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OF THE

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H. E. THE GOVERNOR

AT

COIMBATORE

New Buildings for Government Hospital Opened

GOOD WORK BY HONORARY OFFICERS.

Lieut.-Col., F. C. FRASER, I.M.S., Superintendent.

"It has been the policy of this institution to employ local talent to the fullest extent possible and at the present time, we have some five Honorary Assistant Surgeons and Physicians who are doing good work and relieving the official staff of some of the strain. To these assistants we are largely handing over charge of all our specialist departments. Now to open any fresh department involves a big initial outlay and a heavy strain on our finances and we find that all our assistants are crying out for funds; all demanding special consideration for their own particular department. As they rightly say, they cannot make bricks without straw: a department must first be equipped with appliances and drugs, the workmen must have his tools. But, although I counsel economy and preach of small beginnings, they are a hungry lot and cry for more.

"I would like to place it on record that we have been a very happy family here: my staff, official and unofficial, have worked together with the greatest harmony and I foresee in this a happy augury for the future, when most state hospitals will be largely staffed by voluntary physicians and surgeons. Such an arrangement is of mutual benefit to the State and to the doctor for it relieves the former of much expense and assists the local doctors in building up a practice."

H. E. The Governor of Madras.

"I am extremely gratified to hear of the harmonious relations of the staff, which reflects the greatest credit on them and on the Superintendent, and with you I look forward to the day when hospitals will be largely staffed by honorary medical workers."

"Though the prospects at present are not bright, I hope it will not be long before the Government will be in a position to help with the improvements you have mentioned, thereby making the Coimbatore Headquarters hospital a model of mofussil medical institutions."

What have our traducers to say?

BULLETIN

OF THE

SOUTH INDIAN MEDICAL UNION.

OCTOBER 1931.

The Indian Medical Council Bill.

The Government of India has before this published the text of two bills with a similar object. These were private bills. We heard nothing more about them. The present bill comes forth under official auspices. It has evidently been planned in haste, but it is exhibited with energy, nay, almost with audacity. One might be amused. But the official parentage requires that it should be seriously considered.

The ostensible object of this bill is to ensure a minimum standard of efficiency in medical education in the different parts of this country, and to enforce a code of moral and ethical principles on the practitioners of this land. These objects are unexceptionable. But as far as we know, the various Provincial Medical Councils have been designed to serve identical purposes, and unless it be proved that the provincial councils have failed to achieve or that by their very constitution they are incapable of achieving the above objects, we cannot see the justification for the creation of yet another body which will carry out identical functions. We can understand a new central body created to subserve the functions for provinces and areas where as yet no Medical Council has been created.

It is argued that as medical education is a *central* subject, it is the Government of India that should set the pace for medical education and as such that it should have the guidance of a central body like the projected council, to determine the standard from time to time. This is a very plausible argument. But may we venture to point out that some of the Provincial Medical Council Acts were enacted before the present regime, when medicine was not a transferred subject and the central Government of India had direct control over these councils through the local Governments. But if the changes in the constitution of the Government of India have really created any administrative difficulties in the way of the Central Government carrying out its duties of control of medical education in the various provinces, one would think that the present, when every one believes that this country is on the eve of further, probably, fundamental changes in the constitution of the Government of India, is the least suitable moment for the creation of a new body like the Indian Medical Council.

This bill contemplates the perpetuation of the two classes of medical men in this country, one class who would find a place in the registers of the provincial as well as the central councils, and another who could only aspire for a place in the provincial register. In our opinion this uncalled-for innovation is an injustice to the practitioners of this country. This injustice is all the more bitter as it is sought to be perpetuated by the very Government which has created these two classes of practitioners, practitioners who have been till now considered to be competent to engage in all kinds of professional work both under the Government as well as outside. But if it is the view of the Government that the standard of education of the *Licentiates* is below the minimum level of efficiency, methods should be devised by which the *Licentiates* could qualify themselves, without unnecessary difficulties, for the requisite standard. Thus all medical men who are authorised by the Government of the land to be fit to engage in the practice of medicine could be brought under one common roll. It is urgently necessary to have an organisation which could guide the progress of medical education and the general improvement in the tone of conduct of the profession. But while engaged in this task, it is entirely unnecessary to inflict an injustice, tangible or imaginary, on any class of men who have all these years been recognised by the Government as fit and competent to render medical aid to the public in and out of institutions and to assist to a great extent in medical education. In fine, it is our considered opinion that the creation of this council, however constituted, should have as its corollary the simultaneous creation of facilities for the many to *pass over* to the promised land even if it be through the intervening wilderness.

A further fundamental defect of this bill is the desire to placate the General Medical Council of Great Britain. The Union and its Bulletin have from the beginning strongly condemned the attitude of the Government towards the above council. The whole country is against it. It is this unnecessary subservience to external authority that vitiates the merit of the bill in about every important essential. We have repeatedly shown that India has nothing to lose by the non-recognition of her medical degrees and diplomas by any foreign country. As things are, a few medical men who are in service and who hope to better their prospects by securing one or other British diplomas or certificates may perhaps feel a little disappointed—and even this is not very likely—.To yearn for recognition for this paltry return is highly unwise for any self-respecting individual not to speak of nations. Surely we hope it is not the intention of the Government to continue to allow *service conditions and interests* to over-ride the larger interests of the country concerning medical education and practice.

In the light of the above views we do not consider it useful to criticise the details of the bill. We are sure the country would vote against a nominated president for a cultured council as is proposed. The composition of the council should be such that practically all the members should be elected, except the few who may be nominated by the central Government. The bill does not show any sign, that the authorities of this country have realised, what is becoming increasingly felt by other countries, that practitioners, apart from teachers, have as much right and capacity as the latter to indicate what should be the standard and type of education that the future practitioner should receive while at college and what should be the ethical standard that should be maintained. It was the late Sir James Mackenzie who said that in all questions of medical education or medical politics the one person who is never consulted is the one who is most affected by these changes, *viz*, the General Practitioner.. We therefore do not agree that the members who are elected to the council should have had experience of teaching medicine for any period. Experienced teachers should be there and we expect that medical faculties of the various universities would see to it that their representatives on the council have the desired equipment and experience. But the other members need not necessarily possess that teaching experience. In the proposed constitution, there is hardly any scope for non-official medical opinion to be heard. We think that each province should be enabled to send at least one representative to the council.

UNION NOTES.

(*By the Secretaries.*)

24th August 1931 was a very important day in that there was an unusually large attendance of members of more than 50 at the 'At Home' given by the President Dr. S. Rangachari, M.B. & C.M., to the city members. His genial personality always gathers a good attendance, thus giving an opportunity for the members to affirm their loyalty to him as their President and the high esteem in which he is held as one of the leaders of the profession. The greater attraction of the evening was his address narrating "Some Weird Experiences.'

The sumptuous repast followed by the intellectual repast was a sufficient recompense to many of the medical men present at the meeting probably at great personal inconvenience. The professional demands on the time of the members prevent, many of them from coming to our clinical meetings much as they like to be there. The average attendance of 25 to 30 members at a meeting we consider as a creditable event.

At the clinical meeting on the 28th September 1931 Dr. C. V. C. Rao read another paper 'Tonsillectomy and its indications' which may be taken as a continuation of a former paper entitled 'Adenoids and Tonsils and their harmful effects.' His paper was listened to with great attention, more especially when he was narrating the methods adopted at Vienna whither he had been for post-graduate study two years ago. Many of the members took part in the discussion.

At the clinical meeting of the 5th October 1931 Dr. K. C. Paul, M.D., Honorary Physician of the Government Royapuram Hospital, delivered a very interesting lecture on 'Hepatic Disturbances.' The Lecturer enumerated the following functions of the Liver:

(*i*) Biliary function.

(*ii*) Metabolism.

(*a*) Internal—In collaboration with the ductless glands.

(*b*) Vegetative.

(*iii*) Function of urea formation *i.e.*, Diaminozation of the amino acids ($\frac{1}{5}$ of the liver being enough for this purpose.)

(*iv*) uric acid formation—as is otherwise called Purin metabolism.

(*v*) Carbohydrate Metabolism, *i.e.*, Formation (1) of ferments which on the one hand convert glucose into glycogen and later on converts such glycogen into glucose according to body needs (2) Maintenance of a uniform blood sugar level as found by the drop in the blood sugar level after dehepatization.

