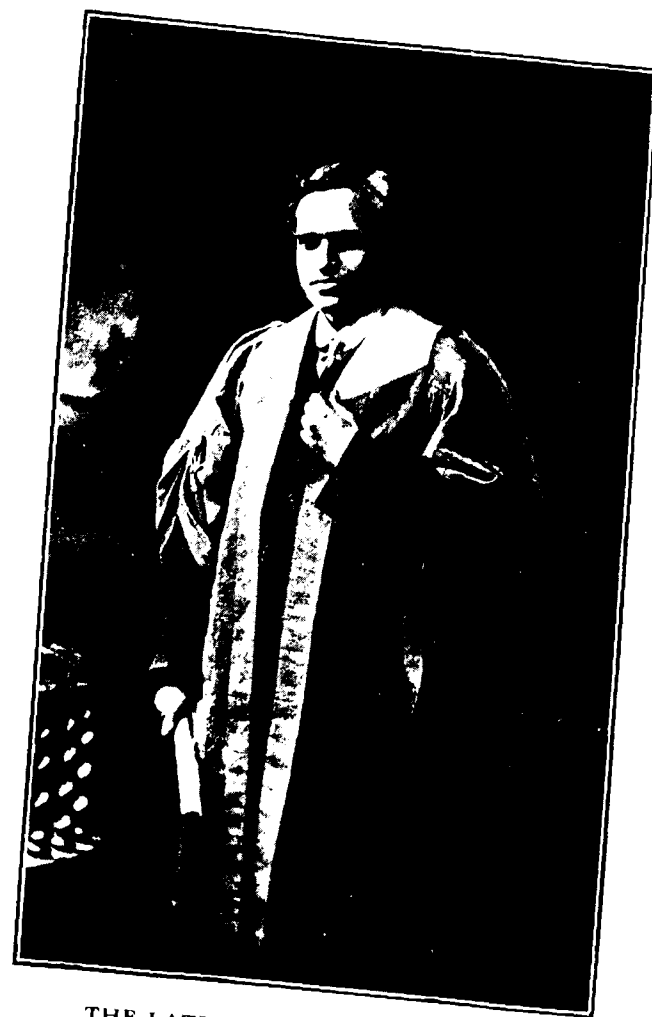




THE LATE DR. S. SWAMINATHAN.

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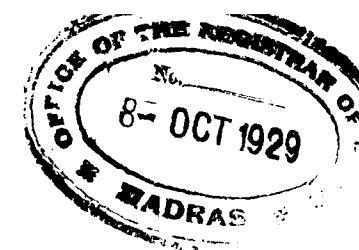
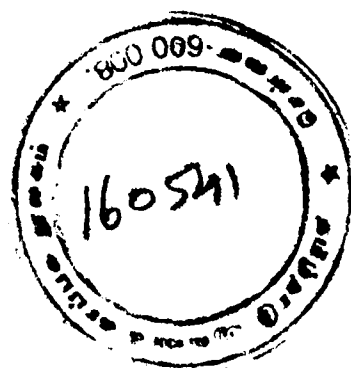
It is with deep regret that we have to record the sudden and premature death of Dr. S. Swaminathan, L. R. C. P. & S. (Edin.), L. R. F. P. & S. (Glas.), Professor of Anatomy, Medical College, Vizagapatam, which took place in Madras on Saturday, the 20th July 1929.

The late Dr. S. Swaminathan entered the subordinate Medical Service, Madras, as a Hospital Assistant on the 1st July 1898. Very early in his service, he attracted the attention of his superior officers for honest, hard and conscientious work. After taking the Triple Qualification in Scotland, he was promoted to the Madras Medical Service. He was for many years Lecturer in Anatomy in the Royapuram Medical School, and by dint of hard work and merit rose to the position of Professor of Anatomy, first in the Madras Medical College and later in the Vizagapatam Medical College, which post he held up to the time of his death.

As a lecturer, his exposition of the subject interspersed with humorous anecdotes and short stories, was masterly. The students and the staff of his department regarded him more as their guardian than as their master. As a practitioner, before he entered the Anatomy Cadre, where private practice was debarred he had a very wide clientele and held a prominent place in the profession. His courtesy and bedside manners endeared him to his patients and earned for him a very high popularity and esteem. He was kind and considerate to the poor and was popularly styled "the poor man's doctor". He was a member of the Executive Committee of the Madras

Medical Association for some years. In his death, the service has sustained an irreparable loss, the Madras Medical Association an active and sympathetic member and the staffs of the Royapuram Medical School and the Vizagapatam Medical College one of their best friends and colleagues. The life and work of the late Dr. S. Swaminathan constitute an example of how by sheer work and merit one can reach the highest position in the service.

On behalf of the members of the Provincial Medical Association, we offer our hearty condolences to the members of the bereaved family.



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TREATMENT OF PEPTIC ULCERS

BY N. MANGESH RAO, F.R.C.S.

Ulcers of the stomach and duodenum can and do heal under medical treatment and their progress can be watched by X-ray examination, and by direct vision with a Gastroscope. That peptic ulcers do heal naturally is also known and acknowledged. In post-mortems as many scars of healed ulcers are found as open ulcers (Lehman and Hart). Lynch says that 62.5% of gastric and 79.5% of duodenal ulcers heal under medical treatment, but some of these are liable to break down again. According to Mac-Lean all uncomplicated peptic ulcers and a good number of penetrating ulcers can be made to heal by medical treatment.

Pyloric stenosis due to oedema and congestion in cases of juxta-pyloric ulcers, is also relieved fairly quickly under medical treatment. At the present day chronic peptic ulcers are first given the chance of medical treatment, for six months. If they fail to heal or relapse, or when pain is constant from perigastric adhesions, or there is stenosis, etc., they are treated surgically.

Since there is either hyperacidity, or delayed secretion of gastric juice especially on an empty stomach in all these cases, and as HCl is one of the factors in the production of a chronic peptic ulcer and preventing its

healing, drugs that will neutralise the acidity of gastric juice will aid in the healing of these ulcers. Stomach digestion is not very essential and its temporary suspension is unlikely to do any harm. Sodium-bicarbonate though an excellent antacid causes a secondary secretion of HCl in increased amounts. Magnesium carbonate is a better antacid as it does not cause a secondary secretion of HCl, but it has a laxative effect. It is therefore combined with other antacids as Calcium carbonate and Bismuth oxycarbonate which counteract the laxativeness. Magnesium carbonate grs. 20 Calcium carbonate grs. 20, Bismuth oxycarbonate grs. 10 given as a powder acts well. Magnesium ammonium phosphate and Calcium phosphates are much in use in America. They are also to be used in cases where there is a likely fear of alkalosis, owing to the vomiting of gastric contents whereby acid HCl is lost to the body and the use of the alkalies is contraindicated.

Whatever the site of the ulcer the pain is relieved in a few days unless it is complicated, as penetrating ulcers, marked perigastric adhesions, organic strictures of stomach, pylorus or duodenum, or malignant changes in the ulcer. Our aim in this is to keep the stomach contents slightly alkaline, to reduce the amount of gastric juice secreted and to help the regurgitation of duodenal and pancreatic juices into the stomach by relieving the spasm of pylorus. This is fairly easy during the day but at night it is difficult. Patients should therefore have a double dose of alkalies before going to bed and keep couple of doses by the bed-side to be taken if woken up by pain. Tr. Belladonna m 7 given first thing in the morning will not only reduce the amount of gastric juice but also relieve spasm of pylorus.

While the dietetic and drug treatment are being done any Focal Sepsis that is present should be attended to at the same time or as soon as the patient is fit to stand it.

Patient has to be in bed for the first four weeks while the treatment is being carried on. The return to normal activity is gradual.

Diet—first week,—milk, Bengers food, Glaxo, Ovaltine, or milky coffee, 2 to 4 ozs. are given at two hourly intervals. Sodium citrate grs. 10 may be mixed with each feed of milk. A powder is given between the meals. A double dose is taken before bed time. As soon as the pain has subsided, add beaten up eggs to the feed, first one then two and three a day.

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In the second week pain and discomfort have completely subsided, milk feeds with eggs are given every three hours. Then small amounts of toast and butter, cream, are gradually added. Later biscuits, rusk, well boiled sago congee or rice congee, custard and blancmange can be added. Powders are continued, but once in three hours with a double dose at bed time.

In the third week three tiny meals with two-hourly feeds are arranged. Breakfast—one lightly boiled egg, one rusk and butter, three ounces of milky coffee. Lunch—milky strained soup with an egg beaten in it 4 ozs. milk pudding with cream 3 ozs.

Supper—one poached egg, one rusk, and ovaltine or junket. Other articles allowed are—well boiled rice with milk, rice congee, eggs cream, toast, and butter, biscuits, cereal-puddings, and a little boiled fish. Powders are given every four hours, double dose at bed time.

In the fourth week to sixth week food is increased by adding other articles as chicken, veal, mutton. Powders are given four times a day.

From seventh to tenth week—powders are given thrice daily one being at bed time. At the end of this period one powder at bed time is enough in gastric cases, but in duodenal ones powders should be continued for a longer time.

In gastric cases the powders are given soon after meals, but in duodenal ulcer cases the powders are given an hour to two after food. Alkalosis is likely in cases of renal deficiency, or in pyloric stenosis. In such cases it is better to give the neutral phosphates of magnesium and calcium. In duodenal ulcer cases one can be more liberal as regards diet than in gastric cases. Fats have a definite inhibitory effect on gastric secretion if taken on empty stomach in between meals. A tablespoonful of olive oil or cream mixed with grs. 20 of magnesia should be given between meals.

1. *Subsequent Diet.*—Avoid food likely to cause irritation of stomach, *i.e.*, articles likely to leave a heavy residue of cellulose as vegetables spinach, salads, tomatoes, raisins and currents.

2. Articles likely to cause hypersecretion of gastric juice and hypermotility—meat, meat extracts, beef tea condiments, and pickles.

3. Meals should be small taken at regular intervals of four hours. If this be not possible patient should carry a packet of biscuits.

4. Food should be well cooked, well masticated before swallowing.

5. All focal sepsis be carefully attended to.

Alkalosis.—It may give rise to slight symptoms generally in earlier stages, but these subside. Dryness of the throat and mouth, headache, anorexia, nausea, and vomiting may be complained of. There is an increase of nitrogenous waste products and a disturbance of the "acid base" equilibrium. But these symptoms are rare and only with excessive doses. When patient complains of any of the above symptoms the drug is stopped. In cases suffering from chronic nephritis and pyloric stenosis, HCl is constantly being lost to the body by vomiting and the antacids with a relative increase in the alkali so that the body fluid have a tendency to pass into a more alkaline condition. When severe alkalosis is accompanied by severe symptoms most pronounced being Tetany. According to Haldane Calcium Chloride acts as an antacid and the chlorine is absorbed as HCl. In cases of pyloric stenosis it is best to give calcium carbonate with small doses of magnesium carbonate. These interacting with HCl calcium and magnesium chlorides result and chlorine is reabsorbed as HCl in the intestines.

All cases of peptic ulceration should give up smoking and chewing tobacco and abstain from alcohol.

Surgical Treatment is indicated under following conditions:—

1. All cases with a high degree of pyloric or duodenal stenosis.

2. All cases of hour-glass contraction of the stomach.

3. All cases of deep ulceration involving adherence to or excavation of, neighbouring structures as pancreas or liver.

4. Cases which have relapsed after a thorough medical treatment.

5. Cases which have recurred in spite of medical treatment.

6. Cases in which there has been recurrent and dangerous hæmorrhage though treated medically.

7. Cases where prolonged medical treatment is not feasible owing to patient's economical position and habits.

8. In gastric ulcers of some standing if a large ulcer be present operation should be done (partial gastrectomy for fear of malignant changes.)

All operative treatment should be preceded by eradication of focal sepsis, during which period patient can be treated by drugs and diet.

On opening the abdomen a thorough and quick examination of all abdominal organs should be made routinely. Such conditions as cholecystitis, appendicitis, etc., should be dealt with at the same time. The ulcer should be demonstrated before starting to do any operation. In the early stages it may be difficult to detect an ulcer from outside the stomach. A stippling of the serosa followed by a blush with deep red punctuate markings is seen over an ulcer-area, on handling the part. Inflammatory lymph glands along the greater curvature in such cases mean an accompanying gastritis (Schneider).

There are various types of operations with advocates for each. They may be classified as below.

I. Operations which leave the anatomical conditions as near to the normal as possible.

(a) Excision of the ulcer by cautery (Balfour's) or knife. This operation is now-a-days combined with a posterior no-loop gastro-jejunostomy.

(b) Wedge—resection of ulcer now rarely done as it leaves behind a deformed stomach and may take as long a time as gastrectomy.

(c) Sleeve—resection of gastric ulcers is indicated only in a few cases.

(d) Gastro-duodenostomy—for pyloric and duodenal stenosis.

(e) Pyloroplasty of Finney—for juxta-pyloric ulcers where the ulcer can be excised. It is also done for stenosis in this situation.

(f) End to side implantation of stomach into the side of the duodenum (Haberer-Finney). It is combined with excision of juxta-pyloric ulcer.

(g) Pean's resection of duodenum and pylorus, then end-to-end union. This is a slightly modified form of Billroth I. It requires good mobilisation of second part of duodenum and great care is necessary to avoid injury to the Hepatic artery and common bile duct, etc.

(h) Shoemaker's operation consists of resection of the ulcer-bearing area of the stomach and duodenum and end-to-end union.

II. Operations where the route of stomach contents is diverted without any part of the stomach being excised.

1. Anterior gastro-jejunostomy (Wolfler) now performed as a short-loop anti-colic one.

2. Posterior gastro-jejunostomy anti-colic. In this when the mesocolon is thickened and short, the jejunum

is brought in front of the colon and anastomosed with the lower part of posterior surface of the stomach through an opening in the gastro-colic omentum.

3. Posterior no loop Gastro- jejunostomy which may also be combined with local excision of the ulcer is the most popular operation.

4. Jejunostomy—to divert the stream of food material so as to give complete rest to the stomach and duodenum and the ulcers.

