respect to the gross income from the practice of medicine. From the data furnished in this study, this optimum seems to be among cities with a population range of 50,000 to 100,000. (See tables 5 and 6 and chart 2.)

Only those reports from physicians who limit themselves to a particular type of special practice are included in the classification of specialties. There are many physicians who give special attention to some type of limited practice but who supplement their special work with varying amounts of general practice. In many instances the gross annual income of physicians who pay special attention to a particular type of practice is influenced by both

the extent to which their time is devoted to the special practice and the difference in the fee schedule for special as compared with general practice. The gross income figures given in table 9 for type of practice are for physicians who limit themselves to the specialty of choice.

An examination of tables 7 and 8 gives a comparison of the numbers of reports, according to type of practice, with the total number of physicians in the 1929 American Medical Directory classified under the corresponding specialty. Although the number of schedules from general practitioners represents 60 per cent of the total reports received for this study, the number of physicians in the 1929 American Medical Directory classified under general practice reached 85 per cent of the total. The proportion of eye, ear, nose and throat specialists in the study is 8.5 per cent, while only 3.9 per cent of physicians in the directory are listed under this classification. The percentage of specialists is found in each instance to be higher in the study than for the corresponding classification in the directory. It will be seen, therefore, that the figures for general practice are underweighted while for each type of special practice the amounts are overweighted to varying degrees.

This underweighting and overweighting must be kept in mind when examining table 9 and chart 3, which gives the average annual gross incomes for types of practice. It appears from this table that the largest gross incomes, for the majority, are made in orthopaedic surgery. When all reports are considered, including those whose income falls above the \$30,500 mark,

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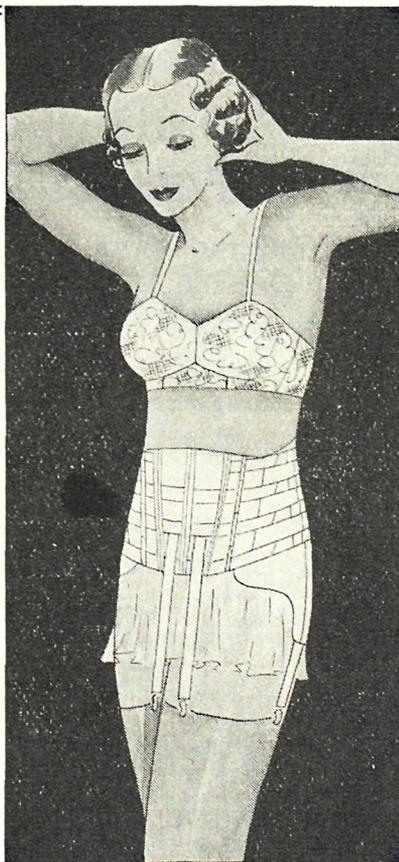
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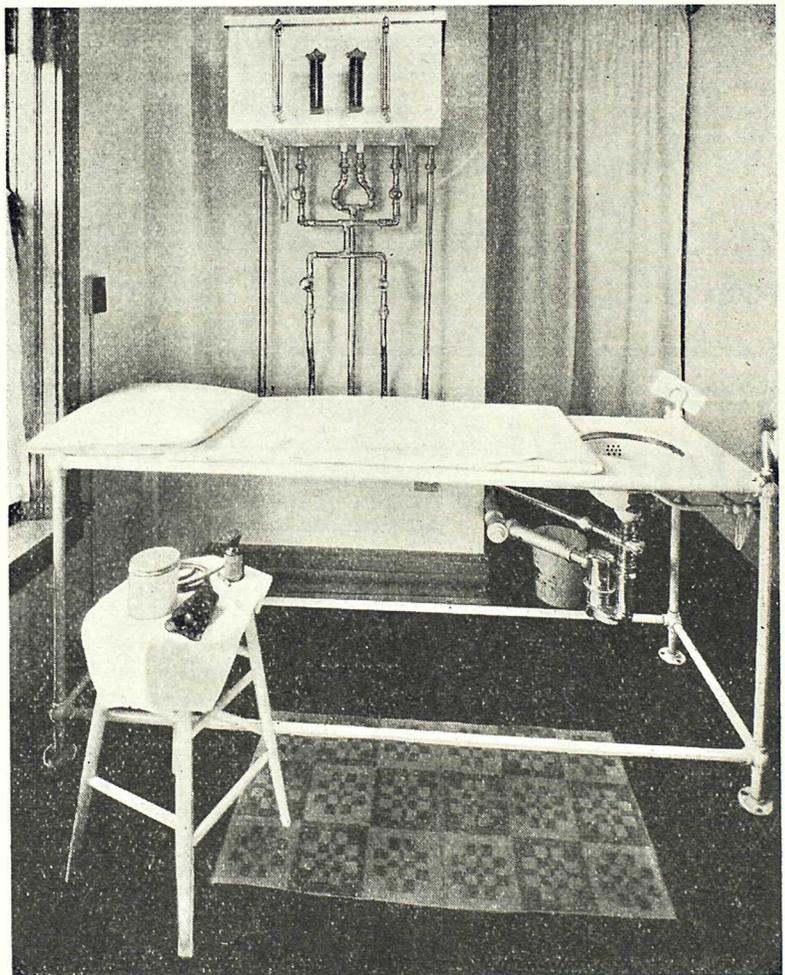
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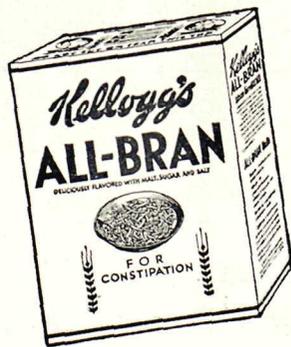
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(1) *The Influence of Bran on the Alimentary Tract*, pages 133-156, *J. Am. Dietetic Assn.*, July, 1932.