(*vi*) Fat metabolism—whereby the fat molecules absorbed from the gut are desaturated.

He then went on to say how the defence of the body was also maintained by the formation of antitoxins on the one hand and the detoxication of the toxins absorbed from the gut, and formation of such substances as Precipitins and Bacterolysins. The part played by the liver on blood destruction and regeneration was also touched upon.

He then pointed out how many of these functions were disturbed in various conditions. The members present took such a keen interest in the lecture that the lecturer was assailed with a great number of questions which he answered with great lucidity.

The Coimbatore Medical Association.

The annual meeting and the annual dinner of the above Association were held in the Moses Gnanabaranam Eye Hospital on Thursday 24th September between 8 and 10 p. m.

The following members were present:

Doctors.

S. V. Appaji.
P. Keralavarma.
C. K. Louis.
C. Nanjapa.
S. Narayanasami.
R. Ramachandran.
K. A. Subramanian.
T. R. Venkataraman.
K. Dayanand.
N. Krishnasami.
S. Gurubatham.
K. Narayanan.
S. K. Nathan.
P. N. Ramasami Naidu.
V. Thangamani.
T. R. Venkatarama Iyar.
D. Devanathan.
R. Lashmana Rao.
S. G. Masillomony.
T. K. Narayanan.
C. P. Ramachandran.
K. Shiva Rao.
N. Velapan.
M. Vital Rao.

1. The proceedings of the last annual meeting were read and recorded.

2. Seceretary's report and financial statement were read and passed.

3. Resolved that a reading room be arranged in the Moses Gnanabaranam Eye Hospital until permission is obtained from the Government to have a room set apart in the Government Hospital premises for the purpose

4. Resolved that the entrance fee be fixed at Rs. 2.

5. Resolved that the Executive Committee do consist of seven members, including President, Vice-President and Secretary.

6. Office-bearers for 1932 :—

President.—Dr. K. Shiva Rao, proposed by Dr. K. Dayanand, seconded by Dr. S. K. Nathan and carried unanimously.

Vice-President.—

(*a*) Dr. M. Vital Rao, proposed by Dr. N. Velapan and seconded by Dr. K. Dayanand.

(*b*) Dr. Varma, proposed by Dr. M. Vital Rao and seconded by Dr. K. Shiva Rao.

(*c*) Dr. R. Sunderarajan, proposed by Dr. S. K. Nathan and seconded by Dr. S. Gurubatham.

(*d*) Dr. C. S. Ramasamy, proposed by Dr. C. P. Ramachandran and seconded by Dr. N. Krishnasami.

Dr. C. S. Ramasamy, elected by the majority.

Secretary.—Dr. S. Gurubatham, proposed by Dr. N. Krishnasamy, seconded by Dr. N. Velapan and carried unanimously.

Executive Committee.—Duly proposed and seconded.

1. Dr. C. Nanjapan.
2. Dr. N. Krishnasamy.
3. Dr. N. Velapan.
4. Dr. K. Pratap.
5. Dr. R. Sundararajan.
6. Dr. S. K. Nathan.
7. Dr K. Gopalmenon.
8. Dr. P. Keralavarma.

The following were elected.—Dr. S. K. Nathan, Dr. R. Sundararajan, Dr. K. Pratap and Dr. P. Keralavarma.

With a vote of thanks to the chair the meeting came to close.

The following are a few extracts from the Secretary's report.

The Association has been in existence for the past 7 years.

The year began with 36 members on roll and it has risen to 40. During the year one of our foremost members Dr. R. Visvanathan suddenly passed away and several of the old members left Coimbatore for good.

There were regular monthly meetings except in May.

One meeting was called for condemning the high-handed action of the General Medical Council of Britain.

The attendance which used to be poor has risen to an average of 20 at each meeting.

The financial statement was as follows :—

INCOME.

	Rs.	A.	P.
Opening balance ...	203	4	4
Interest on Savings Bank Account ...	4	5	4
Membership subscription	373	0	0
Special collections ...	28	0	0
Peon's deposit money ...	5	0	0
Total ...	613	9	8

EXPENDITURE.

	Rs.	A.	P.
Journals ...	188	4	1
Peon's salary ...	110	0	0
Postage and stationery...	2	3	0
Furniture ...	21	1	0
Specials ...	38	1	6
Closing balance ...	254	0	1
Total ...	613	9	8

Tanuku Medical Association.

The non-official section of the Tanuku Medical Association passed the following resolutions at their meeting held on 27th September 1931.

(1) This association thanks the committee for recommending equal facilities and opportunities for all grades of medical qualifications.

(2) This association is of opinion that unless the duties of the three grades of Honorary Medical Officers, Clinical Assistant, Assistant Surgeon, Physician, or Surgeon are clearly defined it is not possible for the would be applicants to take advantage of the scheme. Therefore this association requests the Committee to define the various duties before further action is contemplated.

(3) This association is of opinion that all Honorary House Surgeons and Physicians should be paid an honorarium of not less than Rs. 50 per month.

(4) (*a*) To make the Honorary system workable and attractive this association is of opinion that Government should declare it as their policy that the paid medical staff will be replaced entirely (in a certain minimum period) as vacancies occur by the honorary medical staff and further recruitment to paid services will be stopped hereafter.

(*b*) This association further is of opinion that as a token of the above policy the Government should appoint Honorary Medical Officers permanently in such of the posts as have fallen vacant, and for this purpose should invite applications from would-be candidates from among Private Medical Practitioners.

(5) This association recommend that a small representative Committee of the Honorary Medical Staff of

the Presidency be formed with the Surgeon-General as Chairman (for the present) to deal with matters concerning this side of the profession. The decision of the Committee be binding on the Chairman. In cases of difference of opinion the Minister-in-charge should be appealed to who should have the final say in the matter.

(6) The association is of opinion as regards the report in *The Hindu* of 22nd September 1931 that Honorary Assistant Surgeons who hold M. B., B. S. degree have been empowered to grant medical certificates, that it is contrary to the spirit of clause I of recommendations of the committee on Honorary system and as such recommends that all Honorary officers eligible to hold appointments to grades of at least 2 and 3, *i e.*, Honorary Assistant Surgeon and Honorary Physician and Surgeon irrespective of their qualifications, be empowered to issue Certificates.

Meeting of Madras Private Practitioners.

A meeting of the private medical practitioners of the city of Madras was convened by Dr. M. S. Krishnamurthi Aiyar, Editor, The Medical Practitioner, on Sunday 4th instant, at 2 p.m. The meeting was held in the Council Chambers, Ripon Buildings; the attendance was about 13. The convener proposed Dr. T. V. Ranganath Rao to the chair.

The following resolutions were passed:—

1. The meeting while approving the suggestion of the Committee to do away with the designation of Sub-Assistant Surgeon in the honorary system of medical relief scheme, wish to point out to the Government that the honoraries should be so designated as to cannote the nature of work they do in a particular institution, whether as Assistant or Chief.

2. The meeting is of opinion that medicoes including those trained by the Government for Civil or Military duty passing from medical schools and colleges should undergo training as house surgeons and house physicians for one year before they are eligible for registration.

3. The meeting is of opinion that clinical assistants should be paid a monthly honorarium of Rs. 50 in the mofussil and Rs. 75 in the city and should be debarred from private practice.

4. That in the opinion of the meeting honorary assistant surgeons and physicians should have a fixed tenure for a period of five years to make room for other recruits and ordinarily these assistants should be selected from clinical assistants, but provision should be made for recruiting honorary assistants, from private registered practitioners who should have been in actual practice for at least five years and these should be given a carriage allowance of Rs. 30 in the mofussil and Rs. 50 in the city.

5. The tenure of office of honorary physicians and surgeons should be ordinarily for 10 years, so as to make room for honorary assistants; and honorary assistant surgeons and physicians who have put in five years' service should be eligible for these appointments and also private medical practitioners of not less than 10 years practice.

6. The meeting suggests to the Government that the recommending authority for honorary appointments should be a committee consisting of the Surgeon-General and two independent medical practitioners other than honoraries.

7. Regarding the Committee's recommendation XIV (2) concerning the appointment of honoraries for administrative work the meeting is of opinion that no honorarium should be

paid but in case they are entrusted with the teaching work they should be given suitable allowance for such work.