5. Divine's operation—in addition to a no-loop posterior gastro-jejunostomy a section of the stomach through the pyloric antrum distal to the anastomosis is done and the two ends closed. Modifications of this consist in uniting the stomach end to the side of jejunum through the meso-colon or anti-colic.

III. Partial Gastrectomies with anastomosis through the meso-colon or anti-colic.

1. Billroth II—the duodenal bulb and pylorus with ulcer are excised, duodenum closed, the end of stomach also closed and a proximal posterior no-loop gastro-jejunostomy is performed.

2. Polya Operation—Partial gastrectomy with closing of duodenum and a retro-colic anastomosis end-to-side of stomach and jejunum.

3. Foersters Operation—In this, stomach was cut through the pyloric antrum proximal to pylorus and this end was closed. After removal of a good portion of stomach, a retro-colic or anti-colic Polya operation was done. This no doubt removed gastric ulcers but duodenal ulcers were left behind being only excluded.

4. Shoemaker's modification of Polya consisted of excising the stomach horizontally under the left cupola of diaphragm and performing a retro-colic end-to-side anastomosis.

5. The anticollic modification of Polya operation was first introduced by Balfour which got further modified by Mayo, Moynihan and others. At the present day it consists of excision of stomach to include the duodenal bulb and pylorus distally, and proximally the stomach is cut almost in a horizontal direction, under the left cupola of diaphragm. This allows a short loop of jejunum to be brought across the splenic flexure (which being fixed is unlikely to cause any pressure on jejunum) for the anastomosis.

A diagrammatic representation of the operations is given herewith. In the first group Finney's operation is more popular in America. Pean's resection of duodenum is done more on the continent of Europe. Shoemaker's operation requires special experience, and those who do it commonly, speak highly of it.

In the second group posterior no-loop Gastro-jejunostomy is the most frequently performed operation and it may be combined with excision of the ulcer. It gives good result in 90% of the duodenal ulcer cases and in 65% of the gastric ulcer cases. The immediate mortality is very low not 3% depending on the experience of the surgeon. It gives rise to least shock and therefore is the one indicated in patients who will not stand a prolonged operation. The opening is almost vertical, but Mayo makes it slightly oblique so that the first loop of jejunum which normally lies in the left renal area and which is used for the anastomosis remains undisturbed as to its position. As the duodeno-jejunal flexure usually lies behind the

proximal part of pyloric antrum the gastro-jejunostomy is usually done in this situation, whatever the position of the ulcer is. But Sherren advocates that the stoma should be proximal to the ulcer. The new stoma should neither be too big nor too small, 2—2½ inches. It should encroach on the greater curvature so as to drain the stomach better.

In the third group in patients who could stand the operation the modified anti-colic anastomosis after a gastrectomy is the best as it not only removes the ulcer bearing area but also reduces the total acidity of the stomach. Any chance of malignant changes are also removed. Anastamotic ulcers after a gastro-jejunostomy in duodenal ulcer cases are becoming fairly frequent and partial gastrectomy was introduced both for curing this condition and for preventing its occurrence in peptic ulcer cases. As most of the oxyntic glands in the stomach lie in the cardiac part of it, it is unlikely that this would happen. Hurst and others have noticed anastamotic ulcers even after partial gastrectomy but the incidence is not so frequent as in the posterior gastro-jejunostomy. Too extensive a resection of the stomach with the idea of reducing the acidity is liable to be followed in later years by achlorhydria and its consequences, *viz.*, pernicious anæmia and combined degeneration of the cord (Hurst). In spite of all these points against partial gastrectomy it is the one operation that is advocated for the following reasons :—

1. The whole of the ulcer bearing area is removed and so recurrence is remote. There is neither the fear of perforation nor the danger of hæmorrhage as the original ulcer is removed.

2. It reduces the total amount of acidity, partly owing to removal of a big bit of the secreting area of the

stomach, partly due to inhibition of the secretory function after removal of the lesser curvature. Also the duodenal contents can flow into the stomach freely and neutralise or reduce the acidity of gastric contents.

3. All chances of malignant changes in gastric ulcer cases are avoided.

4. The after history is uneventful and troubles such as vicious circle are avoided.

The occurrence of anastamotic and jejunal ulcers is also rare. But the operation is accompanied by greater shock and the immediate mortality is much higher, and lung complications are more frequent than in the case of posterior gastro-jejunostomy. Leakage from the stump of the duodenum is another difficulty especially in cases of duodenal ulcers on the posterior surface where there may not be enough healthy duodenum between the ulcer and the Bile-papilla, for invaginating the stump.

The no-loop posterior gastro-jejunostomy if properly performed reduces the gastric acidity partly by regurgitation of duodenal contents through the new stoma and partly due to relief of hypermotility. It also provides proper drainage in cases of pyloric or duodenal stenosis, and gives rest to the ulcer by the quicker emptying of the stomach and the diversion of the stream. The operation is quickly performed, and attended with very little shock. It can also be done fairly easily under local anæsthesia in those emaciated patients who would not stand an operation under a general anæsthetic. Where the perigastric adhesions are too extensive to do a resection a posterior anti-colic or an anterior short loop gastro-jejunostomy may be the only feasible operation to give the patient some relief. But when a gastro-jejunostomy is

done it may not prevent either a hæmorrhage or a perforation of the ulcer for the relief of which the operation was done. To avoid this possibility either the ulcer should be excised at the same time or invaginated by a purse string suture with ligature of vessels going to the ulcer. The operation is more successful with duodenal and pyloric ulcers, but not so as regards gastric ulcers elsewhere. Vicious circle vomiting is due to the proximal loop being too long giving rise to kinking, or to torsion of jejunum on its axis. Meso-colon should be stitched to the stomach and not to the jejunum, as the opening is liable to narrow down and produce a kinking of the two loops.

After Treatment.—For the first twenty-four hours normal saline and glucose are given per rectum by the drop method at the rate of a pint of the solution every six hours. If vomiting is present Soda-bicarb. grs. 30 in five ounces of water will help to empty the stomach. But if vomiting persists stomach lavage will relieve it. It usually consists of stale hæmorrhage. If fresh hæmorrhage is noticed hæmoplastine or calcium chloride grs. 3-5 intravenously is tried first, but if still it is present the best thing is to open the stomach and ligature the bleeding artery. Morphia may be required on the first night to make the patient comfortable but it should not be continued. Sips of water are allowed by the mouth to moisten the lips and throat during the first twenty-four hours. Next four days patient is given liquids by mouth as beef-tea, weak-tea, albumin water, whey, etc.

First day after operation—glucose water 1 oz. hourly.

Second day after operation—albumin water and glucose water alternately every hour. 2 ozs.

Third day after operation—albumin and whey alternately 3 ozs. every hour.

Fourth day after operation—water and whey alternately 4 ozs. every hour.

Fifth day after operation—citrated milk 5 ozs. every two hours.

Eighth day—small quantities of bread and butter and whole milk and milk puddings are given. Well boiled rice congee.

Tenth day—lightly boiled egg-pounded fish are added. Patient gradually returns to normal diet. He should however take the alkaline powders for two or three months if the ulcer has not been dealt with. All focal sepsis should be promptly attended to. Patient should never go empty stomach and should have small meals every four hours. It should be remembered that he is not normal and is liable to get peptic ulcers again, and so he should be careful for some years.

Post-operative Complications.

Chest—Broncho-pneumonia, Lobar pneumonia, Massive collapse of pasture, and Pulmonary embolism may occur as complications.

Broncho-pneumonia is more common after operations on the upper abdomen for (1) organisms from the site of operation are absorbed by the abundant lymphatics of the peritoneal surface of the diaphragm especially on the right side and reach the pleura and lungs. (2) Fixation of the lower part of chest and relaxation of diaphragm occur reflexly to protect the operated viscera. This leads to stagnation

in the bases of the lungs predisposing to infection. Coughing being painful patient avoids it as much as possible resulting in stagnation of secretions in the alveoli. This is more liable to occur after a partial gastrectomy than after a simple posterior gastro-jejunostomy. The afferent impulses proceed partly from the viscera and partly from the abdominal wall. Therefore as little trauma as possible should occur to both. Mouth and teeth should be cleaned before operation and should be kept sweet by mouth washes after the operation. Atropine is of great help in limiting bronchial secretions. The incidence is greater during cold weather and so the need of keeping the patient warm during and after the operation. Massive collapse of Pulmonary is liable to be followed by broncho-pneumonia.

Hæmorrhage is usually from the site of anastomosis, but occasionally from the site of the ulcer. Bleeding occurring immediately after the operation is dangerous as it adds to the shock. It is preventable by ligaturing the vessels of the stomach opening and carefully suturing. It is one of the many advantages where a gastro-jejunostomy is performed without clamps, that one can ligature all the bleeding points.

Vomiting may be due to anæsthesia, vicious circle, strangulation of the anastomosed loop after some types of gastrectomy where the jejunum is pulled up through an opening in the meso-colon. It may occur as the result of obstruction at the outlet after a Pean's Resection. Or it may be due to acute dilatation of the stomach.

Post anæsthetic vomiting.—Try soda-bicarb. grs. 30 in 5 ozs. of water, but if persistent wash out the stomach,

Vicious circle.—Try stomach lavage, if persistent then open the abdomen, and put right the kink in the efferent limb. This condition is supposed to be due to the proximal loop of jejunum being too long, rotation of the jejunum on its long axis during anastomosis, suturing of the meso-colon opening to the jejunum instead of stomach or due to adhesions causing obstruction between the jejunal flexure and the anastomosis. Cutting the ligament of Treitz should be avoided.

Acute Dilatation of Stomach due to pressure of root of mesentery or glands, etc., on the third part of duodenum is unlikely to occur here. But it may be due to inhibition of motor reflex. There is great dilatation of stomach and also increased amount of secretion of gastric juice. Persistent vomiting, tenderness, a feeling of distention and discomfort in the epigastrium are present. Vomit is at first green then brown and later black, and becomes constantly regurgitated. Lastly it becomes foetid, and patient is collapsed. The dilated stomach can be seen and felt extending down to hypogastrium. Treatment consists in passing a stomach tube to empty the contents and gas and placing the patient in the prone position with a pillow under the shoulder and raising the foot of the bed. Operation is contraindicated.

Later Complications.—(1) Intussusception of the distal limb into the stomach through the anastomotic opening. Operation is indicated for reduction. (2) Internal hernia with strangulation through the mesocolic opening where it was not sutured to the stomach. (3) Separation of the viscera is very rare and according to Moynihan occurs only after the use of clamps. Leakage may occur giving rise to peritonitis. (4) Adhesions may form at the site of operation or some distance away and

these may cause obstruction at the stoma or in the distal limb. Other adhesions of omentum may give rise to strangulation. (5) Diarrhoea—some people have discomfort after every meal after a gastro-jejunostomy is done. This is due to too large an opening giving rise to "Dumping Stomach". For this condition patient should lie down for 15—30 minutes after each meal. If persistent the gastro-jejunostomy is undone if the ulcer has healed or the opening is diminished in size.

Gastro-jejunal Ulcer is liable to occur in those who have a short history, a well-marked hypertonus, a high abrupt curve of acidity, and rapid emptying. In these cases alkalisiation of gastric juice by gastro-enterostomy is unlikely owing to rapid secretion and emptying. This ulcer is more likely to occur in duodenal ulcer cases where a gastro-jejunostomy is done. It is more common after Devine's type of operation. This condition is becoming more common as the number of cases operated for gastro-jejunostomy has increased.

This condition as well as recurrent ulcer can be avoided by insisting that patient should consider himself as a case of ulcer-diathesis and should continue to take alkalies and small meals at four hourly intervals for six to eight months after the operation. All septic foci should be eradicated. Patient should be kept under observation and with the least sign of trouble should be put again on diet and alkalies as mentioned before.

Acute Perforation of Gastric and Duodenal Ulcers.—The usual age of incidence is from 20 to 40 years, but may occur at any age. The determining cause is unknown, but distention of stomach may have some

influence. Perforation usually occurs after an hour or two after a full meal. Sometimes a perforation may occur in patients undergoing hospital treatment.

Perforation is slightly more common in duodenal than in gastric ulcers. The site of lesion is usually near the pylorus. 75% of perforated gastric ulcers lie near the pylorus and 25% on the lesser curvature. Majority of perforations are on the anterior surface. Anterior ulcers do not form adhesions owing to the movements of the anterior abdominal wall during respiration. Ulcers on the posterior surface penetrate into and form adhesions with pancreas, but a few may perforate into the lesser sac. Only 5% of gastric ulcers occur on the cardiac portion of stomach and a few of these may perforate. It is rare to have more than one perforation. Perforation usually occurs during an acute inflammation of the base of the ulcer. The size of perforation varies a good deal from a pin point to half an inch. The surrounding tissue is found to be friable and easily tears during suturing, indicating an acute inflammatory condition around the ulcer. Many of the perforations are due to acute ulcers and they heal well with simple suturing.

Chyme is poured out into the peritoneal cavity and it is highly irritating to the peritoneum. Which tries to dilute this with an effusion of lymph. Only in large perforations food particles may escape. Deaver and Pfeiffer found in 23 out of 34 cases sterile fluid in the peritoneum. Duval found in one-third of the cases no micro-organisms from 3 to 32 hours. There is an absence of granulation tissue in perforated ulcers indicating a rapid advance in the ulceration. A perforated ulcer usually heals if treated early. But the same patient may perforate again.

Signs and Symptoms.—Usually there is a history of indigestion preceding the perforation. Sometimes none may be given, and perforation may be the first sign, the ulcer having remained latent. Very often the symptoms of ulcer increase in severity a few days or weeks before the perforation. The condition may be divided into three stages.