(2) *Wheat Bran as a Source of Vitamin B*, pages 368-374, *J. Am. Dietetic Assn.*, March, 1932.

(3) *Factors in Food Influencing Hemoglobin Regeneration*, pages 593-608, *J. Biological Chem.*, June, 1932.

(4) *Laxative Effects of Wheat Bran and "Washed Bran" in Healthy Men*, pages 1866-1875, *J. Am. Med. Assn.*, May 28, 1932.

(5) *Further Studies on the Use of Wheat Bran as a Laxative*, pages 795-802, *J. Am. Med. Assn.*, March 18, 1933.

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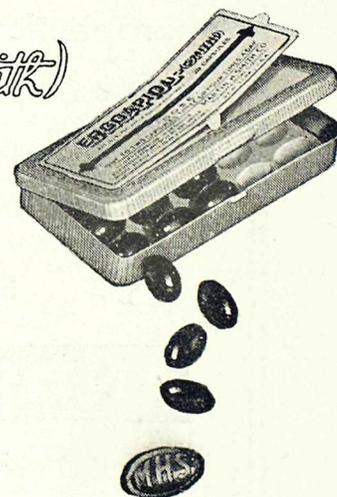
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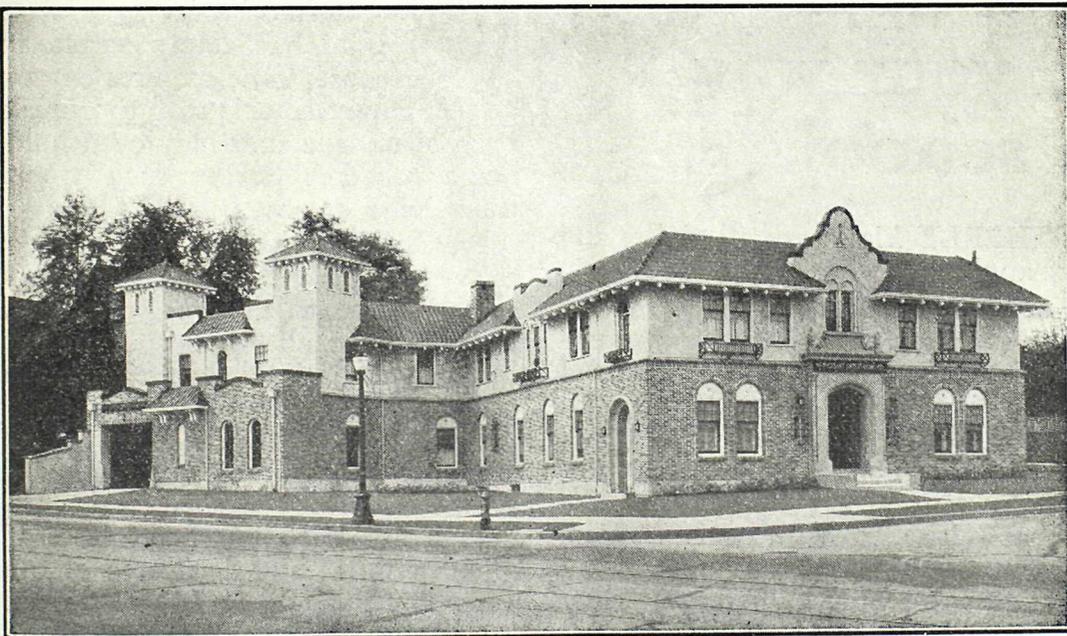
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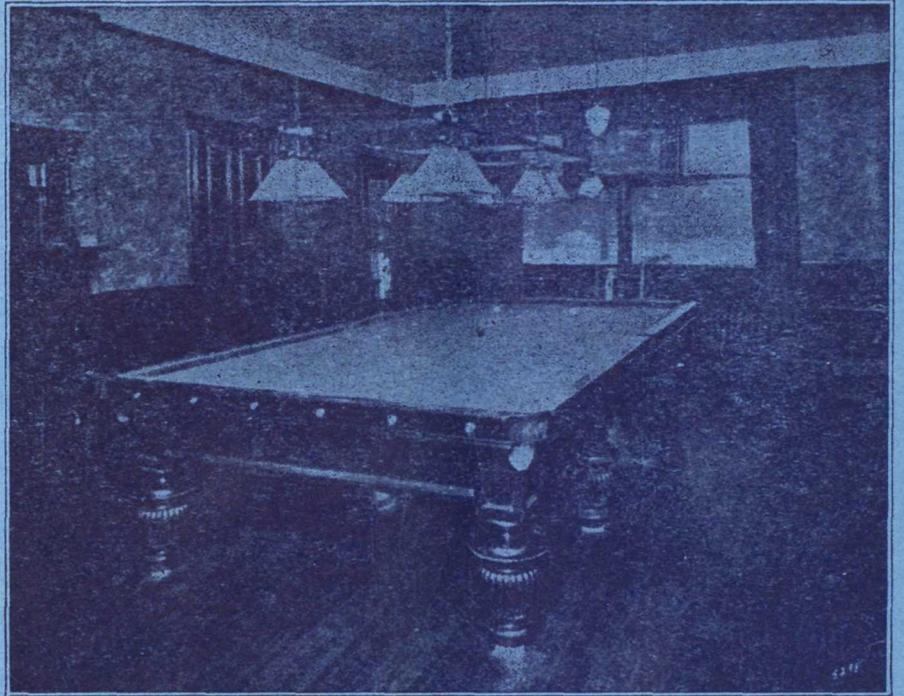
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