8. The meeting is of opinion that there is no need for the provision of the confidential report even in a modified form, and reports against or in favour of the honoraries should be made openly to the recommending authority.

The meeting discussed about the advisability of passing their opinion regarding the Indian Medical Council Bill. But as the whole Bill was not before them they passed the following resolution.

9. The meeting understands that a large section of medical practitioners registered in the provincial registers will not be treated as recognised medical practitioners for the purpose of Indian Medical Council Bill and considers that this omission is unjust and detrimental to the interest and unity of the medical profession and will be definitely against the very aims and objects of the contemplated special legislation.

10. The meeting thanks the Corporation authorities for permitting the use of the Council Chambers for conducting the proceedings of the meeting.

A vote of thanks to the chair was also passed unanimously.

CORRESPONDENCE.

The Indian Medical Council Bill

This bill is in my opinion both retrograde and reactionary. The Council to be created under this Act will be nothing but a grand official appendage to the Government of India set up with a view to placate the General Medical Council of Great Britain, and to serve merely as a substitute for ' the Commissioner ' they had formerly proposed to inspect and report on the sufficiency or otherwise of the standard of Medical examinations conducted by the various Universities in India. In the words of the Government of India, ' the creation of such a Council, offers the best if not the only, prospect of again securing the General Medical Council's recognition of Indian degrees ' and this forms the basis of the Bill. The functions of a truly democratic Council should be to ensure uniformity in the standards of medical education in the various provinces in India and reciprocity between the different provinces of India and between them and other Medical Councils in the British Empire, and other countries. I have searched in vain to see if these functions have been assigned to the Council in the Bill. This bill aims at setting up only an intermediary between the various Indian Universities and the General Medical Council of the United Kingdom, to act as the agent of the Governor-General in Council, to inspect and report through the Government of India to the various Provincial Governments the adequacy or otherwise of the standards of the examinations conducted by the Universities. And who are to be these functionaries ?

(1) A perpetual President to be nominated by the Governor-General in Council, (2) One member to be nominated from each of the Provincial Governments, (3) One member from each Governor's Province to be elected from amongst themselves by the members of the Medical Faculties of British Indian Universities, (4) One member from each of the Provincial Councils transformed into Provincial Committees or from graduates who had been on the teaching staff for not less than five years in any, Medical College or School affiliated to British Indian Universities, (5) three members to be appointed by the Government of India. In other words this small body of 28 members proposed by the Government of India will consist of the representa-

tives of the various examining bodies—the British Indian Universities and professors and lecturers in the various teaching institutions—the Medical Colleges and Schools in India, with the nominees of both the Provincial and Indian Governments, to sit in judgment over their own work, an anomaly which can never be thought of by a democratic Government. The Government of India have skilfully managed to exclude the Independent Medical Practitioners who are graduates and the vast army of Licentiates in India. The Electoral qualification for graduates is such as to preclude the Independent Medical Practitioners from contesting in the first place and if even there should be one or two who could contest, from coming out successful, unless they happened to be in the good graces of officialdom. I would therefore suggest that the graduates should be elected from among private practitioners only, or in the alternative, two graduates from each province, should be elected, of whom one must be an Independent Medical Practitioner, with or without teaching experience. As for the Licentiates they are banned for the present, though the door against them is not altogether banged, barred and bolted. It would be a misnomer to call the Council, 'the Indian Medical Council', when it is representative of only a section of Medical men, the graduates. "The Indian Medical Graduates' Council" or some such name, would be more appropriate and the licentiates all over India should protest against this title and agitate for a drastic reconstitution of the Council, with the inclusion of their representatives, one member from each province, in the Council. These representatives should be elected from among private Practitioners only. If the Government are not keen on raising the standard of Licentiates and giving them equal rights and equal privileges with the rest of the profession, there is no justification for the incessant manufacture of these Licentiates which will only lead to more misery and unemployment. The nomination of one member by each Local Government is unintelligible and should therefore go. Evidently this is the prize the Provincial Ministers have obtained for compromising their position and surrendering some of their rights to the council, real or imaginary, with regard to the nomination of three members by Governor-General in Council, that may be retained only to represent special interests or special branches of Medical Science. The President cannot be a perpetual nominee of the Governor-General in Council and must be elected, at least after the first term of the Council. We want an All-India Council which must be a purely democratic body, with non-official element preponderating, with full control of Medical Education and with full representation for all classes of Medical men, graduates and Licentiates, or none at all. The present constitution of the Government of India is already in the melting post and a new constitution is being forged. Nothing would be lost if the Government of India should wait for a year or two more, and leave this Bill for the new constitution to handle. In these days of straitened finances of the Government of India, it would be a sheer waste to spend money on a Council of this kind, which cannot claim popular approval. After all, only a few graduates who wish to pursue post-graduate study in England, and practise in that country, will be hard hit by the withdrawal of recognition of our Indian Universities by the General Medical Council of Britain and for their sake, to sacrifice a sacred democratic ideal and squander money on a good-for-nothing body like the proposed Indian Medical Council will be nothing short of criminal folly.

13th October 1931. U. RAMA RAO.

The Liver and its Bile Pigment Metabolism.

With Special Reference to the Study of Liver Efficiency.

By K. C. Paul, M.D.,

Honorary Physician, Government Royapuram Hospital.

The excretion of the pigmentary bodies that confer on the bile its characteristic colour and known as bile pigments is an important function of the liver. When the liver is diseased, the proper performance of this function may be interfered with, and in consequence such disturbances as retention of bile pigment in the blood may arise. The demonstration of bile pigment retention in the blood may, therefore, be employed in the study of liver efficiency as affording evidence of impaired hepatic functioning. Retention of bile pigment in the blood may, however, occur in the absence of hepatic disturbances. In order to appraise correctly the significance of bile pigment retention, it is necessary, therefore, to study the intricate problems presented by bile pigment metabolism.

The pigments of the bile are *bilirubin, biliverdin,* and *urobilin.* Biliverdin and urobilin are derivatives of bilirubin and are present in the bile only in small amounts. Biliverdin is formed in the bile by oxidation of bilirubin, and it has but little direct clinical significance. Urobilin, which is a reduction product formed by the action of bacteria, usually in the alimentry canal, has far greater significance, but we are not concerned with it in the present discussion. Bilirubin is the principal or main pigment of the bile, and it is this substance which is usually referred to as "bile pigment." Round it a good deal of controversy has raged in the past, especially regarding the site of its formation and its physiological significance. In the following paragraphs it is proposed to give, without entering into the details of the controversy, a summary of the views now current regarding it.

Recent researches by McNee, Rich, Mann, and others show that bilirubin is formed from the haemoglobin set free during blood destruction, by the cells of the reticulo-endothelial system of Aschoff, a system widely distributed in the body, the chief situations where its constituent cells are found being the spleen (lining the sinuses), the liver (the stellate cells of Kupffer), and the bone-marrow. The liver is concerned in bilirubin formation only in virtue of the Kupffer cells, which belong to this system. The polygonal cells of the liver do not take any part in the formation of the pigment. They simply take up the pigment elaborated by the reticulo-endothelial cells and excrete it in the bile.

There is, however, some difference, chemical or physical, between the pigment which has not passed through the polygonal cells and that which has passed through them. Peyton Rous says that "the liver hall-marks the pigment as it puts it out, with the result that it can be recognized from the pigment upon which the organ has not acted." The recognition of the two varieties of bilirubin is made by means of the van den Bergh test. Before it has passed through the polygonal cells it may be said to be in the "indirect" form (as it gives generally a reaction only with the *indirect* test); and as it is this form which normally exists in the blood, it may be spoken of as "haemo-bilirubin". The polygonal cells alter the "haemo-bilirubin" in some way, as they excrete it in the bile. The pigment which is present in formed bile is this altered variety, which may be said to exist in the "direct" form (as it gives an immediate reaction with the *direct* van den Bergh test), and spoken of as "chole-bilirubin."