Stage of Perforation.—The patient is attacked with most excruciating pain in the epigastrium, but soon extending over the abdomen, especially the right iliac fossa. But the patient does not writhe or roll about as in colic. With this there is severe abdominal shock (peritoneal shock) as shown by sudden blanching, rapid weak pulse, difficulty in breathing from partial immobilisation of diaphragm and fixation of chest to prevent movement of abdominal viscera. Vomiting once or twice is usual in this stage. This primary shock is due to the sudden irritation of the nerve endings of the peritoneum by the highly irritant chyme which is poured out of the perforation. After a while owing to the peritoneal exudate diluting the chyme and the passing off of the primary shock patient feels more comfortable and he passes into the second stage of reaction. Face is slightly flushed, pulse is full and only a little higher than normal. Temperature which might have been subnormal in the first stage becomes normal again. Limbs are warm and not clammy as in the first stage. Patient will reply that he is better and may appear so especially in cases where the perforation is very tiny. This is the stage where one may miss the diagnosis and by postponing the operation reduce the chances of recovery. However the breathing is still thoracic, the abdominal wall being retracted inwards instead of the

usual forward movement during inspiration. He does not like to be moved about and lies motionless. There is still an anxious look on his face. The most important sign is the reflex rigidity in the right rectus. If now the pulse and temperature are noted hourly there is seen a progressive rise in the pulse rate, and it becomes gradually weaker. Temperature at first rises slightly and is followed by a fall. Then he begins to complain of pain again in the abdomen and sometimes in the right shoulder due to irritation of the diaphragm. The rigidity of abdomen extends and is accompanied by tenderness. By gentle stroking movement of the examining fingers the segments of the rectus muscle may be made out to be in strong contraction. Owing to the escape of gas into the peritoneal cavity the liver dulness is replaced by resonance. Tenderness is most marked below the right costal margin and in the right iliac fossa. The natural path for the fluids escaping from the perforation is along the lateral border of hepatic flexure and ascending colon to the right iliac fossa and over the pelvic brim to the lowest part of the peritoneal sac which gives rise to the extreme tenderness to rectal palpation of the anterior wall of rectum found in these cases.

Stage of Peritonitis the condition advances rapidly. He becomes extremely cyanotic and ill, his eyes are sunken, skin cold clammy, pulse is small, rapid, thready, and temperature is subnormal. He is apathetic and abdomen becomes distended from paralysis of guts. Difficulties in diagnosis in the stage of reaction the gravity of the case is underestimated by the patient and friends and so likely to be missed. Patient's pulse may be normal, temperature normal, and pain may have disappeared almost completely. But the rigidity does

not disappear usually and tenderness over the site of perforation is invariably present. Sometimes acute appendicitis may be diagnosed from the tenderness in the right iliac fossa. But a man with a perforation is as bad in a few hours as a sufferer from appendicitis in days, and the fulminating type of appendicitis is not so common. Presence of tenderness over the pyloric region is characteristic. Rarely a case of perforation may recover spontaneously, but temporary occlusion of the perforation by omentum and other viscera is more common. If the perforation is tiny and is partially occluded by adhesions to surrounding parts a sub-phrenic abscess may result. Late cases coming for operation 24—36 hours after perforation may show temporary occlusion. But a second leakage slowly takes place giving rise to sub-phrenic abscess. These abscesses contain gas which can be demonstrated to shift its position by altering the position of the patient. Such abscesses are few and the patients are very toxæmic. When these cases are drained a gastric or duodenal fistula may be left behind. The patient usually succumbs to sepsis and imperfect nutrition.

Treatment.—Operation as soon as patient recovers from the primary peritoneal shock. Operation in the first twelve hours after perforation gives every chance of recovery. Even operation after twenty-four hours has good prognosis owing to the temporary plugging that takes place in these cases.

On opening the abdomen fluid and gas will escape. It is usually bile stained if it is a duodenal perforation. The fluid is swabbed out or aspirated especially from the pelvic pouch. The neighbourhood of the perforation is covered with flakes of lymph and the perforation itself

may be plugged with omentum, gall-bladder or the liver. First examine round the pylorus as 75% of the perforations occur here about. Next examine the lesser curvature where 20% of the perforations occur. Next see whether the Foramen of Winslow is occluded, if so the lesser sac will be found bulging in cases of perforation there. If the foramen is open fluid will be seen exuding from it. Lastly examine the cardiac portion for any perforations. It is very rare to have more than one perforation. The perforation is closed by tiers of sutures at right angles to the axis of the gut. The paritoneal cavity is swabbed dry and if necessary a drainage tube through a separate stab incision is inserted into the Dougl's Pouch. This is removed after 36-48 hours. In over 50% of the cases the ulcer heals but there may be some obstruction to the outlet owing to the closure of the ulcer in a few cases. On account of this many surgeons perform a gastro-jejunostomy simultaneously if the patient can stand it and the peritoneum is not badly infected. But this adds to the time and to the shock and there is the possibility of spreading the infection to other parts. But it is indicated if there is any fear of pyloric obstruction.

Resection of the ulcer is done by some but it also adds to the shock.

Gastric and duodenal fistulæ are treated by performing a posterior no loop operation proximal to the perforation and excluding the pylorus either by Devine's method or Von Eiselberg's method. The approach should be by a left pararectal incision.

Haemorrhage.

Bleeding in small quantities occurs often enough, but copious hæmorrhage occurs only in about 20% of

gastric and 25% of duodenal ulcer cases. In the gastric ulcer usually the pyloric or the coronary arteries are the ones eroded, and sometimes the Splenic. In duodenal ulcers either the gastro-duodenal or the pancreaticoduodenal arteries are eroded. In the stomach the bleeding ulcer is either on the lesser curvature or is adherent to the posterior abdominal wall. In the case of duodenal ulcers it is always from the posterior ulcer adherent to pancreas. Hæmorrhage, though dangerous but not often fatal, may come from vessels on the margin of an anterior ulcer. It is a secondary type of hæmorrhage and is apt to be recurrent. Bleeding may occur from acute ulcers and then it is from the smaller arteries of the mucosa and the ulcer may be a small one.

Clinical features.—Usually a long history of indigestion is given, and often the symptoms have been of great intensity just before the hæmorrhage. Sometimes the ulcer may be quite latent. These cases of bleeding have to be distinguished from gastro-stasis in which there is no history of ulcer.

There may be severe pain in the epigastrium just before bleeding. In the case of gastric ulcers hæmatemesis is usual but may be followed by malæna. With duodenal ulcers there is usually malæna only; but in some there may be slight hæmatemesis as well. Usually there are one or two small hæmorrhages followed by a large one after a short interval. When the hæmorrhage is severe patient complains of faintness and has a pale mucous membrane. The pulse becomes running easily compressible. Body feels cold, respiration is feeble and patient has a pinched and apathetic look.

Abdominal examination may reveal nothing except some pain in the epigastrium with local tenderness. Rigidity is not usual. The resulting feeble circulation and the contraction of arteries allows clotting of blood and occlusion of the bleeding points. Hurst and Paterson say that death from hæmorrhage in ulcers is rare. Walton considers duodenal hæmorrhage as more serious. But Sherren is not so optimistic.

Treatment.—Repeated small hæmorrhages are a warning sign for operative treatment including excision of ulcer. For severe bleeding absolute rest in bed, all food being stopped. Morphia, hæmoplastine, calcium chloride injections are given. Rectal saline and glucose may be given later. Operation is indicated as soon as the bleeding has stopped and patient is recovering. If necessary blood transfusion should be given. Sherren recommends operation as soon as primary shock has passed in about 36 hours. Finsterer and a few others operate immediately, if necessary blood transfusion being done at the same time. Two methods are followed as regards operative treatment.

1. Ligature of all the blood vessels around the ulcer with invagination of the ulcer. This may be combined with a gastro-jejunostomy.

2. Finsterer recommends resection of the ulcer especially when adherent, as it is difficult to ligate the vessels in these ulcers.

When no ulcer can be made out externally the lesser omentum should be opened and the posterior surface of stomach examined. In posterior duodenal ulcers transduodenal resection may have to be done.

Late Cicatrised Stomach.

Pyloric ulcers may leave behind' stenosis of the pylorus, an ulcer on the lesser curvature may leave an hour-glass contraction. Sometimes both the deformities may be found together.

For pyloric stenosis where patient is much dehydrated and suffering from chloride starvation from vomiting a gastro-jejunostomy gives excellent results. For hour-glass contraction, partial gastrectomy, or a sleeve resection will give fair results. The former is the better of the two, and is the one indicated if pyloric stenosis is also present.

As an alternative to sleeve resection gastro gastrostomy may be done in cases in which the pylorus is patent. If the patients condition is poor and pylorus not stenosed a gastro-jejunostomy with the proximal pouch (usually the larger one) is enough. But if pylorus is stenosed gastro-gastrostomy with a gastro-jejunostomy should be done to drain both pouches. In such cases a partial gastrectomy and anastomosis is the better. Chloride starvation in such cases should be investigated and corrected before undertaking these cases.

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THE PROBLEM OF PHARMACOLOGICAL RESEARCH INTO THE INDIGENOUS DRUGS OF INDIA.

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It is a well known fact that the majority of the inhabitants of India pin their faith to the indigenous systems of medicine. In fact, it is the only medical relief available to most of the rural population of this country. The question of the indigenous systems of medicine and the methods by which these could be encouraged form the subject-matter of sporadic discussions, interpellations and resolutions in the Provincial Legislative Councils as well as the periodical meetings of local bodies. Committees were appointed by various governments and diverse measures have been devised by them in order to encourage Ayurvedic and Unani systems of medicine. All this has helped to focus public opinion on the important problem of the materia medica and therapeutics of India.

This problem may be tackled in several ways. *Firstly*, the different indigenous systems of medicine may be subsidised by the Government. The Madras Govern-

ment has taken up this question seriously and has also instituted a School of Indian Medicine. Opinion about the wisdom of encouraging the Ayurvedic and Unani systems, as they exist at present, will certainly vary.

Secondly, a clinical study of the preparations, simple and compound, of the indigenous materia medica may be made by physicians who have the opportunity to do so, and such as are found therapeutically useful may be incorporated into an addendum to the official pharmacopœia.

Thirdly, a detailed scientific study may be instituted of such drugs as are reputed to be of use, and their active principles and pharmacological actions may be worked out.

The first two methods may help towards the appreciation of what may be of intrinsic value in these indigenous systems of medicine, but will not be of scientific value. Rational therapeutics requires that before a drug may be accepted as a cure for a particular disease, its physical and chemical properties and its physiological and toxic actions should first be studied and understood.

The third method entails much work and a considerable outlay of money, as a well-equipped pharmacology laboratory as well as a trained chemist with a properly fitted up analytical laboratory are necessary. The crude drug has to be analysed, the active principles obtained in pure form and their physiological properties studied by experiments on animals, etc.; when the physiological and toxic actions have been worked out, clinical trials may be undertaken. Very little effort has been made in India to conduct research on these lines. It was only recently, that is about 8 years ago, that the first pharmacology laboratory was opened at the Calcutta School of

Tropical Medicine, and a number of indigenous drugs have been studied there. India owes a debt of gratitude to Lieut.-Col. R. N. Chopra, M.A., M.D., I. M. S., for initiating such work. Later another such research laboratory was opened at the Haffkins Institute, Bombay. Now-a-days almost every medical college has its own pharmacology laboratory, but such research cannot be undertaken easily owing to its cost. The Madras Government has sanctioned the creation of a Pharmacology Research Unit, as an adjunct to the Pharmacology department of the Madras Medical College with effect from the 1st of April 1929, and well equipped pharmacological and analytical laboratories are being fitted up.

Three main objects may be kept in view in undertaking such research on the indigenous drugs of India.

1. To make our country self-supporting by enabling her to utilise the drugs produced in the country and by manufacturing them in a form suitable for administration.

2. To discover remedies from the claims of Ayurveda, Unani and other sources so as to be employed by the practitioners of Modern Medicine and included in the recognised pharmacopœias of the world.

3. To discover the means of effecting economy so that these remedies can come within the means of the great masses in India.

Regarding the first proposition, it is well known that a large number of medicinal plants, known both in eastern and western medicine, grow in this country and their properties and actions are not unknown, in many cases. Firstly, a large number of plants grow in India that are official in the Pharmacopœia. Some of these are collected and exported to foreign countries and come back to us in the form of standardised pharmaceutical preparations and

active principles in pure condition, probably at a price a hundredfold of the original crude product. A host of others grow, mature, and eventually die, without being put to any use whatsoever. There are numerous examples. Chopra and Ghosh, (1926) showed that *Valerian wallichii* grows abundantly in the Himalayan mountain ranges and yield from 0.31 to 0.4 % of the essential oil as compared to 0.5 to 0.8% of the imported variety; that *Artemisia maritima* grows abundantly in certain parts of Kashmere and yields up to 2% of Santonine; that *Hyocyamus niger* occurs in the temperate Himalayas and contains 0.3% of total alkaloids; that *Atropa belladonna* is abundant in the Himalayas, (Kancy Lal Dey observed that there is enough belladonna on the Himalayas to supply the whole world), and the root contains 0.81% of total alkaloids as against 0.45% laid down in the B. P. while the leaves contain 0.5% as compared with 0.3%. They also showed that *Digitalis* leaves of full potency could be had from the various hill stations where they have been cultivated. *Podophyllum emodi* is met with in the higher temperate forests of the Himalayas from Sikkim to Kashmere and the yield of resin is 10% as against 3%, U. S. P. standard. Chopra, Gupta and Ghosh (1928), pointed out that several species of Aconite can be obtained plentifully in India, their alkaloidal content comparing very favourably with that of the imported varieties. Such examples can be multiplied.

Of plants that are not official but are similar, may be mentioned *Colchicum luteum* closely resembling the official *C. autumnale* in composition. The root of *Gentian kurroo*, growing on the Himalayas contain the same active principles as the imported varieties of gentian. *Mentha arvensis (pudina)* and *M. sylvestris*

yield an essential oil similar to peppermint oil now imported. Chopra, Ghosh and Dutt (1928) remarked that a number of varieties of *Ephedra* grow in India yielding 0.655% of Ephedrin as against 0.25% from the Chinese varieties. Many more such examples can be given.

The second proposition of discovering new remedies from among the old ones of the Indian materia medica is a more difficult problem. The problem is rendered very hard because almost every plant and shrub is credited with healing virtues. Some beliefs are based on clinical data, but mostly the drugs are administered empirically. A thorough and complete research into all these drugs would occupy the lifelong work of innumerable chemists, pharmacologists and physicians. For practical purposes one should begin with getting the opinion of Hakims, Vaidhs, and Kavirajs, and drugs with great local reputation should be investigated first.

Dr. M. C. Koman who was deputed by the Madras Government to study clinically the more important therapeutic agents of the indigenous systems reported favourably on the action of some of these, but remarked that further scientific research was necessary before they could be recommended for universal adoption. Of the drugs he has recommended, *Hydnocarpus wightiana* has already come into almost universal use in Leprosy. Chopra, Ghosh and De (1923) reported that *Baehraavia diffusa*, (Punarnava) contained an alkaloid and Potassium Nitrate and was an efficient diuretic. Chopra, Gupta, David and Ghosh (1927) stated that Conessine, the alkaloid from *Holarrhena antidysenterica*, (Kurchi, Veppalai,) had a lethal action on *Entamoeba histolytica in vitro*. This has been later confirmed on patients by Knowles at the Carmichael hospital for Tropical diseases,

Calcutta. *Adhatoda vasica*, (Chopra and Ghosh, 1925) is a useful expectorant. *Butea frondosa* is a recognised anthelmintic against round worms. *Psoralea corylifolia* (Babchi) was shown by Chopra and Chatterjee (1927) to be of use in the treatment of leucodermic patches. Mention has only been made of those drugs, the actions of which have been and are being studied. Needless to say, equally or more useful drugs exist in the armamentarium of the village 'vaidhyan', that may one of these days be found to be as important as Ephedrine.

Thus we see the far reaching importance of a thorough and scientific study of the Indian materia medica. Not only shall we be able to wrest the secrets of Ayurveda and discover therapeutically useful drugs but such research will also go a long way to cheapen the cost of medical treatment for the poor. This can be done by encouraging the production, collection and manufacture of indigenous drugs and their pharmaceutical preparations in a systematic manner by (a) producing locally, (b) substituting equally potent drugs for the imported ones. If this can be done, there will be a great reduction in the cost of manufacture, owing to cheapness of labour, and therefore in the selling price of the drugs. Tea dust from India and Ceylon is exported to the west at normal price and comes back to us as caffeine. Similarly nux vomica, belladonna, datura, stramonium and castor oil seeds and oil are all taken thousands of miles away for manufacturing refined products. If we could only take stock of the supply at hand in India and manufacture the standard preparations here, India will soon be self-supporting and the cost of medical treatment can be enormously reduced.

We have already mentioned that a beginning is being made at the Madras Medical College to conduct

research on lines indicated above. Every reader of this article can collaborate with us in our work and help the research by giving us any information regarding indigenous drugs that may be of use. We have prepared the following questionnaire with a view to collect useful information from medical officers and practitioners and we shall be grateful if answers are sent to the Professor of Pharmacology, Madras Medical College. Any other information relevant to the subject of research on Indian drugs that the medical officers may be able to furnish will be thankfully received :—

Q. 1—Are the medical officers and practitioners aware of the existence of any potent remedies or specific drugs for diseases used by the practitioners of the Indigenous systems of Medicine and if so, whether they have tried them clinically in their own cases and with what results?

Q. 2—If administration of these drugs has proved beneficial will they furnish all possible information about their source, botanical names, vernacular names, therapeutic uses, dosage and mode of administration?

Q. 3—Can the medical officers recommend or suggest names of *bona fide* practitioners of the indigenous schools of medicine who will be prepared to help with their co-operation a rational investigation of indigenous drugs from the view point of modern medicine?

It will facilitate our work if answers are supplied in tabular form under the following headings :—

1. Name of the disease and of the specific drugs—in the different South Indian Vernaculars—used in its treatment. If possible please give botanical names.

2. Results of clinical trials.

3. Sources from where a liberal supply of the drug may be obtained.

4. Different preparations of the drug and dosage.

5. Any remarks concerning the physiological action, toxicity and composition of the drugs, if known.

6. The names and addresses of well-known practitioners of the indigenous systems of Medicine willing to help in the investigation.

7. Whether and where it will be possible to arrange for interviews with them.

On the response made to this appeal will to a large extent depend the success of this new venture of research into the indigenous drugs of South India.

REFERENCES.

1. Chopra, R. N., and Ghosh, B. N.—1923. "The field for research in Indian indigenous drugs." Ind. Med. Gazette, March.
2. Chopra and Ghosh, N. N.—1926. "Some medicinal plants growing in the Himalayas." Ind. Jour. Med. Research, Vol. 13, No. 3, January.
3. Chopra and Ghosh, S.—1925. "Some observations on the pharmacological actions and therapeutic properties of *Adhatoda vasica*." Ind. Jour. Med. Research, Vol. 13, No. 2, October.
4. Chopra, Ghosh, S., Ghosh, B. N., and De. P.—1923. "The pharmacology and therapeutics of *Baehraavia diffusa*." Ind. Med. Gazette, May.
5. Chopra, Gupta, David and Ghosh—1927. "H. antidysenterica" Ind. Med. Gazette, March.
6. Chopra and Ghosh, N. N.—1928. "Indian varieties of Aconite" Ind. Jour. Med. Research, April.
7. Chopra, Ghosh, S., and Dutt, A. T.—1928. "Ephedrine from the Indian varieties of Ephedra." Ind. Jour. Med. Research, April.
8. Chopra and Chatterjee, N. R.—1927. "Psoralea corylifolia" Ind. Jour. Med. Research, July.
9. Chopra, Ghosh and Ratnagireswaran.—1929. "Some medicinal plants growing on the Himalayas." Ind. Jour. Med. Research, January.
10. Chopra, Dikshit and Venkatachalam Pillai—1929. "Ephedrine and Pseudo-ephedrine." Ind. Jour. Med. Research, XVI, January.
11. Acton and Knowles—1928. "On the dysenteries of India." Thacker Spink & Co., Calcutta.

SIGNIFICANCE OF BIOCHEMICAL ANALYSES IN NEPHRITIS.*

BY DR. A. S. MANNADY NAIR,

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A new orientation in the study of medicine is visible in recent years. Hitherto a static conception of diseases based on morbid anatomy and histology dominated medicine. Although the study of morbid anatomy and histology has done great service in the furtherance of our knowledge of diseases, it has been realized recently that the picture of the pathologist is only the final photograph of the end of the tragedy and one does not see the scenes of the drama. The clinicians have to correlate their bedside observations with this final picture.

Most ailments begin as derangements of function and each and every function of living cells and organisms ultimately involves or depends upon chemical reactions. So if we form a dynamic conception of diseases based on the knowledge of physico-chemical reactions in the normal organism and their changes in the functional derangements we are enabled to see the scenes more clearly. Such an attempt is being made by the biological chemists engaged in the field of medicine.

Kidneys possess two main functions in the body.

A. Metabolic Function.

B. Excretory Function.

A. *Metabolic Function* is not often emphasised as kidneys are usually regarded as Excretory organs.

* Lecture delivered under the auspices of the Madras University, March-April 1929.

Three purposes are served by the kidneys under this function.

- (i) Formation of Ammonia in the kidneys. Nash and Benedict were the first to point out this function of the kidneys and the importance of the ammonia formed in neutralizing the acids in acidotic conditions like uræmia and diabetic coma.
- (ii) Synthesis of hippuric acid from glycine and benzoic acid. This is the method of detoxicating the benzoic acid formed in the body by the oxidation of the aromatic substances present in the vegetables and fruits we eat and also of the aromatic amino acids of the proteins.
- (iii) Oxidation of fatty acids like β -Hydroxybutyric acid and diacetic acid. This function is an important one to be considered in diabetic coma to see whether it is the impairment of this oxidative function of the kidney that aggravates hyperketonæmia and ketonuria.

B. As *excretory* organs also three main purposes are served by the kidneys.

- (i) To eliminate the end products of protein metabolism.
- (ii) To assist in the maintenance of the normal volume and composition of the blood.
- (iii) To aid the neutrality regulation of the organism.

The end products of protein metabolism are urea, uric acid and creatinine. These substances are in solution in the blood plasma and are excreted in solution,

Kidneys excrete both acidic radicles like sulphate, phosphate and chloride and basic radicles like sodium, potassium, calcium and magnesium. The ability of the kidneys to assist in the neutrality regulation is in proportion to their ability to retain basic radicles and reject acidic radicles. Although these substances are excreted in solution the kidneys maintain the volume of the blood constant.

In this connection the term "The variability of the kidney function" may be explained. When large quantities of fluid are taken the kidneys eliminate a large amount of urine and these excretory substances are in very dilute solution; on the other hand when water is withheld or depleted through other channels as skin in excessive perspiration, or gastro-intestinal canal in diarrhoea and vomiting, the kidneys excrete a very small amount of urine and then the excretory substances are in high concentration in the urine. This power of the kidneys in eliminating a very dilute or concentrated urine according to the necessity is called "The variability of the kidney function."

The substances excreted are not all concentrated to an equal degree. The following table taken from Cushny's "The secretion of urine", gives an idea of different degrees of concentration in kidney of different substances.

Substances.	Concentration in kidney.	
Na		1
Ca		2
Mg	...	2
Cl	...	2
K	...	7

Substances.	Concentration in kidney.
Uric acid	 12
Po ₄	 16
N H ₄	 40
Urea	... 60
Createnine	 75
So ₄	 90

Of these, substances like createnine are "non-threshold bodies", *i.e.*, they are excreted in direct proportion to their amount in the plasma while substances like glucose, sodium and chloride are "threshold" bodies as they are excreted in proportion they exceed their threshold value. The threshold values of different substances also differ; glucose, sodium and chloride are high threshold bodies, potassium, urea and urate medium threshold bodies while phosphates are low threshold bodies. The concentration factor of some of these excretory substances are utilised to find out the efficiency of the kidneys, for example the urea concentration factor.

The kidney consists according to Braus a million physiological units called Nephrons. Each Nephron consists of a Malpighian body and uriniferous tubule. The collecting tubules simply serve to conduct the urine formed by the Nephrons. The blood supply of the Nephrons needs special emphasis. The interlobular artery breaks up into branches. Each branch goes to a Malpighian body as the afferent artery of the glomerulus where it enters at the vascular pole and divides into four or five branches, each branch forming a series of capillary loops which anastomose with one another. The capillary loops join together to form the efferent artery which leaves the glomerulus at the vascular pole. The efferent artery breaks up into a plexus of capillaries

round the neighbouring tubules. The number of these capillaries are so great that the cortical tubules seem to swim in blood. Thus the whole arterial supply of the Nephron passes through the glomerulus although a few branches of the interlobular artery go direct to the tubules. This fact of the blood supply is significant in understanding Nephritic phenomena.

Regarding the physiological function of the Nephron last word is not yet said. Cushny's modern theory is most acceptable though it fails to explain certain pathological phenomena. According to this theory filtration occurs in the glomerulus and reabsorption in the tubules. Filtration is purely a physical process depending on the difference of pressure on the two sides of the filtering membrane, the character and oxygen supply of the membrane and the nature of the plasma. The energy for filtration is supplied by the blood pressure in the glomerular capillaries. The filtrate in the capsule is a deproteinized plasma. The filtrate on passing through the tubules is subjected to reabsorption. Active absorption of water and high threshold bodies like glucose chloride and sodium takes place while substances like urea, phosphate and sulphate are not absorbed. So they are in high concentration in the urine. Absorption occurs in the proximal and distal convoluted tubules, Henle's loop serving only as a pressure reservoir to prolong the stay of the filtrate in contact with the absorbing cells.

How these functions are altered in diseases of the kidneys and how far these functional derangements can be studied by biochemical investigations shall be the method of study adopted here. Before the application of the biochemical tests to the understanding of the

functional derangements of the kidneys in Nephritic conditions is considered the main tests themselves may be briefly explained.

At the outset it may be pointed out that only a fraction of the million Nephrons is necessary to do the work of the kidney in every day life. So nature has provided us with an enormous reserve power of the kidneys. Hence when we speak of kidney insufficiency tests a difference has to be made between relative insufficiency and absolute insufficiency. In relative insufficiency tests we add an extra load to the work of the kidney either in the form of an extra amount of water or urea or chloride or a foreign dye and then see how far the reserve power of the kidneys is able to cope with the extra work. We do not know what is the maximum reserve power of the kidneys and what percentage of the reserve power we are testing by these tests which are but rough and crude.

In the case of absolute renal insufficiency tests on the other hand we examine whether the kidneys are able to do even the minimum work demanded by them in every day life.

A.—Relative Insufficiency tests.

I. *Volhard's Water Test*.—The most important substance that causes variation in the activity of the glomeruli is water. And one of the most important functions of the kidneys is to help to maintain the constancy of the volume of the blood. The test is performed as follows. "The patient empties his bladder in the morning and then in an empty stomach drinks within $\frac{1}{2}$ — $\frac{3}{4}$ hr. 1500 cc. of water. Then he remains in bed and empties the bladder every half-hour.

(a) Normal.—

- (i) A healthy individual with his million glomeruli of each kidney able to function, eliminates this water within two or three hours or at the most four hours.
- (ii) In health the individual half-hour portions increase in volume with time giving thereby a rapid rise in the diuretic curve. The volume may reach 500 cc. or more.
- (iii) The specific gravity curve falls.

(b) With Slight Relative Insufficiency.—

- (i) The quantity is eliminated within four hours.
- (ii) The individual portions are more uniform in quantity and specific gravity.

(c) With a Severe Relative Insufficiency.—

- (i) The individual half-hour portions become smaller and smaller.
- (ii) The specific gravity does not vary much.
- (iii) Elimination is prolonged proportionately to the severity of the relative renal insufficiency.

However.

I. Tendency to œdema, 2. Renal and cardiac œdema, 3. Sweats, 4. Diarrhœa, and 5. Fever will interfere with this simple test.

II. *The Concentration test of Volhard*.—After the water test the patient gets a dry meal without liquids and is kept on dry diet till next morning. The urine is collected every two hours.

(a) *Normal.*—

- (i) The individual portions drop quickly in quantity.
- (ii) The specific gravity rises to 1030 or more.

(b) *With Relative Insufficiency.*—

- (i) The individual portions is more uniform in quantity.
- (ii) The specific gravity does not rise very much.

In this test also œdema interferes as when fluid is withheld the œdema fluid is reabsorbed to the circulation and the urine is diluted.

Both these tests when normal indicate absence of renal insufficiency. These tests will indicate the degree of relative renal insufficiency in the absence of absolute renal insufficiency.

The Mosenthal test meal renal test is only a variation of the Volhard's concentration test in which standard meals are administered and urine collected periodically and tested for twenty-four hours.