It has been suggested that haemo-bilirubin is bilirubin in combination with the plasma-proteins, and that chole-bilirubin is the pigment freed from this linkage. This view has been recently affirmed by Piotrowski. But Andrews could not find any evidence in support of it. He believes that haemo-bilirubin is identical with haematoidin, the iron-free split product of haemoglobin (usually met with in old haemorrhagic effusions). Collinson and Fowweather say that haemo-bilirubin is the free acid bilirubin, whereas chole-bilirubin is its ammonium salt. According to Davis and Dodds, chole-bilirubin is pure bilirubin, whereas haemo-bilirubin is bilirubin which has undergone and oxidative change.

The rate of formation of bilirubin and the amount of it formed are dependent upon several factors, of which blood-destruction, which sets free haemoglobin, is the most important. According to present evidence, bilirubin is formed only from haemoglobin.

Blood destruction is a physiological process which is going on continuously, and, under normal condition, at a fairly constant rate. It follows, therefore, that the amount of bilirubin formed normally is limited. The polygonal cells of the liver put out a sufficient quantity of bilirubin so as to keep its concentration in the blood within normal limits. The bilirubin content of normal blood serum lies between 1 in 1,000,000 and 1 in 400,000, that is, between 0·1 and 0·25 mgm. per 100 c.c. of serum. (Greene, Snell, and Walters say that it varies from 0·5 to 2 mgm. per 100 c.c. According to Forster, it may lie between 0·2 and 1 mgm. per 100 c.c. Perkins has found that it varies from 0·05 to 0·35 mgm. per 100 c.c.) When the liver cells are damaged and unable to excrete the pigment brought to them, an accumulation of the pigment will occur in the blood. But bilirubin will accumulate in the blood also when too much haemo bilirubin is produced in the body, that is, when excessive blood destruction is going on. For, the liver cells are unable to deal with more than a certain amount of the pigment in a given time. This explains the common occurrence of the accumulation of bilirubin in the blood of the new-born (Williamson), in whom, during the first few days after birth, there is excessive physiological blood destruction taking place, whereby more pigment is brought to the hepatic cells than they are able to pass out. Accumulation of bilirubin occurs in the blood also when the bile passages are obstructed, due, no doubt, to resorption of chole-bilirubin from the bile stagnant behind the obstruction.

McNee has admirably summed up the various ways in which excess of bilirubin in the blood (hyperbilirubinæmia) may arise. They are, to quote him :—

" 1. Where bile pigment, formed in the cells of the reticulo endothelial system, passes through the polygonal cells normally to reach the bile capillaries, but is obstructed there and finally reabsorbed into the blood.

" 2. Where, owing to damage to the polygonal cells of the liver, the bile pigment carried to them by the endothelial cells is unable to enter them. The bilirubin would therefore pass directly along the hepatic venous radicles into the general circulation. On the other hand, part of the bilirubin might pass through, and part be unable to do so.

" 3. Where, in excessive blood destruction, too much bilirubin is formed in the reticulo-endothelial system for the polygonal cells to deal with. In such circumstances, some pigment might normally pass into the bile capillaries, and colour the faeces, while the excess might pass straight through the hepatic vein into the circulation and bring about jaundice.

"4. Where, in addition to damage and disordered function of the polygonal cells, there is also obstruction in the bile ducts—for example, cholangitis. In such circumstances some pigment might pass directly through the hepatic vein into the circulation, and some through the polygonal cells to be afterwards reabsorbed on account of obstruction."

Hyperbilirubinæmia (and jaundice) may therefore be classified, after McNee, as being due to :—

I. Obstruction in the bile passages (OBSTRUCTIVE) ;

II. Damage or disordered function of the polygonal cells (pure, or combined with obstruction in the bile passages) due to the effects of toxic and infectious agents (TOXIC AND INFECTIVE) ;

III. Excessive blood destruction (HÆMOLYTIC).

In obstructive hyperbilirubinæmia, the bilirubin in the blood is predominantly of the variety which has passed through the polygonal cells of the liver, that is, chole-bilirubin.

In toxic and infective hyperbilirubinæmia, both kinds of bilirubin are increased in the blood. The increase in bilirubin is at first due to the inability of the polygonal cells to pass out the pigment brought to them ; at this stage the blood will contain only hæmo-bilirubin. Later on, due to obstruction in the bile passages, chole-bilirubin will appear in the blood, when both varieties will be present in large amounts. In some cases, where the injury to the liver cells is preceded by obstruction in the bile passages, the increase in the bilirubin content of the blood will be at first due to the reabsorbed chole-bilirubin.

In hæmolytic hyperbilirubinæmia, the bilirubin in the blood is of the variety which has not passed through the polygonal cells, that is, hæmo-bilirubin.

Normal urine is free from bilirubin. When, however, the bilirubin content of the blood is raised beyond a certain level, the kidneys pass the pigment into the urine. Till this concentration is reached none is passed through. The kidneys are "threshold organs" for this pigment, and till the threshold level is reached they do not let any of the pigment pass into the urine. The renal threshold for chole-bilirubin seems to be set at a lower level than that for hæmo-bilirubin, and lies between serum bilirubin concentrations of 1 in 55,000 and 1 in 50,000, that is, those of 1 8 and 2 mgm. per 100 c c. When hæmo-bilirubin accumulates in the blood, none of it may escape into the urine even when its concentration in the serum is as high as 1 in 12,500 (8 mgm. per 100 c c.). In some instances, however, it may be passed out when it reaches a concentration of 1 in 20,000 in the serum.

Meulengracht holds that there is a cutaneous threshold as well for this pigment. Only when this threshold level is reached in the blood, will the pigment escape into the subcutaneous tissues and sclera, and give rise to the yellow colouration in these situations so characteristic of bile pigmentation. According to Meulengracht, this threshold level is reached in the blood when the "bilirubin index" as determined by his method is between 8 and 12. It is difficult to express these figures in terms of bilirubin concentration. But clinical evidence tends to show that the cutaneous threshold level should lie between serum bilirubin concentrations of 1 in 50,000 and 1 in 40,000 (*i.e.*, of 2 and 2·5 mgm. per 100 c.c.), especially for chole bilirubin; for it is known that the appearance of the yellow colouration of the skin and conjunctivæ is, as a rule, preceded by the escape of bilirubin into urine by at least a few hours, and sometimes even 24 hours. When there is noticeable bile pigmentation of the skin and conjunctivæ, clinical jaundice or *overt jaundice* is said to be present. If the bilirubin content of the blood is raised beyond its normal level, but there is no manifest jaundice, *latent jaundice* may be said to exist.

The foregoing account of bile pigment metabolism in health and disease clearly shows that the significance of bile pigment retention is varied. We shall now proceed to a consideration of the means by which the existence of bile pigment retention may be detected and the significance of the retention determined.

REFERENCES.

1. *Andrews A. C. H.*—Brit. Journ. Exper. Path., 1924, 5, 2 3.
2. *Aschoff, L.*—"Lectures on Pathology", 1924, New York
3. *Collinson. G. A.*, and *Fowweather, F. S.* —Brit Med Journ., 19 6, ii, 1081.
4. *Forster, J.*—Klin. Wchnschr, 1925, 4, 1688.
5. *Greene, C H.*, *Snell, A, M.* and *Walters, W.*—Arch. Int Med., 1925, 36, 248.
6. *McNee, J W.*—Quart. Journ. Med 1922-23, 16, 39^.
7. *McNee, J. W.*—Brit. Med, Journ, 1924, ii 455,
8. *Mann, F. C*—Arch Path. and Lab. Med., 1926, 2, 516.
9. *Meulengracht, E*—Deutsch. Arch. Fur Klin. Med., 1920, 132, 285.
10. *Perkins, F S*—Arch. Int. Med., 1927, 40, 1915
11 *Piotrowski G*—Arch. de mal, de l, appar. digest, 1925, 15, 798.
12 *Rich, A. R*—Physiol. Rev, 1925, 5, 182.
13. *Rous, P.*—Amer Journ. Med. Sci., 1925. 170, 625.
14, *Williamson.*—Surg. Gen. and Obstat. 1923, 37, 57.

Tests of Hyperbilirubinaemia.