III. *Mc Lean & De Wesselow's urea concentration test.*—The patient is starved after previous night's supper and comes to the laboratory next morning in an empty stomach. Little or no water is taken during this interval. He empties the bladder and the urine collected as sample i. Then 15 gms. of urea dissolved in 100 cc. of water is given to drink. The patient empties his bladder one hour and two hours after the administration of urea. The urines collected are samples ii and iii. The volumes of the samples are noted. If the quantity

of the iii sample is more than 120 cc. a third hour sample is collected. The percentage of urea in each sample is estimated by Hypobromite method. McLean as a result of innumerable experiments states that in normal persons the percentage of urea will be above 2.5% while urea above 2% indicates the kidneys are fairly efficient. But a percentage below 2% is a warning that the kidneys are relatively insufficient. According to McLean this is a simple means of testing the efficiency of the kidneys.

IV. *Chloride concentration test of De Wesselow.*—

This test is not so well known as the urea concentration test. In this test there is no restriction of food intake. The test is carried out thus. Two hours after the breakfast of his choice, 4 gms. of sodium chloride is given in cachet and 200 cc. of water over it to wash it down. Then three samples of urine at the end of one, two and three hours after the administration of salt, are collected and the chloride content estimated in each sample. In health the maximum chloride content varies between .84% and .94%. The maximum concentration which is generally noticed in the third hour is never below 0.8%. In kidney insufficiency conditions the chloride content will be far below this figure namely 0.2%–0.3%.

V. *The Phenol Sulphonephthaleine test.*—A dye easily detected and estimated is injected into the system and it is rapidly excreted by the normal kidneys. Deficient kidneys excrete slowly. The test is carried out as follows. In the morning with an empty stomach the patient is given 300–400 cc. of water thirty minutes before the administration of the dye in order to ensure a free flow of urine. Then 1 cc. of a solution of the dye containing 6 mgs. of phenol sulphonephthaleine is injected

intramuscularly. The patient catheterised and the urine as it flows is allowed to drop into a beaker containing two drops of 25% NH_4OH . The appearance of a red color in the beaker indicates the beginning of the excretion of the dye. Normally the dye appears in 5—10 minutes after the injection. Urine is now collected at the end of one and two hours after the dye has begun to excrete. To each sample of urine so collected 25% NaOH is added till the maximum intensity of colour is developed. The amount of dye excreted in each sample is then determined by comparing with a standard solution of known strength in a colorimeter.

Normally 40—60% of the drug is excreted in the first hour and 60—85% in two hours. In kidney insufficiency the time of the appearance of the red color is delayed and the percentage of the drug excreted is very much diminished in proportion to the damage of the kidneys.

B.—Tests for Absolute Renal Insufficiency.

Absolute renal insufficiency is a condition in which the kidneys are unable to eliminate the nitrogenous waste products of the metabolism even when the patient is on a minimum protein intake. In absolute renal insufficiency all the reserve power of the kidney is lost and the glomerular function is so much diminished that even with a minimum food intake the nitrogenous waste products cannot pass through the glomeruli.

The tests are :—

- (i) Estimation of the increase of total non-protein nitrogen in the blood over the normal
Normal non-protein is 20—40 mgs. per 100 cc. of blood.

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- (ii) Estimation of the increase of blood urea over the normal which is 20—40 mgs. of urea per 100 cc. of blood.
- (iii) Estimation of the increase of blood creatinine over the normal which is 1.2—1.5 mgs. per 100 cc. of blood.
- (iv) Estimation of the increase of uric acid in blood over the normal, the normal being 0.7—3.7 mgs. per 100 cc. of blood.
- (v) A high phosphate content also is found in the blood in kidney insufficiency. Normal blood phosphate is 2—3.8 mgs. of phosphorus as inorganic phosphate.

Besides these special tests are the usual tests applied to urine as qualitative examination of urine for albumine blood, etc., microscopic examination of sediments for various urinary casts and cells and quantitative examination of urinary constituents urea, uric acid, chlorides, ammonia acidity of the urine and so on.

In order to have an idea of the significance of the biochemical analyses in the diagnosis, prognosis and treatment of Nephritis, a clear conception of the different forms of Nephritis is essential. Unfortunately diseases of the kidney have been looked from so many different aspects and innumerable attempts have been made to classify them. This has created a bewildering confusion as one individual's description of chronic parenchymatous nephritis may mean chronic glomerulo nephritis or lipoid nephrosis of other writers.

There are three elements that are of importance in considering the functional derangements of the kidney.

1. The glomeruli, 2. The tubules, 3. The arterial system.

The classification given here is after that of Elwyn which is based on that of Volhard and Fahr.

A. *Acute Glomerulo Nephritis* which might either be—

- (i) Focal glomerulo nephritis where only a fraction of the glomeruli are diseased while the rest are healthy and able to perform their function.
- (ii) Acute diffuse glomerulo nephritis where all the glomeruli of both kidneys are more or less uniformly affected. This acute form may either subside or might
 - (a) take a short and stormy course longer than the acute diffuse form which then is called *Sub-acute diffuse glomerulo nephritis*, or
 - (b) take a course milder in character and run a period longer than the sub-acute which is then termed *Sub-chronic diffuse glomerulo nephritis* or again.
 - (c) might take a very chronic course which then is called *Chronic glomerulo nephritis*.

B. *Tubules*.—The blood supply of the tubules almost entirely passes through the glomeruli. Therefore in inflammatory conditions of the glomeruli the nutrition of the tubules is naturally affected and secondary changes are therefore met with in them. Therefore they need hardly be considered as separate entity. On the other hand degenerative changes are met with without inflammatory changes in the glomeruli. These are termed

Degenerative Tubular Nephritis or Nephrosis.—

This term Nephrosis coined by Frank Muller though much disliked still by conservative pathologists in England has been more or less accepted in the continent and America.

C. *Arteries*.—The disease of the renal arteries affect the blood supply of the kidney and consequently functions of the kidney are deranged. Besides this, the filtration pressure is diminished in the glomeruli as a result of narrowing of the arteries and when the occlusion of the lumen takes place the function of the corresponding malpighian body is abolished and it undergoes Hyaline degeneration. When larger branches of the renal arteries undergo sclerosis with general arterio sclerosis no definite signs are observed in relation to the kidneys; but when the small arteries are affected the function of the kidneys are affected. This condition is differentiated from the former by the term renal Arteriole sclerosis. In this condition two varieties are met with; one with no renal insufficiency as only a fraction of the arterioles and malpighian bodies are affected. This condition is called Benign Hypertension, while in the other condition the damages to the arterioles and malpighian bodies is greater and renal insufficiency is marked. This is also called Malignant Hypertension, the classification is therefore

- (i) Renal Arterio Sclerosis.
- (ii) Renal Arteriole Sclerosis
 - (a) without renal insufficiency—Benign Hypertension.
 - (b) With the renal insufficiency—Malignant Hypertension.

(To be Continued.)

THE COMPARATIVE VALUE OF EHRLICH'S
DIAZO REACTION AND WEISZ'S
UROCHROMOGEN TEST, WITH SPECIAL
REFERENCE TO PULMONARY
TUBERCULOSIS.*

BY M. KESVA PAI, M.D., C. A. VENUGOPAL, L.M. & S.,
AND P. K. GUNASAGARAM, L.M.P.

Since the discovery by Ehrlich of the Diazo reaction in the urine in a number of acute inflammatory conditions, the test has been extensively used in the determination of the diagnosis and prognosis of tuberculosis. As a result of investigations conducted by a number of workers in tuberculosis it was found that in cases with a favourable prognosis the reaction was usually negative and in those with an unfavourable prognosis, very often positive. Frequently the reaction becomes positive some long time after the prognosis is declared to be unfavourable by clinical examination and observation.

Weisz considers that his reaction is due to the appearance in the urine of urochromogen in toxic diseases of metabolism wherein dissolution of protoplasmic albumen takes place in the body. He thinks that urochromogen is a precursor of the substance that gives the Diazo reaction and is consequently detected in the progress of the cases that subsequently show the latter reaction.

Bonnert¹ confirms the above view and has shown by chemical tests that in urines which give a positive

* Paper read before the Indian Science Congress, 1929.

Weisz but a negative Diazo reaction, 24 hours' heating in a thermostat or oxidation of the urochromogen by permanganate of Potassium changes the urochromogen into 'Urochrome' which then gives a positive Diazo reaction.

A large amount of work has been done on the value of the two tests in the diagnosis and prognosis of tuberculosis and other toxic diseases, the results obtained by various workers being more or less similar in character.

On account of the general agreement of view regarding the biochemistry of urochromogen and urochrome which form respectively the basis of the Weisz and Diazo reactions, it has been supposed that the former reaction should not only precede the latter in the sequence of biochemical changes in the various diseases characterized by tissue destruction, but should be elicited in a larger percentage of cases than Ehrlich's Diazo reaction. Thus Bosch² examined 1,000 cases and obtained several positive Weisz reactions in cases where the Diazo test was negative. Of 832 cases examined by Cowen³ in America, 741 gave a negative result by both the tests, the Weisz test was positive and Diazo negative in 89 cases and both tests were positive in 2 cases only. Of Bonnerts 1,000 cases in all stages of pulmonary tuberculosis both the tests were negative in 850 cases, both positive in 180, Weisz's positive and Diazo negative in 41, Weisz's negative and Diazo positive in one only. There was thus a complete agreement between the two tests in Bonnert's series in 95.8% cases and a disagreement in 4.2% only, this disagreement being in favour of Weisz reaction which gave a positive, whilst the Diazo was negative in all except one case. Bonnert's work proved that the Weisz

reaction appeared a month or so in advance of the Diazo reaction in many cases.

Though a negative Urochromogen reaction does not exclude the possibility of tuberculosis a positive reaction usually denotes tissue destruction. Thus Kilduffe⁴ by examining the urines of 888 non-tuberculous patients, obtained 16 positive results, *i.e.*, 1.8%. Four of these 16 cases on re-examination were suspected to be tuberculous and so 1.3% only of the definitely non-tuberculous cases gave a positive Weisz's re-action, which should therefore be considered to be an important point in the biochemical diagnosis of active tuberculosis.

It is usually considered that the Weisz reaction gives more reliable results in diagnosis than the Ehrlich's Diazo reaction, as many cases of tuberculosis wherein the latter is negative seem to give a positive result by the Weisz test. Thus Schuithler⁵ obtained 48% Diazo and 75% Weisz in clinically tuberculous patients, every Diazo case giving a positive Weisz reaction. Gottschalk,⁶ Hakki,⁷ Seix⁸ and others obtained similar results. This they explained by the fact that urochromogen appears in the urine much earlier than urochrome, the two being respectively the substances concerned in the Weisz and Ehrlich reactions.

The greater value of the two reactions lies however in the part they play in deciding the prognosis of cases of tuberculosis. Different observers have placed different degrees of stress on the importance of the positive urochromogen reactions. Thus Lunde⁹ observed 261 cases for one year and found that 83 of these which gave a persistent Weisz reaction were of the more severe type. Both the Ehrlich and Weisz reactions he considered to

have the same significance when positive, but a negative reaction did not always exclude the presence of active tuberculosis. Bosch² laid so much stress on the prognostic gravity of a positive reaction that he said that in his experience 100 per cent of the strongly Diazo+ cases and 99 per cent of the strongly Weisz+ cases died in less than 8 months. He thought that sporadic positive or a weak reaction was of little value in prognosis. The reaction ought to be strong and persistent time after time.

Seix⁸ is of opinion that the Urochromogen reaction of Weisz has greater prognostic value than the Diazo. Klare¹⁰ also thinks that even a temporary Weisz reaction is of great significance in prognosis though the patient may live for some time after giving the positive test. Of 18 soldiers and 13 children he kept under observation, 12 soldiers and 4 children were dead within a few months after showing a positive reaction and others were still very ill. He agrees with the others that the intensity of the reaction increases with the progression of the disease and in surgical cases a progressing reaction ought to be considered an indication for amputation or similar decisive interference.

Guth¹¹ considers that the reaction is mostly positive in the unfavourable cases. Frequently the reaction becomes positive long after an unfavourable prognosis is pronounced clinically. A negative reaction he therefore thinks need not necessarily mean a good prognosis, whilst a persistently strong positive reaction indicates a grave prognosis. In a clinically doubtful case of pulmonary tuberculosis, a strong urochromogen reaction justifies, according to him, heroic measures like artificial pneumothorax or thoraco-plasty.

Gottschalk¹² thinks that the test is helpful in differentiating the type of pulmonary tuberculosis as well as in forming the prognosis. Fibroid and Cirrhotic forms give, according to him a negative or weak reaction and exudative, cavernous and toxic forms, a strongly positive reaction. He is of opinion that the Weisz reaction is more sensitive than the Diazo. He says that a graphic representation of the Urochromogen reaction by a systematic quantitative estimation is a sure method of pronouncing the prognosis.

Conversely Geldmacher¹³ considers that when the test becomes gradually negative, complete arrest is indicated and no radical measures should be tried in treatment. According to Memmens¹⁴ a positive Diazo reaction with intestinal complications indicates an absolutely grave prognosis and early death.

Hakki⁷ considers the Weisz reaction to be of greater value than the red cell sedimentation test and gives more consistent results than the latter, this view being favoured by a comparison with the Turban Gerhardt classification and the clinical prognostic valuation of the pulmonary cases.

Kelemen¹⁵ found that the Diazo reaction was usually negative in bone and joint diseases, even when there was active pulmonary disease present. He thought that this was due to an inhibitory effect of the surgical complication on the reaction so that according to Kelemen the prognostic value of the test in lung tuberculosis is lessened by the presence of bone and joint complications.

Stubb¹⁶ on the other hand examined the urine of 51 cases that ultimately died of pulmonary tuberculosis

and of 209 that were suffering from active tuberculosis of the lungs and found the Diazo reaction positive in only 25 cases. He found cases of miliary tuberculosis and tuberculous lepto-meningitis giving negative Diazo reactions. He concludes that the Diazo test has neither diagnostic nor prognostic value.

It will be seen from the above references that there is a fair amount of agreement as well as a certain degree of disagreement between different observers in the diagnostic and prognostic value of the Diazo and Weisz reactions in tuberculosis.

The comparative results of the tests carried out by us in cases of pulmonary tuberculosis, of surgical tuberculosis including disease of glands and bones not complicated with appreciable pulmonary affection and in clinically non-tuberculous cases are set out in Table I. Of the 712 tests carried out in about 300 cases, 100 tests were applied in the first stage of pulmonary tuberculosis. Of these the percentages that gave positive Diazo and Weisz reactions were 32 and 43 respectively. In Stage II, the corresponding percentages were 60 and 51 and in Stage III 80 and 65 respectively. It appears from these results that while Weisz's urochromogen reaction gives a larger percentage of positive results in the early stages, it gives a smaller percentage of positives in the later stages.

In Surgical tuberculosis our figures are too small to be of any real value. But the fact that only 10% cases gave a positive result and both the Diazo and Weisz tests gave practically the same percentage of positives is significant.

In non-tuberculous cases there were 8% and 9% positive results by the two tests. It must however be mentioned that the patients classed as non-tuberculous included cases clinically diagnosed as asthma, chronic bronchitis, Bronchiectasis, nephritis, influenza, syphilis etc., and it is not unlikely that a certain number of the cases were either tuberculous, though tubercle bacilli could not be demonstrated in the sputum and the physical signs did not indicate tuberculosis; or they were non-tuberculous conditions involving destruction of tissue.

TABLE I.

Diazo and Weisz Reactions in Tuberculous and Non-tuberculous conditions.

	P. T. I.	P. T. II.	P. T. III.	Surgical tubercu- losis.	Non- tubercu- lous.	Total.
D. R. + ...	14 (32 %)	20 (60 %)	126 (80 %)	1 (16 %)	8 (8 %)	169
D. R. — ...	30 (68 %)	14 (40 %)	31 (20 %)	5 (84 %)	88 (92 %)	168
W. R. + ...	24 (43 %)	18 (51 %)	128 (68 %)	1 (16 %)	8 (9 %)	179
W. R. — ...	32 (57 %)	17 (49 %)	62 (32 %)	5 (84 %)	80 (91 %)	196
Total ...	100	69	347	12	184	712

The Relative Value of the Two reactions.—It has been usually considered that the Weisz reaction gives more reliable results than the Diazo as urochromogen appears earlier in the biochemical process than urochrome. Our experience has not however confirmed this view so far as our results go in this preliminary

work. As is seen in Table II in the large majority of cases, *viz.*, 278 both tests give identical results; in 113 both reactions were positive and in 165 both were negative. It was however found that of the cases where there was a disagreement between the results of the two tests, 42 cases showed a positive Diazo and negative Weisz, whilst 11 cases only showed a negative Diazo and positive Weisz reaction, which is just the reverse of what many workers have obtained in their experience.

TABLE II.

Comparative results by the Diazo and Weisz tests in Pulmonary tuberculosis.

D. R. +	113
W. R. +	
D. R. +	42
W. R. —	
D. R. —	11
W. R. +	
D. R. —	165
W. R. —	

It may be of some interest to analyse the relative results of the two tests according to the presence or absence of bacilli in the sputum. This factor can be taken as an index of the presence or absence of tissue destruction in the lung. The difference between the results obtained by the two reactions seems to be slight. In the bacillus negative cases the results obtained are identical but in the bacillus positive cases the Diazo reaction gives a slightly larger percentage of positives than the Weisz (*vide* Table III). Most of the cases were of the advanced stage III type, the absence of the bacilli having been due either to the result of

artificial pneumothorax treatment or to prolonged Sanocrysin or general treatment. No definite conclusions can be made from the above analysis as the cases are not numerous enough.

TABLE III.
Diazo and Weisz Reactions in T. B.+ and T.B.— cases of Pulmonary Tuberculosis.

T. B. + D. R. + 97 (73 %)	T. B. + W. R. + 117 (66 %)
T. B. + D. R. — 35 (27 %)	T. B. + W. R. — 60 (34 %)
T. B. — D. R. — 39	T. B. — W. R. — 39
T. B. — D. R. + 16	T. B. — W. R. + 16
Total 187	Total 232

The Prognostic Value of the two Reactions.—To judge the relative or absolute prognostic value of the two reactions it is essential that the cases should be kept under observation for fairly long periods and the tests applied time after time in the course of their progress. Our cases were under observation for comparatively

short periods varying from 2 to 3 months only and hence the results must be considered as a preliminary analysis only. In table IV the results of the two tests are grouped under three classes of cases, viz., class 1 where the maximum temperature did not exceed 100° F in 24 hours ; class 2 where the maximum ranged between 100° F and 101° F ; and class 3 where the daily maximum exceeded 101° F. It will be seen that in all the three classes of cases the Diazo reaction gave a larger number of positive results than the Weisz.

TABLE IV.
Diazo and Weisz Reactions in cases with different ranges of temperature.

	Class 1 Temp. Nor—100° F.	Class 2 Max. Temp. between 100° F. —101° F	Class 3 Max. Temp. above 101° F.
Diazo +	66 (73 %)	11 (92 %)	5 (84 %)
Weisz +	91 (59 %)	16 (76 %)	8 (66 %)
Diazo—	24 (27 %)	1 (8 %)	1 (16 %)
Weisz—	52 (41 %)	5 (24 %)	4 (34 %)

In table V the results of the two reactions are grouped according to the actual clinical observations made during the short period of about 3 months. It is found that in the vast majority of cases the patients were found to be getting worse where the Diazo and Weisz reactions increased in degree and were improving when the reactions lessened in degree. When the reactions were constant the patients were mostly improving or tending to stabilize. No marked difference could be

made out between the two tests as regards their value in judging the prognosis but the number of patients under observation was not sufficiently large to enable us to draw definite conclusions.

TABLE V.

Showing the relationship between the degree of the Diazo and Weisz Reactions and the progress of cases of Pulmonary Tuberculosis.

W. R. decreasing and case improving	...	30
W. R. increasing and case improving	...	3
W. R. decreasing and case worse	...	2
W. R. increasing and case worse	...	2
W. R. constant and case improving	...	19
W. R. constant and case worse	...	4
D. R. decreasing and case improving	...	18
D. R. increasing and case improving	...	1
D. R. decreasing and case worse	...	2
D. R. increasing and case worse	...	0
D. R. constant and case improving	...	6
D. R. constant and case worse	...	0
Total	...	87

REFERENCES.

1. *Bonnert, D.*—The Prognostic Value of Weisz's Urochromogen Reaction in Pulmonary Tuberculosis—Tubercle, Sept. 1921, p. 537.
2. *Bosch.*—Quoted by Bonnert—Tubercle, Sept. 1921, p. 537.
3. *Cowen*—Quoted by Bonnert—Tubercle, Sept. 1921, p. 537.
4. *Kilduffe*—Urochromogen Reaction in Non-tuberculous Conditions—Abst. Amer. Rev. Tub., Vol. VII, p. 48.

5. *Schmithler*—Quoted by Bonnert—Tubercle, Sept. 1921, p. 537.
6. *Gottschalk, H.*—Urochromogen Reaction Curve in Pulmonary Tuberculosis—Abst. Amer. Rev. Tub., Vol. VII, p. 145.
7. *Hakki, S.*—Red Cell Sedimentation and Urochromogen Reactions in Prognosis—Abst. Amer. Rev. Tub., Vol. XV, p. 101.
8. *Seix, T.*—Chromogenic Reactions in the Urine of Tuberculous Patients—Abst. Amer. Rev. Sub., Vol. XIV, p. 193.
9. *Lunde*—Quoted by Bonnert—Tubercle, Sept. 1921, p. 537.
10. *Klare*—The Urochromogen Reaction in Surgical Tuberculosis—Abst. Amer. Rev. Tub., Vol. V, p. 92.
11. *Guth, E.*—Diazo and Urochromogen Reaction and their Clinical Significance in Pulmonary Tuberculosis—Abst. Amer. Rev. Tub., Vol. VI, p. 26.
12. *Gottschalk, A.*—A Graphic Representation of the Result of the Urochromogen Reaction and its Significance in Estimating the Character and Prognosis of Pulmonary Tuberculosis—Beit. Klin. Tub. Rev. Tubercle, Feb. 1923, p. 212.
13. *Geldmacher, M.*—Value of Urochromogen Reaction in Surgical Tuberculosis—Abst. Amer. Rev. Tub., Vol. XIII, p. 88.
14. *Lemmens, K.*—Diazo Reaction in Tuberculosis—Abst. Amer. Rev. Tub., Vol. XIV, p. 134.
15. *Kelemen, G.*—Diazo Reaction in Bone and Joint Tuberculosis—Abst. Amer. Rev. Tub., Vol. XIV, p. 135.
16. *Stubbe, H.*—Diazo Reaction in Progressive Pulmonary Tuberculosis—Amer. Rev. Tub., Vol. XII, p. 50.

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Minutes of a meeting of the Executive Committee held on 11th February 1929 at the residence of the President.

PRESENT:—Rao Bahadur Dr. M. Kesava Pai; Khan Bahadur Dr. M. Azizulla Sahib Bahadur; Drs. P. V. Cherian; G. Sreenivasamurthi; E. Achutha Menon; P. Venkatagiri; A. S. Mannadi Nayar and K. Koman Nair.

The questionnaire sent by the Medical Education Committee was considered along with the replies drawn up by the Vizagapatam members and those received from the members of the Association. There was a free discussion among the members on each question and the Association's reply was drafted at the meeting.

It was also resolved to send copies of the reply to the Vizagapatam members and to Dr. T. M. K. Nedungadi, who wanted to know the views of the Association.

Minutes of a meeting of the Executive Committee held on 23rd February 1929 at 5-30 p.m. at the residence of the President.

PRESENT:—Rao Bahadur Dr. M. Kesava Pai, *President*; Khan Bahadur Dr. M. Azizulla Sahib, *Vice-President*; Drs. P. V. Cherian; E. Achutha Menon; G. Sreenivasamurthi and K. Koman Nair.

The question of the proposed recruitment from the "Open Market" to some of the higher posts in the service was discussed at the meeting and it was decided to send a deputation to wait upon the Minister for Public Health through the Surgeon-General and present a Memorandum to him on behalf of the

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Madras Medical Service; it was also decided to invite one of the representatives from Vizagapatam to join the deputation.

Minutes of a meeting of the Executive Committee of the Association held on Monday the 4th March 1929 at the residence of the President at 7-30 p.m.

PRESENT:—Rao Bahadur Dr. M. Kesava Pai, *President*; Drs. G. Sreenivasamurthi; A. S. Mannadi Nayar; P. V. Cherian and K. Koman Nair.

Dr. T. S. Tirumurti from Vizagapatam was also present on the occasion.

Details of the memorandum to be presented by the deputation in the first instance to the Surgeon-General were discussed at length and the memorandum was finally drawn up. Drs. Sreenivasamurti and Tirumurti greatly helped in the drafting of the same.

Minutes of a meeting of the Executive Committee of the Association held on Thursday the 21st March 1929 at 6 p.m. at the residence of the Secretary (51, Lawder's Gate Street), Purasawalkum.

PRESENT:—Rao Bahadur Dr. M. Kesava Pai, *President*; Drs. A. S. Mannadi Nayar; P. V. Cherian; P. Venkatagiri; K. Koman Nair and E. Achutha Menon.

The meeting was called for to meet Rao Bahadur Dr. T. M. K. Nedungadi, a member of the Committee of Medical Education. The members had a lengthy talk and discussion with Dr. Nedungadi on the several points raised in the answers submitted by the Association to the Questionnaire sent by the Committee on Medical Education. The views of the members of the Association and their feeling in the matter were specially brought to his notice. Dr. Nedungadi promised to do his best in supporting our views before the Committee when it met.

It was also resolved to send copies of the reply to the Vizagapatam members and to Dr. T. M. K. Nedungadi, who wanted to know the views of the Association.

The deputation of the Provincial Medical Service Association headed by Rao Bahadur Dr. M. Kesava Pai, M.D., President of the Association and consisting of the following other members:—

1. Rao Bahadur Dr. T. M. K. Nedungadi, L. M. S., Ex-Vice-President of the Association.
2. Dr. T. S. Tirumurti, B.A., M.B. C.M., D.T.M. & H.
3. „ M. Narasinga Rao, M.B., B.S.
4. „ G. R. Parasuram, B.A., L.M.S., M.R.C.P., D. Psy.
5. „ P. V. Francis, B.A., M.B., B.S.
6. „ V. C. Govinda Menon, L.M.S., L.R.C.P. & S.
7. „ J. C. David, M.B., B.S.
8. „ R. Viswanathan, B.A., M.B., B.S.

waited on the Hon'ble the Minister for Public Health on Monday the 27th May 1929 at 2-30 p.m. at the Secretariat Buildings, Ootacamund. Surgeon-General J. W. D. Megaw, C.I.E., V.H.S., I.M.S., and Mr. S. Ranganatham, I.C.S., Deputy Secretary, Local Self-Government Department, were also present. The Minister gave a very patient and sympathetic hearing to the various representations made by the deputation which lasted for about two hours. The memorandum which had already been presented to the Surgeon-General on the 5th of March last and had received very favourable consideration at his hands dwelt on the various points referring to recruitment to specialist, teaching and other appointments and to study leave and deputation. The Minister was pleased to make detailed enquiries regarding the different grievances which the members of the Provincial Medical Service laboured under with a view to the possible ways of remedying the same without detriment to the interests of medical education and medical relief. To the following points which were urged by the deputation the Minister and the Surgeon-General promised to give their sympathetic consideration:—

1. (a) Whenever professorial and specialist appointments are contemplated by Government, attempts should be made to notify them to the members of the Provincial Medical Service to enable intending applicants to qualify themselves for the same.

(b) For all higher appointments in the teaching and specialist cadres the minimum qualifications and the nature of the training required to hold each of them should be definitely prescribed by the Surgeon-General at an early date to facilitate the acquiring of such qualifications or training by the members of the Provincial Medical Service.

(c) In considering the claims of Provincial Medical Service officers and the work done by them in the foreign institutions where they may be trained, the maximum period of two years of study leave granted by Government to these officers will be considered to be sufficient for qualifying them to the higher posts and the longer period of training of outside applicants in their own countries will not weigh against the local applicants of the Provincial Medical Service.