I. *Fouchet's test.*

Several tests are available for the detection of hyperbilirubinæmia. Of these, the simplest is that devised by Fouchet. This is essentially a qualitative test, but may be used also for the rough estimation of the degree of bilirubin increase in the blood serum. It depends on the development of a greenish-blue colour on mixing the serum with the reagent, this being due to the oxidation of the bilirubin present in the serum by the ferric chloride of the reagent. This colour reaction is obtainable with a minimum serum bilirubin content of 1 in 60,000 (*i e.*, 1·6 mgm. per 100 c.c.). The maximum colour develops with this concentration of bilirubin in about 20 minutes. A prompt colour reaction will occur when the bilirubin concentration in the serum approaches 1 in 20,000 (*i.e.*, 5 mgm. per 100 c.c.).

Mac Cormac and Dodds, Berkeley, Dodds and Walker, and Davies have found the test of considerable clinical value. Friedman and Strauss hold that it is very useful for clinical work, as it will reveal only pathological amounts of bilirubin in the serum. Speik, Liljedhal, and Falk obtained with it positive reactions in 67 per cent. of their cases of cholecystitis; but they got positive results in cases of secondary anæmia also. Garvin is not impressed by its clinical usefulness; he obtained with it positive reactions in only 17·4 per cent. of his gall-bladder cases. Shattuck, Browne, and Preston found the test unreliable for detecting minor grades of hyperbilirubinæmia. King, E.L., also reports on its unreliability.

The test is, of course, only rough. But it may be relied on to give positive results when the bilirubin content of the serum exceeds 1 in 60,000 (1·6 mgm. per 100 c.cm.). In fact, the test seems to be more sensitive than even this. Its simplicity and the fact that the reaction obtained with it is not obscured by slight hæmolysis in the serum are advantages in its favour. Moreover, its sensitiveness is sufficient for clinical work in general practice.

REFERENCES.

1. *Berkeley, C., Dodds, E. C.*, and *Walker, A.L.*—Journ. Obst. and Gynæ. of Brit. Emp., 1924, 31, 20.
2. *Davies, D. T.*—Lancet, 1927, i, 380
3. *Fouchet, A.*—Compt. rend. Soc de biol., 1917, 80, 826.
4. *Friedman, J. C*, and *Strause, D C*—Journ. Amer. Med. Assoc., 1924, 82, 2097.
5. *Garvin, J. D.*—Journ Amer. Med, Assoc, 1924, 84, 492.
6. *King, E. L.*—Amer. Journ, Obst. and Gyne, 1926, 12, 510.
7. *MacCormac, H.*, and *Dodds, E. C*—Brit. Med. Journ., 1923, ii, 1200.
8. *Shattuck, H. F, Browne, J.C.*, and *Preston, M*—Amer, Journ Med. Sci, 1925, 170, 510.
9. *Speik, F. A., Liljedhal, E N.*, and *Falk, M.A*—Journ. Amer. Med. Assoc., 1924, 82. 2097.

II. Van Den Bergh's Test

This is a very delicate test; in fact it is the most delicate test in use for detecting hyperbilirubinæmia. It is Ehrlich's diazo reaction applied to the blood. It depends upon the formation of a coloured product, azobilirubin when Ehrlich's diazo reagent is added to a solution containing bilirubin. It may be performed qualitatively or quantitatively. There is a *direct* as well as an *indirect* qualitative test. In the direct test, untreated blood serum is made use of, while in the indirect, serum treated with alcohol is employed. The quantitative test is adapted for the colorimetric estimation of the bilirubin content of the blood serum; in its original form, it was performed with serum prepared as for the indirect qualitative test.

With the *direct* qualitative test a positive or a negative reaction may be obtained.

The *positive* reaction may be described after McNee as of three kinds:—

1. An *immediate* reaction, in which a violet red colour develops instantly the serum and reagent are mixed, and reaches its maximum intensity in about 30 seconds.

2. A *delayed* reaction, in which a pink colour begins to appear after 1 to 15 minutes or even later, and slowly deepens to bluish-red or violet.

3. A *biphasic* reaction, in which a pink colour begins to appear immeditely, but the maximum bluish-red colour occurs only after several minutes.

In the *negative* reaction no colour change is observable in the mixture of serum and reagent.

An immediate direct positive reaction is given by the bilirubin in formed bile, that is, the chole-bilirubin. The significance of this reaction is, therefore, that the bilirubin in the serum is predominantly that which has been reabsorbed from the bile, that is chole-bilirubin. Such a reaction is obtained with sera from cases of obstructive jaundice. A delayed positive reaction indicates the presence in excess of bilirubin which has not passed through the polygonal cells, that is, haemo-bilirubin. This reaction is obtainable in conditions in which the hyperbilirubinæmia is of hæmolytic origin. It may be obtained in the early stages of some cases of toxic and infective jaundice also. The biphasic reaction signifies the presence of both varieties of bilirubin, and should be obtainable in the toxic and infective group of hyperbilirubinæmia.

Clinical experience does not justify the rigid classification of the direct positive reactions as given above. It is but rare that an immediate positive reaction of the type indicated is given by sera from cases of obstructive jaundice. Andrews says, "I have hardly ever found such a reaction, and even with fresh bile the colour goes on changing after thirty seconds. If a red colour begins to appear within thirty seconds I consider that the direct reaction is positive." McNee and Keefer and Hall endorse this statement. Hall says that the designation "biphasic" is misleading and should be dropped. He suggests that the direct reactions should be classified as follows: (1) immediate, any reaction beginning in 30 seconds after addition of the reagent to the serum, (2) delayed, a reaction beginning slowly after thirty seconds and reaching its maximum very slowly.

The occurrence of hæmolysis in the serum interferes with the colour reaction of the test. To remedy this McNee and Keefer use oxalated plasma in place of serum. They also recommend, for making the test more useful, the employment of the technique introduced by Lepehne, in which caffeine sodium salicylate is added to the serum or plasma, along with the reagent, so as to enhance the colour reaction. They have noted further the necessity of doing the test within two hours after withdrawing the sample of blood; for it has been found that a serum or plasma which does not give a positive direct reaction when fresh, does give a delayed effect when it has stood for a few hours.

When the direct test is negative, the *indirect* test is to be performed. With this a positive reaction is indicated by the immediate development of a bluish-red or violet colour.

Hæmo-bilirubin may give a delayed positive reaction with the direct test, especially if it be present in large amounts. But it will not do so always. With the indirect test, however, it will invariably give a positive reaction. Even normal sera will give a faint positive reaction with the indirect test, for they contain sufficient hæmo-bilirubin to react with the reagent and produce the coloured azobilirubin. For a positive indirect reaction to be regarded as pathological, the colour developed should be more intense than that obtainable with normal sera. It may be mentioned here that chole-bilirubin also will give a positive indirect reaction.

All sera giving a direct positive reaction will give a well-marked indirect reaction as well. But the converse does not hold. This is easily understood from what has been stated above. When the direct test is negative, a well-marked indirect positive reaction has the same significance as a delayed direct reaction. If a direct positive or a well-marked indirect positive reaction is obtained with a serum from a patient not manifesting clinical jaundice, he may be diagnosed as a subject of *latent* jaundice.

The indirect test may be adapted for the *quantitative* estimation of the bilirubin concentration in the serum. The colour developed in the serum is compared colorimetrically against the colour of a standard ethereal solution of ferric sulphocyanide. This standard solution, according to van den Bergh, has the same amount of colour as a 1 in 200,000 solution of azobilirubin. Van den Bergh has utilized this concentration of bilirubin as the unit for measuring the pigment content of the serum. In terms of this unit, the bilirubin content of normal blood serum or plasma may be expressed as lying between 0·2 and 0·5 of a unit. Clinically manifest jaundice ordinarily occurs with a serum bilirubin concentration of about 3·5 or 4 units. Greene, Snell and Walters discard the term "units" and express the bilirubin concentration in milligrammes per 100 cubic centimetres of serum. 1 mgm. of bilirubin per 100 c cm. of serum is equivalent to 2 ven den Bergh units.

As bilirubin is but slightly soluble in alcohol, a considerable amount of the pigment is lost during the alcoholic extraction of the serum. Therefore, only low values could be obtained for the serum bilirubin content when the estimation is made according to the original van den Bergh method. The loss could be minimized, as McNee and Keefer have shown, by employing the modification of Thannhauser and Andersen.

Ven den Bergh has recently advocated the use of a new standard, an aqueous solution of anhydrous cobaltous sulphate, in place of the ethereal solution of ferric sulphocyanide. It is considered to be a more stable standard.

It has been mentioned that this is the most delicate test in use for the detection of hyperbilirubinæmia. The diazo reaction obtained with it seems to be specific for bilirubin, and the sensitiveness of the reaction is such that by its aid the pigment may be detected in as low a concentration as 1 in 1,500,000. All observers who have made use of the test agree as to its extreme sensitiveness. Schamberg and Brown, Shattuck, Browne and Preston, McNee, Ravdin, Muller, Ravdin and Ravdin, Greene, Rowntree, Fishberg, Cowen and Cowen and others report on its usefulness in detecting minor grades of bilirubin increase in the blood.

The clinical usefulness of the test does not rest with its sensitiveness only. It was with its aid van den Bergh differentiated the two forms of bilirubin. McNee built up his classification of jaundice on the basis of the various reactions obtained with it.

But the claim made for it at the time of its introduction into clinical medicine, that with it the clinical differentiation between the various forms of jaundice could be made, has not been in the light of present experience, fully justified. Andrews admits that the differentiation between frankly obstructive and frankly hæmolytic jaundice could be made with the test, but he is of opinion that its value in distinguishing the hyperbilirubinæmia due to liver-cell damage, that is, the toxic and infective type, is slight. McNee and Keefer admit this. Faville, Davies and Eustermann are also of the same opinion.

Mann and Bollman have recently made an experimental study of the test. They could not give the same interpretations to the reactions obtained with it as van den Bergh and McNee have done. They state that "the value of the direct and indirect van den Bergh tests as differential diagnostic tests can be determined only by careful and controlled observations on the human being", for they found that the test gives different types of reaction in different species of animals.

The clinical value of the van den Bergh test, according to present experience, may be summed up here, in the words of McNee and Keefer:—

"1. The van den Bergh reaction is the best method so far available for the clinical investigation of the bilirubin content of blood serum or plasma. It has numerous advantages over other tests which have subsequently been proposed: (*a*) its extreme delicacy; (*b*) it is not given by other yellow substances which may colour the plasma; (*c*) it gives important qualitative distinctions between certain forms of icterus; (*d*) it can now be used for satisfactory quantitative estimation of bilirubin.

"2. The qualitative reaction may enable a positive diagnosis of obstructive or of hæmolytic icterus to be made. Pernicious anæmia, except in the stage of rapid temporary improvement, can be distinguished from secondary anæmia. In some diseases (for example, catarrhal jaundice, subacute yellow atrophy, cardiac failure) the reaction may pass through all the stages from completely delayed to prompt direct, as the disease progresses. As a rule, however, in the commonest type of jaundice (the toxic and infective group) no information of any diagnostic or prognostic value is given to the clinician.

"3. The test is of great practical value for the detection of latent jaundice."

REFERENCES.

1. *Andrews, C. H.*—Quart. Journ. Med, 1924 25, 18, 19.
2. *Cowen, M*, and *Cowin, S. O*—Med. Journ. Australia, 1925, i, 177.
3. *Davies D. T*—Lancet, 1927, i, 380,
4. *Eustermann, G. B*—Annals of Int. Med., 1927-28, i, 53.
5. *Faville, G*—Sperimentale, 1925, 79, 647.
6. *Fishberg, A. M*—Journ. Amer, Med. Assoc., 1923, 86, 1516.
7. *Greene, G. H*—Journ. Amer. Med. Assoc., 1925, 85, 1476.
8. *Greene, C H., Suell, A. M.* and *Walters, W.*—Arch. Int Med., 1925, 36, 248.
9. *Hall. W W.*—Journ. Lab and Clin Med,, 1926-27, ,6 529.
10. *McNee, J. W.*—Brit Med Journ, 1922, i, 716.
11. *McNee, J W.*—Quart. Journ. Med., 1922-23, 16, 390.
12. *Mc Nee, J. W.*, and *Keefer, C. S.*—Brit. Med Journ.. 19 5, ii, 52.
13. *Mann, F. C.*, and *Bollman, J L.*—Arch. Path. and Lab Med., 1926, 1, 681
14. *Muller, G. P., Ravdin, I, S*, and *Rvdin. E G.*—Journ. Amer. Med Assoc, 1925. 85, 86.
15. *Ravdin, E G.*—Amer. Journ. Med. Sci, 1925, 169, 850.
16. *Rowntree, L G.*—Trans, Assoc Amer. Physicians, 1925, 40, 376
17. *Schamberg, J E,* and *Brown, H*—Journ. Amer. Med. Assoc., 1924, 82, 1911.
18. *Shattuck, H. F., Browne J. C*, and *Preston, M.*—Amer. Journ. Med. Sci., 1925. 170, 510.
19. *Thannhauser, J. S*, and *Andersen, E.*—Arch. fur klin. Med., 1921, 137, 179.
20. *Van Den Bergh, A A H.*—" Dar Gallenfarbstoff in Blute ", 1918, Leipzig.
21. *Van Den Bergh, A. A. H.*—Presse Med, 1921, 29, 441.

III. Meulengracht's Test.

A third test for the determination of increases in the bilirubin content of the blood is that devised by Meulengracht. In this test the colour of the blood plasma is compared directly against the colour of a standard 1 in 10,000 solution of potassium dichromate. The intensity of the colour in the plasma is expressed numercially, the colour of the standard solution being taken as unity. Meulengracht has devised a simple "bilirubin colorimeter, which resembles Sahli's haemoglobinometer, for this purpose.

Maue modified Meulengracht's technique, by making use of blood serum, which is a clearer than plasma, and a Duboscq colorimeter, for accurately comparing the colours. From the readings a ratio is worked out, which is designated as the " icterus index ".

The test is based on the assumption that the colour of blood plasma and serum is due to the bilirubin present in the blood. But bilirubin is not the only yellow pigment in blood plasma or serum Two other pigment of the nature of lipochromes, carotene and xanthophyll, both derived from the food, are also present in varying amounts. Some of the colour of the plasma and serum is due to these pigments. It has been found that the colour of the plasma would be deepened by the ingestion of substances containing these pigments. Such substances are yolk of eggs, oranges, green vegetables, and carrots. Greene, Snell and Walters observed "two patients with pronounced discolouration of the skin and carotinæmia after the prolonged use of carrots in their diet. The icterus index in one of these cases was 18, but by chemical methods the serum bilirubin measured only 0·5 mgm. per cent., an entirely normal amount. In the second case the icterus index was 26, but the serum bilirubin was only 1·1 mgm. per cent." Bernheim also says that carotinæmia and increased icterus index could be induced by the ingestion of carrots; but she holds that the effect of carotinæmia is but transitory and will disappear after a fast of about 12 hours.

Other sources of error in the use of the test are (1) the liability of the serum to be cloudy, and (2) hæmolysis. As Bernheim says, the cloudiness of the serum could be obviated by taking the sample of blood on the fasting stomach, and hæmolysis by careful technique in the withdrawal of the blood and the use of dry needles, syringes and tubes.

The normal icterus index, according to Maue and Stetten, lies between 2·5 and 6. Bernheim says that it lies between 4 and 6. All are agreed that there is hyperbilirubinæmia when the index is above 6. In latent jaundice the index is above 6, but below 15. Clinical jaundice is invariably present when it is above 15. Bernheim says that there is "hypobilirubinæmia" when the index is below 4.

This test has been extensively used by American workers, and the majority of them are impressed by its simplicity and clinical utility. Stetten found it of great value in his surgical gall-bladder cases. Barrow, Armstrong and Olds say, "The icterus index is the test of choice for the quantitative estimation of bilirubinæmia for the reason that it is simple, accurate, and of definite clinical value." Shattuck, Browne and Preston hold that it is "the most useful single functional liver test...for clinical work."

Bernheim prefers the icterus index determination to van den Bergh's test, because with the latter some loss of bilirubin is invitable in the quantitative estimation and the "zone of hypobilirubinæmia" could not be measured, Murphy claims that information of as much value could be obtained with the simpler icterus index as with the more elaborate phenoltetrachlorphthalein test. St. George and Brown recommend the test for its simplicity, and on the ground that the more accurate results obtained with the more complex van den Bergh test are not essential for ordinary clinical purposes.