2. In making higher appointments to the specialist and teaching cadres, if qualified persons are obtainable from the members of the Provincial Medical Service, they will have preference over outside applicants, due consideration being paid also to the seniority of such qualified members of the service.

3. The formation of teaching cadres is approved.

4. (a) Only when exigencies of service arise owing to want of qualified men for an appointment which must be immediately filled up, such a post will be temporarily filled up by recruiting in the open market by advertisement, but it will be for a contract period not exceeding three to five years to enable selected service members to qualify themselves in the meanwhile.

(b) If at the expiry of such short term contracts a Provincial Medical Service officer with the required qualifications is available, the appointment will be given to him.

5. (a) Increase in the number of officers who will be granted deputation or study leave annually will receive the sympathetic consideration of Government.

(b) In granting deputation the question of seniority will be taken into consideration, provided the officer is likely to serve the department for about 10 years after return from the deputation.

6. Recruitment of Professors will be made as a rule from amongst the Assistant Professors, who have had teaching experience and who have shown special aptitude, provided they possess the prescribed minimum qualifications.

7. In all cases of open recruitment the selection shall be made by a properly constituted Public Service Commission for Madras.

In publishing the above results of the deputation on the Hon'ble the Minister for Public Health, we have to warn the members of the Provincial Medical Service that the Professorial appointments in the Medical Colleges will not come to them as a matter of course simply because they happen to be Assistant Professors at the time the places fall vacant, but they will have to stand the test of open selection. It is only when the members of the service reach the mark and are as well qualified as any outside applicant that they stand a chance of being selected. So now it is the duty of every member to work and get the best qualifications, work under the best Professors in Europe and get certificates of merit from such professors. Every five years or so the places will fall vacant as foreign recruited short term contracts cease. There is thus a chance at every stage for a member of the service to get the highest places in the teaching cadres. It is hoped members of the service will promptly realise the situation and qualify themselves in large numbers in every subject and in every special branch thereof, qualifying themselves for the higher teaching appointments. It will not be possible for Government to guarantee any of the higher appoint-



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ments to an officer simply because he is a member of the Provincial Medical Service.

If members of the service do not wake up to the situation and qualify for the appointments they have themselves to blame.

In this connection we would also bring to the notice of the members of the service that the standard of education in the schools is going to be brought up to the standard of the colleges and it is probable that there will be at least three, possibly four teaching institutions where professors of the required standard of higher qualification would be employed. This practically amounts to four or five specialists for each subject of the medical curriculum.

Lastly we request the members to watch and see what new chairs will be created in the near future, e.g., skin diseases, anaesthetics, orthopedics, pediatrics, border line diseases, and nervous diseases, etc., and we urge that many of our keen and enthusiastic members of the service who have an aptitude or desire to specialise in those subjects will go quickly to foreign countries and obtain as long a training as is possible for them to have, thereby holding themselves in readiness for any new appointments that may be created in the near future.

REPLY TO THE DEPUTATION.

From M.R.Ry. R. R. Williams Ayl., B.A., M.B.C.M., etc.,
Personal Assistant to the Surgeon-General with the Govern-
ment of Madras, to the President, the Madras Medical
Association, 48, Harris Road, Mount Road P. O., Madras,
No. P. 175-E, dated 12th July 1929.

Ref:—G. O. No. MS. 1653 P. H., dated 3rd July 1929.
Copy forwarded for information.

*P. V. S./12-7. Copy of Local Self-Government Department
G. O. No. MS. 1653 P. H., dated 3rd July 1929.*

ABSTRACT.—Deputation—Madras Medical Service—Proceedings—Communicated to the Surgeon-General with remarks.

ORDER.

A copy of the proceedings of the deputation of officers of the Madras Medical Service which waited on the Hon'ble the Minister for Public Health on the 27th May 1929 is communicated to the Surgeon-General with the following remarks :—

1. *Para 1 (a) of proceedings—Early notification of special appointment in contemplation.*

Paras. 5 (a) and 5 (b)—Increase in the number of officers to be granted study leave and the principles on which study leave should be granted.

The requests contained in the above paragraphs will be complied with as far as practicable.

2. *Para 3—Formation of teaching cadres, and*

Para 7—Recruit by a Public Services commission.

These two questions are under the separate consideration of the Government.

3. *Para 1 (b)—Prescription of minimum qualifications.*

Para 1 (c)—Maximum period of training in foreign countries required of Provincial Service officers.

Para 2 and para 4 (b)—Service men to be preferred to outsiders.

Para 4 (a)—Special recruitment in the open market to be on short term contracts.

Para 6—Recruitment of Professors to be made from amongst the assistant professors.

A final decision on these points will be deferred until the Government have received and considered the report of the Committee on Medical Education.

HILTON BROWN,
Secretary to Government.

CENTRAL MEDICAL RESEARCH INSTITUTE.
ALICE BUILDING, HORNBY ROAD,
Bombay, the 28th January 1929.

From

DR. R. D. MODY, L. M. & S. (BOM.), L.R.C.P.
(LOND.), M.R.C.S. (ENG.),
President, Bombay Medical Union,
BOMBAY.

To

THE SECRETARY,
Department of Education, Health and Lands,
Government of India,
DELHI.

SIR,

With reference to the scheme for a Central Medical Research Institute at Dehra Dun, proposed by the Fletcher Committee, and the proposals, based in part on that Report and on the generous endowment of the Rockefeller Foundation to establish a Public Health Institute at Calcutta, submitted to the Standing Finance Committee of the Indian Legislative Assembly by Government, I am requested by my Committee to have the honour to forward to you herewith, the Resolutions passed at a Meeting of the Managing Committee of the Bombay Medical Union in regard to the same, and to request you to

submit the same for consideration by Government before their proposals referred to are sanctioned by the Assembly and take definite shape.

2. I may avail myself of this opportunity to point out that the Committee of the Union is not satisfied with the spirit or the letter of the Government proposals, inasmuch as the same do not even conform to the conditions so carefully laid down by the expert Committee appointed by Government themselves, under the Chairmanship of Sir Walter Fletcher, F.R.S. As the Committee themselves observe—

“ If our proposals as a whole are unacceptable in principle or along their major lines, the proposal for a new Institute at Dehra Dun should be rejected at once and action should be taken to proceed immediately with the parts of the scheme that are acceptable **using the existing Institute at Kasauli as the base** ” (Page 74, para 2).

The proposals of Government as they stand run definitely counter to this opinion of the Committee for the Dehra Dun Institute as now proposed would only be a replica of the present Kasauli Institute with the addition of a Department of Medical Biology. In view of the further fact that a well-equipped up-to-date Public Health Institute is to be simultaneously established at Calcutta, thanks to the generous offer of the Rockefeller Foundation, the Government proposal for a Central Medical Research Institute at Dehra Dun on the lines submitted for the approval of the Standing Finance Committee on the 29th August 1928, will only result in a superfluous duplication for the most part, without in any way improving the present research possibilities or conducing towards the benefit of the public. The Committee of the Union is, in this connection, of the considered opinion that for a really efficient Research Institute, to have all the clinical and pathological materials available at all times for ensuring the progress and success of its activities, a populous centre like Calcutta or Bombay, as is the case in England and

other civilised countries, will be far more suitable than an out-of-the-way place like Dehra Dun. The Fletcher Committee itself is not very enthusiastic either about the particular place—Chandbag—proposed to be converted into the Central Research Institute. For these reasons, the Committee earnestly urges upon the Government that they should reconsider their proposals in this behalf.

3. The Committee of the Bombay Medical Union is all the more inclined to disapprove of the proposals of Government in this behalf on financial grounds. My Committee apprehends that the financial provisions suggested by the Government in this behalf will considerably retard the progress and seriously prejudice the cause of medical research in India, instead of promoting the same as originally contemplated. The research now conducted in the several provincial centres by the help of grants from the Indian Research Fund Association will, under the proposals of the Government, be very considerably curtailed; while there is no hope that the cut thus effected on the provincial resources will be made up effectively by the Dehra Dun Institute. If financial reasons compel Government to adopt such cheeseparating measures, the Committee of the Union earnestly press upon their attention to consider the advisability of not transferring the Central Research Institute from Kasauli to Dehra Dun, *i.e.*, of maintaining the *status quo* so far as the Central Research Institute is concerned, especially, in view of the establishment of the Public Health Institute at Calcutta.

4. The last-mentioned Institute, the Committee of the Union very cordially appreciate and welcome. They have no doubt that, properly housed, equipped and staffed, the Public Health Institute will be a veritable boon to the people of India. But while welcoming the idea as such, the Committee of the Union cannot but take strong exception to the method of staffing the Institute. The wide gulf between the Professor and the Assistant Professor in regard to pay and status will not only preclude any possibility of continuity in research any time that a Professor is away on leave or retires, but what is much more

objectionable and undesirable is that it will make that Institute permanently dependent on the foreign imported element. The Committee of the Union have therefore suggested that while the Professors or Heads of Department may, in the first instance, be recruited on a term of years from suitable applicants from all over the world. They should have immediately under them men of very nearly their own qualifications and attainments in a special intermediate grade, say of Rs. 1,000—100—1,500 per mensem who would be thus not only the real colleagues of the Professors as recommended in the Fletcher report but would be able also to maintain continuity in research during the temporary absence of the Professors and take their place when the latter retire, without any danger to the cause of Public Health or Medical Research.

5. The Committee of the Union cannot, however, leave this subject without entering an emphatic protest against the recommendations of the Fletcher Committee aiming at a very large reservation of the appointments in these Institutions to the members of Indian Medical Service. The Committee are definitely of opinion that such appointments should not as a matter of policy be reserved specifically in any proportion to the members of the Indian Medical Service having an equal chance of selection, based on merit only, with the rest of the qualified men; but no special reservation should be permitted. The policy of reserving a large number of research posts to members of the Indian Medical Service and the creation of a separate grade of inferior Service, members of which can never aspire to higher appointments, is largely responsible for retarding the progress of Medical Research in this Country. The present scheme, if allowed to stand, will result in perpetuating the old policy. In all progressive countries, facilities for research are provided when suitable men are found for the purpose and it is to be hoped that a similar liberal policy will be adopted by Government in this country and that no effort will be made to fill in posts even when suitable men are not available. As the resolutions forwarded in this behalf are sufficiently explicit, I will

conclude by reinviting the attention of Government to the same before the proposals materialize into accomplished facts.

I have the honour to be,
Sir,
Your most obedient servant,
(Sd.) R. D. MODY,
President, B. M. Union.

Resolutions passed by the Managing Committee of the Bombay Medical Union at its Meeting held on the 17th January 1929.

1. This Committee places on record its strong conviction that Dehra Dun is not a suitable place for locating the Central Medical Research Institute, distant and detached as it is from all centres of population in India and from large Hospitals with their plentiful supply of clinical and pathological materials for research and investigation, as well as from academic environment.

2. This Committee protests against the hasty and ill-considered action taken by Government upon the Report of the "Committee on the organisation of medical research in India", presided over by Sir Walter Fletcher, F.R.S., without even inviting academic or professional medical opinion and views on the references made to the Committee or on the recommendations made by it. This Committee earnestly urges upon the Government as well as the Legislative Assembly that the said Report be published in order to invite profession as well as public opinion on the same, before any action is taken on the scheme, as this Committee is convinced that a precipitate action on it will adversely affect Medical Research in India for several years to come.

3. This Committee is of opinion that—

(a) The proposals of the Government submitted to the Standing Finance Committee at its session in August 1928 are

not even in accordance with the letter or the spirit of the recommendations of their own Committee presided over by Sir Walter Fletcher, F.R.S. ;

(b) That the said proposal concerning the transfer of the existing Research Institute from Kasauli to Dehra Dun will lead to a mere reproduction of the work heretofore done by the existing Institution, with the only addition of a section on Medical Biology, without fulfilling the various functions expected of a Central Research Institute, as recommended by the Fletcher, Committee ;

(c) That it will involve a fruitless waste of heavy expenditure in adapting and equipping the Chandbagh building at Dehra Dun for the proposed truncated Institute ;

(d) That the research now carried out with the help of the Indian Research Fund Association in the different provincial centres will be considerably curtailed by the proposed centralisation, owing to the consequential reduction of the Funds from about 7 lakhs to less than 2 lakhs a year available for the purpose ; and that therefore,

(e) instead of the proposed Central Institute of Medical Research carrying out certain activities in addition to those now carried on by the Indian Research Fund Association, as recommended by the Fletcher Committee, it will under the scheme proposed by Government cause a considerable reduction of the activities of the Indian Research Fund Association and of the provincial centres affiliated thereto.

4. This Committee places on record its sense of high appreciation and welcomes the generous offer of Rockefeller Foundation to establish a Public Health Institute at Calcutta.

5. In view of the definite proposal to establish a Public Health Institute at Calcutta, which this Committee has welcomed, this Committee is strongly of opinion that the simultaneous proposal of Government to transfer the Kasauli

Institute to Dehra Dun in manifest contravention even of the recommendations of the Fletcher Committee, will be of no benefit whatever to this country by way of extra medical research, and that they fail to realise the reasons prompting Government to adopt such a course.

6. This Committee emphatically condemns the recommendation of the Fletcher Committee to specifically reserve a very large proportion in the cadre of appointments in the Research Institute for members of the Indian Medical Service, and is of opinion that no such appointment be definitely reserved for any members of the Indian Medical Service, but that on the contrary research appointment should be made on merits by careful selection from among applicants invited from all over the world.

7. This Committee protest emphatically against the proposals of Government to give low salaries of Rs. 400 per mensem each to the Assistant Professors at the proposed Public Health Institute at Calcutta as against those of Rs. 2,500 per mensem each to the Professors, a system which will effectively prevent the indigenous workers from aspiring to positions of trust and responsibility in the Institute, a policy which cannot be in accord with the high aims and objects with which the Rockefeller Foundation have offered the gift, and recommends that in order to ensure continuity of work in the various Departments, either when a Professor retires or during his absence on leave, competent Indian be recruited from the start for subsequent promotion to the Professorial rank, in the intermediate grade of Rs. 1,000—100—1,500 per mensem and that such a grade be established, as a stepping stone to the Professorial grade.