Murphy, and recently Brown have modified the test, by introducing a series of permanent standards, against which the serum colour could be directly compared. Davis has adapted the technique for determining the index with small quantities of capillary blood. Earnest and Förster precipitate the serum with twice the volume of acetone and compare the colour of the filtrate with a potasium dichromate standard.

The test is simple enough, but the obvious fallacy underlying it lessens considerably its clinical usefulness. Van den Bergh's test has considerable advantages over it. With the van den Bergh qualitative test it is possible to differentiate obstructive from hæmolytic jaundice. With the icterus index it is not possible to do so. The van den Bergh test is specific for bilirubin; but the icterus index determination is vitiated by the ingestion of substances containing carotene and xanthophyll. The quantitative van den Bergh test, in its improved form, estimates the actual amount of bilirubin present in the blood. The icterus index can only indicate the intensity of yellow colour in the serum. Lastly, it is possible to do the qualitative and quantitative van den Bergh tests, with Thannhauser and Anderson's technique, with one sample of blood.

As both tests are performed colorimetrically and require almost the same amount of blood, it must be maintained that the more accurate van den Bergh test should be the test of choice.

REFERENCES.

1. *Barrow, J. V., Armstrong, E. L.,* and *Olds, W. H.*—Amer. Journ. Med. Sci., 1925, 170, 519.
2. *Bernheim, A. R.*—Arch. Path. and Lab. Med., 1926, 1. 747.
3. *Brown, A. L.*—Arch. Path. and Lab. Med., 1927, 3, 409.
4. *Davis, D*—Amer. Journ. Med. Sci, 1926, 172, 848.
5. *Ernest and Forster.*—Klin. Wahnsche, 1924, 3, 2386; *ibid*, 1925, 4, 1689.
6. *Greene, C. H., Snell, A. M.,* and *Walters, W.*—Arch. Int. Med, 1925, 36, 248.
7. *Maue, H. P.*—Surg. Gyne. and Obst.. 1922, 34, 752
8. *Meulengracht E.*—Deutsch. Arch. fur klin. Med., 1920, 132, 285.
9. *Murphy, W. P.*—Arch. Int. Med., 1926, 37. 797.
10. *St. George, A. V.,* and *Brown, A. L.*—Arch. Int. Med., 1925. 36, 847.
11. *Shattuk, H F., Browne, J C, and Preston, M.*—Amer. Journ. Med. Sci, 1925, 170. 510.
12. *Stetten, DeWitt.*—Ann. Surg., 1922, 76. 191.

Some interesting Corneal Diseases in General Practice—II.*

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Hypopion ulcer.—It is impossible to enter into the vast subject of corneal ulcers, but I will just mention a few words about the one alarming type: the hypopion ulcer. It is also called pneumococcic ulcer from the attendant pneumococci. The name *ulcers serpens* is assigned to it from the characteristic creeping tendencies and I think it is called serpent ulcer as the proportion of blindness of ocular mortality is similar to the mortality in the population caused by the bite of serpents. Serpiginous ulcer starts at or near the centre of the cornea in the form of a grayish white or yellowish disc surrounded by a delicate gray area. As the disease progresses, polymorphonuclear leucocytes collect between the corneal lamella and beyond the spreading margin, making it denser and more yellowish. The resultant swelling of the Bowman's membrane and epithelial layer is soon replaced by a sloughing depression, with edges more or less sloping. This becomes violently inflamed early in the disease, aqueous becomes turbid, hypopion collects at the bottom of the A. C., the horizontal top reaching as high as ¾ of the A. C. sometimes. Posterior synechia, occlusis pupil complete the clinical picture indicating the extreme virulence of the bacterial invasion and the malignancy of the case. The symptoms of irritation and inflammation are severe. Chemosis is intense. Photophobia and deep ciliary pain are never absent. When perforation occurs, discharge of pus and other contents of A. C. and prolapse of iris take place. Inflammation may subside or panophthalmitis may supervene. In the absence of perforation staphyloma equally detrimental to vision has got to be feared. The scars of this disease are always dense. The organisms involved in attacking a corneal abrasion are the pneumococcus, the diplobacillus of Morax Axenfield. Clinically there is no difference though it is said that there is no conjunctivitis or dacrocystitis in the diplobacillary infection. The progressive margin of the diplobacillary ulcer is more superficial and has a glassy appearance. Though typical serpigenous ulcer rarely occurs before the 40th year it is not unusual to see the disease a good number of times amongst youngerfolk. The poorer classes exposed to various occupational trauma are very prone to get the attack. Lachrymal sac and conjunctival troubles, malnutrition, and small-pox are the usual causes. Disseminated sclerosis may be an underlying factor. I have a patient woman 30 years with a drag in the left leg. K. J. exaggerated. Well developed ankle clonus. The right eye has a droop and on examination the eye was inflamed, cornea

* Read before South Indian Medical Union, Madras.

anaesthetic and showed a perforating ulcer at 6 o'clock. A. C. ½ full of pus. Treatment has not ended. Condition remains the same, but I wonder if she will have the sudden termination of dissemminated sclerotic patients. Sometimes with cyanosis and convulsions due to laryngeal spasm. Eye change is evidently due to trophic changes caused by a sclerotic area in the nucleus of the V nerve.

This ulcers serpens owing to its destructive nature has always an unfavourable prognosis. Even in cases terminating early, marked lowering of vision owing to dense specification of the pupillary area of the cornea is the rule, as I had recently in a railway employee of 25 years of age. In many cases complications destroy the eye as a whole.

Treatment.—Besides attending to the general health and cleanliness of the usual hypopionic dirty rustic as an immediate soap and warm water bath which is sure to have been denied to him by his sympathetic relations for reasons best known to their rustic brains from the very beginning of the condition, the eye is irrigated with 40 grs. to ozs. 1 of epsom salts solution every two hours, to which I add 2 grs. of quin A hydrochlor or sometimes a tabloid of hexamine. Atropin 1 per cent three installations twice a day, watching tension. Septic teeth removed. Ulcer is treated and pure carbolic with the help of a coochie with cotton wound round the end. Squeezed out well of extra carbolic. A milk injection of 15 c.c. is given. Argyrol is put in the eye hourly. If at the end of 24 hours the hypopion has not come down or even remains the same, a Sæmisch's section is made when the whole hypopion sqirts out en masse if not helped out with forceps. Otherwise paracentesis is done if ulcer is of moderate extent. Zinc sulph. I use in all cases in the same way as I add a quin to the mag. sulph. solution as I do not make or wait for the result of bacteriological examination of smear. Of course I remove the sac if diseased or there is the slightest regurgitation on pressure of sac area, by putting the patient on the table, certainly without his consent, under novacain anæsthesic as an urgent measure. Eyelids are kept open. No dressings. No fomentations. Treatment of convalescence is according to the merits of improvement or otherwise.

There is another treatment for hypopion ulcer called the *combined treatment.* Twenty hypodermic injections of pilocarpine once every day ½ gr. increased to ¼ to ⅓ gr. During the senus, HG is given twice daily ½ hour after food and NaI and NaBr one hour after twice daily too. The latter is given twice between senus. In 4 to 6 months 10 injections of pilocarpine a second time is given.

Mooren's Ulcer is a rare variety of a chronic form of ulcer with a serpiginous outline occurring in old people, often attacking both eyes. The invading margin is deeply undermined and a overhanging edge of proliferating epithelium. No discharge, no ciliary infection. As the disease spreads the first involved portion heals, epithelium growing over the surface. No fibrous tissue forms. There is a loss of about ½ the thickness of cornea after, when the ulcer has healed. As there is no cicatrical tissue, the scar is so thin that a little sight always remains. The whole cornea is nearly always involved. The great peculiarity is that no perforation occurs. About 6 months ago I had an old patient with this condition of bilateral rodent ulcer which had spread so far when he first came to me that just the size of a big pinshead of transparent cornea remained. He was still moving about without help. Scraping the ulcer and a conjunctivo-plasty was done. The conjunctiva did not stick nor did the patient stick to me. Another case of a clerk of the Burma Secretariat throve on repeated cyanide injections. He has an area of cornea left unaffected in the upper and outer quadrant from behind which an iridectomy was done. He was only 42 years at the time and for the last 10 years the disease had not shown any further advance and the eye remains quiet.

On the whole the treatment is unsatisfactory.

Conical Cornea is of great interest to the GP from the aetiological point of view. It is an anomalous condition in which the central or paraecentral part of cornea loses its normal convexity and assumes the form of a cone and generally appearing between 15 and 30 years of life more often amongst females. Well marked cases are easily made out in profile. Placido's disease will demonstrate the corneal deformity. The excessive thinness of the apexmay be demonstrated by touching the apex with a probe. Whatever the cause, congenital weakness at the centre of the cornea yielding during puberty to the normal intraocular tension or a chronic degeneration of the Descemet's membrane the sufferer cannot regain normal sight in spite of cauterising the apex and performing an iridectomy the idea being, opening out a window behind the most transparent and least convex part of the cornea. Kerataconus may be part of a general constitutional disorder with a low basal metabolic rate pointing possibly to thyroid insufficiency. Areas of rarefactio in the cranial bones discovered by X-Rays and not found in other bones may show that defect exists in Ca metabolism. The patients with kerataconus show markedly low haemoglobin percentage with diminished red cell count. The integrity of the sympathetic nerve trunk is necessary for the proper nourishment of cornea as strumectomy of the right side gave kerataconus after 6 weeks in a case.

If these cases are detected early enough, we may be able to avert the worst by mere firm bandage and medical treatment based on the possible aetiology stated above. Here the Slit lamp comes to our aid which shows the increase in the concavity of the inner corneal surface without any appreciable alteration in the contour of the anterior surface. These are cases in which retinoscopy has been impossible on account of circular shadows and yet examination with Placido's ring showed no irregularity. In the past these cases have been explained by invoking an irregular lenticular astigmatism. When a definite cone is formed Slit lamp shows many characteristic appearances that need not be mentioned here.

Leprosy and Cornea.—The saddest chapter in the tragedy of a leper's life is the corneal or ocular affection and the consequent blindness. Superficial punctate keratitis is more frequent in lepers than in the healthy. Limbus infiltrations are common, starting as gray nodules in the periphery of clear cornea. These coalesce and gradually invade the centre. The case I have here is one of this rare variety. Thoroughly the limbus is affected microscopically, the superficial puntcate keratitis is universally distributed on the cornea as seen by the Slit lamp.

Microscope.—Again the so-called lepromata or masses of infected granulation tissue spread in from the limbus and travel on to the cornea as ivory-like pannus. The conjunctival nodules also may travel on to the cornea and exhibit dissimilar features on the cornea. The outer cornea is only mostly affected and through the inner third is left unaffected it will be full of infiltration having operative interference out of question altogether as iridectomy and optical purposes. A deep interstitial keratitis secondary to iridocyclitis is the worst form of the corneal affection with perforation and panophthalmitis.

The forgoing varieties belong to the nodular type as well as the anæsthetic. Only the course is longer, 18 years in the nerve type while in half the time the nodular is over. The troubles met with in the nerve type are secondary results of exposure, loss of nutritional control and the loss of the natural sensitiveness of the organ with consequent abrogation of the protective movements of the lids.

Dystrophies are affections of the cornea which, not classed as suppurative or non-suppurative, form an intermediate progressive group to which Fuchs has given the foregoing name. They are non-inflammatory degenerative changes in the cornea caused by disturbances of nutrition local or general or both. They are usually bilateral appearing in persons of advanced age. These corneal disturbances are free from leucocytic invasion.

Zonular opacity of cornea.—The two cases exhibited to-day of this condition are pathological types of dystrophy. Slow in development occurring in elderly people secondary to some introcular disease like glaucoma or iridocyclitis. This ribbon shaped opacity is formed by the joining of 2 foci developed at the outer and inner margins of cornea but separated from it by an unmolested area. Gout may be a cause.

Superficial punctate Keratits.—It is not possible even to refer to the various other disorders of cornea that would be of interest to the G. P. but I am sure this lecture will be incomplete if I do not refer to the epidemic that is visiting almost every house in Madras at the present day. Superficial punctate keratitis commonly called Madras eye was first described by Fuchs in 1899. It is also called Bombay Keratitis after an epidemic that prevailed there in 1900 observed by Herbert. The Madras epidemic stated about the beginning of 1928. Kirkpatrick has described a variety of this occuring in 1918 in an epidemic form. My own experience is that there has always been sporadic cases of Kirkpatrick's disease all over presidency even before the epidemic of 1918, though genuine cases of superficial punctate keratitis have not been reported or seen from outside Madras. Only twice I saw cases from the Northern Circars. For the last three years the epidemic has been showing exacerbations and remissions in the number of attacks and also in the severity. Kirkpatrick's disease is an independent affection as it has its own special characteristics. It attacks old people as well. The insidious appearance of gray round spots without any hyperæmic signs or discomfort beyond the disability caused by situation of the spots if pupillary is very characteristic indeed. I had a lawyer patient of thirty years of age in 1916 who turned up the next day after I refracted him with a central circular membrane occupying the whole of the front of the pupil, the colour almost like china. This was quite a surprise and the greater surprise was its slow thinning out with complete disappearance after one injection of cyanide of H G subconjunctivally of which I was fond in those days. Kirkpatrick described 3 types of spots, small multiple, mixed large and small and solitary large spots. The last was the variety my patient suffered from. The disease has always been unilateral and I find Muhamadans more often affected.

Treatment of this condition is known to all here. The principle is to bring about a hyperæmia with dionine and increasing strengths of yellow oxide of HG ointment. Grecis method of treatment is to approach the macule with red hot cautery just to heat the part.

This gives effective antisepsis, causes no destruction of normal cornea and no scarring. Prognosis is very good. Though cases of failure are reported, I believe they are due to failure to cause increased irritation. A year may be long, but cures are certain and failures never occur.

Superficial pnuctate keratitis always starts with conjunctival irritation. If focal illumination reveals a few spots without redness of the bulbar conjunctiva I always evert the lid and find the conjunctiva here redder and more swollen than the other unaffected side. As a matter of fact, when I find difference between the two everted lids, I look out for spots with the loupe or corneal microscope. The onset is that of a mild catarrhal conjunctivitis and the unilaterality must put you on the guard. No discomfort in mild cases. Lacrymation and photophobia are always present in cases showing marked degree of hyperæmia and pupillary swelling. Another feature is, there is no conjunctival discharge. The cornea reveals spots in the centre more often varying in number from 1 to 100 as seen by the corneal microscope. Sometimes there will be only a fine haze in the centre macroscopically. At other times a linear faint line may be seen. Slit lamp alone will have to be depended upon for the detection of these in certain number of cases. Iris remains normal. Corneal sensibility keeps within normal limits Staining reactions vary. Hypotonus may be present in certain cases if watched carefully. This disease is most common amongst young adults between 20 and 30 unlike Kirkpatrick's disease which attacks older people as well. There is a limbal form where there are seen few raised points with oedema and engorgement of vessels. In a certain number of cases the pupillary swelling is so enormous that one is tempted to treat with 2% silver solution as if they are cases of trachoma. Here the Slit lamp comes to our aid which will reveal the five curdy deposits in the interior layers of the cornea and the complete absence of blood vessels in the cornea characterstic of incipient pannus ever in the incipient cases of trachoma. The spots appear from the very commencement of the hyperæmia while in some cases they appear after a few days.

Treatment.—Bandage in the beginning improves the patient more rapidly. Prognosis is always good. A local mild treatment is important. Indiscrete application of Ag will lead to disaster as in some cases I have known. Only one case in a young Christian with a refractive error passed futile, which made me think that it was Greenows nodular dystrophy of cornea. So far we had in our surgeries an uneventful convalescence in every case. One interesting point we have to mention is that, occassionally a superficial punctate keratitis patient who neglects to get his condition treated returns with Kirkpatrick's disease. Lastly, at the end of treatment, some patients say their sight is better in the cured eye than in the unaffected eye. And to say if the dominant eye has any predilection for superficial punctate keratitis wants more investigation in my part.

CASES EXHIBITED.

Conical Cornea, two.
Phyctenular keratittis, four.
Interstitial keratitis, two(hereditary.)
—two (acquired.)
Leprosy of the cornea (initial with superficial punctate keratitis), one.
Zonular Dystrophy of cornea, two.
Small-pox cornea, one.
Kirkpatrick's disease, four.

Eighteen cases.