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ALICE BUILDING, HORNBY ROAD,
Fort, Bombay, May 1929.

From

DR. G. V. DESHMUKH, M.D. (LOND.), F.R.C.S. (ENG.),
President, Bombay Medical Union,
BOMBAY.

To

THE SECRETARY,
Department of Education, Health and Lands,
Government of India,
SIMLA.

Sir,

I have the honour to acknowledge receipt of your letter No. 355-H., dated the 22nd February 1929, in reply to the letter addressed by my predecessor in office, dated the 28th January 1929 and to say that my Committee are glad to note from your reply as well as from the reply of Sir Mahomed Habibullah to the Deputation of Members of the Legislative Assembly that waited on him with reference to the location and other questions regarding the Central Medical Research Institute, published in the Press Note, dated the 6th April 1929, that the points urged by my Committee and by the Deputation will have Government's careful consideration. In conformity with this assurance may I urge upon Government, the extreme advisability of suspending all operations and expenditure on the Central Research Medical Institute at Dehra Dun, if any be already started, so that Government should have a free hand if the event of a radical reconsideration of the present plans on locating it at Dehra Dun being decided upon.

My Committee have, however, heard with great misgivings that the Indian Research Fund Association has already agreed to sanction the sum of six lakhs to meet the cost of alterations in the Chandbag Building to make it suitable for the Central Medical Research Institute. This action on the part

ASSOCIATION NOTES.

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of the Governing Body of the Indian Research Fund Association amounts almost to precluding the discussion of the whole scheme as submitted by the Fletcher Committee at the earliest possible moment in the Legislative Assembly, viz., when funds are necessary to effect structural alterations at Chandbag. This is all the more regrettable as the Assembly will, in future years, be called upon to vote more funds for the erection of buildings for housing those sections (particularly Bio-chemical and Pharmacological) which are at present not included in the scheme as submitted to the Standing Finance Committee in September 1928. My Committee would earnestly urge upon Government in this connection as in the next preceding that no action be taken on this grant of the sum of six lakhs by the Indian Research Fund Association, lest such action should ultimately so tie down hands of the authorities concerned as to preclude them from a more suitable course of action later.

My Committee regret that though the Fletcher Committee signed their Report in March 1928, and that though the All-India Medical Congress held at Calcutta urged the circulation of this Report last December, and that though my Committee submitted a similar request last January, Government have not yet published this Report and the evidence collected by the Fletcher Committee. Such an attitude on the part of Government can only serve to increase the suspicion which the Independent Medical Profession is driven to entertain as to the reasons why the Medical advisors of Government are pressing for locating the Central Medical Research Institute at Dehra Dun and rushing this plan through. The location of such an Institute in an out of the way place like Dehra Dun for Medical Research, would be an unheard of thing in any other civilised country.

I have, therefore, the honour to request you for an early publication of the Fletcher Committee's report and of the evidence submitted to the Committee and for their circulation to the Medical and Science Faculties of the various Indian Universities, to the Medical Colleges and to the organisations of

the Independent Medical Profession in this country and for inviting their opinion thereon.

I have further to request you, in view of the strong opinion which is held regarding the unsuitability of Dehra Dun not only by the Members of the Independent Medical Profession but also by several members of the Indian Medical Service, to appoint a small Committee of Medical Men (Officials as well as non-officials) to report as to which City would be the most suitable place for locating the proposed Central Medical Research Institute. The appointment of such a Committee is all the more necessary in view of the way the existing Central Research Institute came to be located at Kasauli in 1906. In the early part of this century it was almost decided as per Surgeon-General Harvey's Scheme to make the Bacteriological Laboratory at Bombay, which had rendered so valuable a service to the Plague Investigation Commission, the Central Research Institute under the Directorship of Mr. Haffkine. The early retirement of Mr. Haffkine owing to the breakdown of his health in 1904, led to the appointment of Major Semple, R.A.M.C. (Retired), who was the Director of the Pasteur Institute at Kasauli at the time, as Director of the proposed Central Institute. Major Semple being strongly in favour of establishing this at Kasauli and "since he was to be Director of it, his view prevailed" (*vide* Fletcher Committee's Report, page 9). In the present case also my Committee is not satisfied that the Fletcher Committee have carefully surveyed the possibilities of locating the Central Research Institute elsewhere than at Dehra Dun. Certain centres of medical importance, such as Lucknow, Lahore, were not even visited by the Fletcher Committee. Further the necessity of associating medical research and education have been well brought out by Major E. W. C. Bradfield, I.M.S., in his interesting Report, dated the 13th December 1921, to the Surgeon-General with the Government of Madras after his return from Deputation to the United States of America where he had gone to study the methods of medical instruction. After alluding to the almost universal

practice in the United States of the intimate connection between Research and Education, he writes, commenting on the conditions prevalent in this country, "the organisation of the Research Department of India as a separate department is a great loss to the country" (*vide* Indian Medical Gazette, August 1922, page 303). My Committee would like to draw your particular attention to this trenchant comment of Major Bradfield and press the appointment of a Committee to investigate and report as to which provincial capital City would be the most suitable place for the proposed Central Institute. Till such a Committee has reported, and till the views of various Universities and Medical bodies on the Fletcher Report are received by Government, my Committee would strongly request you once again to withhold any action being taken in effecting alterations in the Chandbag Building.

My Committee are convinced that there is no merit in conglomerating all sorts of Institutes at Dehra Dun, regardless of the consideration as to whether the place is suitable for all of them or not. I take it that Government will have no difficulty in disposing off Chandbag. In any case, the mere fact that Chandbag is lying idle on the hands of Government at present, will not, my Committee trust, be made a decisive reason for its being utilized for the purpose of a Central Medical Research Institute, irrespective of whether Dehra Dun is, in competent opinion, suitable for the purpose or not, and irrespective of the fact that more buildings will need to be constructed when the Bio-chemical and Pharmacological Units are added, later on, to the Central Medical Research Institute.

As regards the other matters which the Deputation of the Members of the Assembly urged for your consideration on the 6th April 1929, my Committee will address to you later on.

I have the honour to be,

Sir,

Your most obedient servant,

G. V. DASHMUKH,

President, Bombay Medical Union.

THE ORGANISATION OF THE MEDICAL
RESEARCH IN INDIA.

THE EDITOR,

Madras Medical Journal.

SIR,

The organisation of medical research in India recently formed the subject of a special report by an official Committee under the Chairmanship of Sir Walter Fletcher, F.R.S. The matter is one which intimately concerns the progress of India but the Government not only did not think it worthwhile to gather the opinions of the independent medical profession, but appear to have decided to act on the Committee's recommendations in the face of the renewed protests from unofficial medical bodies in India. The detailed report itself is not yet generally available a curious and suggestive circumstance—but the summary of it which has been published in the press has caused widespread disappointment among members of the medical and allied profession and it is the object of the letter to show that if the Government give effect to the Fletcher Committee's recommendations their action will be definitely inimical to the progress of medical research in India.

The worst of the suggested changes is perhaps the removal of the Central Medical Research Institute to Dehra Dun where it will occupy the building at Chandbagh vacated by the Forest Research Institute. The alteration for the building alone will require an initial outlay of Rs. 6,00,000 while further extensions and the creation of a proper scientific atmosphere which does not, and can never exist at Dehra Dun will entail the expenditure of still larger sums of money. Dehra Dun may have certain environmental advantages for the staff of the proposed Institute, but this surely pales into insignificance besides the disadvantages due to the absence of clinical facilities, libraries and scientific co-operation.

Why have the claims of our principal cities like Bombay or Calcutta been overlooked in considering the location of the

Institute? Calcutta, for example offers the following advantages (a) the School of Tropical Medicine, the Medical College, the Zoological and Botanical Surveys of India, the Bose Institute and the Scientific Departments of the Calcutta University, which is probably the most advanced University in India in respect of scientific research, already exist here; (b) the proposed Rockefeller Health Institute will be established in Calcutta; (c) the library facilities, afforded by the School of Tropical Medicine, the Calcutta University, Zoological, Botanical and Geological Surveys of India, the Asiatic Society of Bengal, the Imperial Library and various other institutions and societies available in Calcutta are recognised to be unique throughout the Indo-Malayan region; (d) it may justly be claimed that the clinical facilities available in various hospitals at Calcutta are almost unrivalled in India; (e) co-ordinative research which is one of the main recommendations of the Fletcher Committee, can nowhere be better obtained than among the large staffs of the departments above-named, which maintain specialists in every important branch of medicine and surgery and also in the allied sciences of anatomy, physiology, parasitology, proto-zoology, helminthology, entomology, limnology, general zoology bacteriology, general botany, chemistry, bio-chemistry and physics.

If co-ordination and co-operation be the real basis of the Fletcher Committee's recommendations their advantages cannot be overlooked; for as the late Dr. N. Annandale, C.I.E., F.R.S., Director, Zoological Survey of India, rightly maintained ultimately all the sciences are connected and the separation of any one branch of scientific activity from another must result in a mutually diminished output.

The establishment of the Institute at Dehra Dun is such an obvious fallacy that the Government's action in appointing a Committee in spite of protest to enquire into the alterations necessary at Chandbagh, the voted grant of Rs. 6,00,000 from the Indian Medical Research Fund—a grant which will seriously diminish genuine research in various provinces the reservation of 23 out of 30 appointments for I.M.S. officers, the great disparity

in salaries between Directors and Assistant Directors and the other officers and the official constitution of the Selection Board, can only be interpreted as an attempt, not to genuinely foster medical research in this country, but to establish an Olympus for the Indian Medical Service.

The reservation appointments for I.M.S. officers is really an insult to the Service, which includes some of the most distinguished research workers, and should, therefore, have no fear of open competition. It is well known that science flourishes only in an atmosphere of freedom, and any principle which does not afford equal opportunities to all must inevitably lead to diminished standards of research. Science is above politics, and I quite realise that in open competition I.M.S. officers may gain an even larger share of the appointments than that at present reserved for them, but if India is to develop it does not matter very much who has a particular portion provided he is the best man for it.

If the open competition is adopted, however, selection must be fair, it must rest with a representative body and not a few I.M.S. officials, as is the case with the present Selection Committee. I would, therefore, suggest that the personnel of this Committee be extended to include one representative of the All-India Medical Association, one of the Indian Chemical Society, one of the Indian Science Congress, one of the Zoological and Botanical Surveys of India three of the independent medical profession (who have attained an acknowledged reputation through research work), and representatives of the principal Medical Colleges in India. The constitution of the principal Body of the Indian Medical Research Fund should also be extended along somewhat similar lines, and should also include an elected member from the Legislative Assembly.

The mere fact that the resources of the Fund have already been reduced by the grant for the Chandbagh alterations indicates the necessity for more liberal and representative opinion of this body.

Inadequate salaries is another factor which must operate against the production of worthwhile results from particular researches for it will naturally lead to the recruitment of officers of inferior research accomplishments who will be unable to adequately undertake the work of their superior officers when the latter are on leave or are absent through other causes. The psychological effects of the great disparity in salaries between Directors and Assistant Directors and officers who are expected to do good research, much also be considered. Obviously this must produce discontent among the latter (a detrimental factor which will increase with the capacities of the officers concerned) resulting in a definitely retrogressive effect upon their work.

We must view with particular alarm the fact that the same salary system has been proposed by Government for the officers of the Rockefeller Health Institute which is to be established at Calcutta. This is entirely opposed to the fulfilment of the high standards of research expected from institutions under the aegis of the Rockefeller Foundation, and it would be a general disgrace to India if it did not appreciate this fact.

In conclusion I would express the opinion that not only must the Dehra Dun Scheme be abandoned, the reservation of appointments cancelled, the constitution of the Selection Committee be along more liberal lines, and the salaries be made more commensurate with the work expected (or which should be expected) from the staffs of the Central Medical Research and Rockefeller Health Institutes, but that Research Fellowships and scholarships should also be provided. In addition research at hospitals, both private and official, throughout the country should be officially helped by the Government and encouraged with grants by the Indian Medical Research Fund Association. An enormous amount of unique clinical material is being wasted through lack of such assistance, and in consequence the average doctor is developing into a more routine worker addicted to semi-antique methods and with no original ideas. As the betterment of general health is as much, if not more, dependent on the average doctor as on the research worker. I can imagine nothing

more detrimental than the degeneration of the average members of the profession through circumstances over which they have no control.

Yours faithfully,

H. S. RAY,

*Hony. Secretary, All-India Medical Association
and Calcutta Medical Aid and Research Society;
Professor of Surgery, National Medical Institute,
Hony. Surgeon, Chittaranjan Hospital, etc.*

*Points urged by the Deputation of the members of this
Legislative Assembly, Delhi, for the consideration of
Sir Mahomed Habibulla, Member, Education, Health and
Lands, concerning the Central Medical Research and
Public Health Institutes on the 6th April 1929.*

1. Location of the Central Medical Research Institute.

A. Points stated to be in favour of Dehra Dun.

- (a) Climate: (Work is however done in Provincial Cities all the year round, e.g., at the School of Tropical Medicine, Calcutta, or at the Haffkine Institute, Bombay, etc.)
- (b) A number of Institutes under control of Government of India exist at Dehra Dun. This would facilitate the control and supervision by the Central Government of a Central Medical Research Institute situated there. (There are however Institutes under the Government of India situated elsewhere and the Public Health Institute, donated by the Rockefeller Foundation, is to be founded at Calcutta).
- (c) Plenty of space is available at Dehra Dun which the Central Medical Research Institute could get either free or at very low cost. (Land is also available elsewhere).

- (d) A ready made building, viz., the one evacuated by the Forest Institute (Chandbagh) can be placed at the disposal of the Medical Research Institute (*vide* next page).

B. Points against Dehra Dun.

- (a) No Scientific atmosphere exists at Dehra Dun. The Railway, Telegraph, and X-ray Institutes the Military College and the Geodetic branch of the survey of India and such other departments or Centres have no bearing on Medical Research. The Agricultural Research Institute can have only a few points of contact with the Medical Research Institute.
- (b) Modern Medical Research particularly basic research, requires Team work. This has been also much emphasized by the Fletcher Committee. Such a team work is possible where work on allied lines or allied subjects is carried on, e.g., in Chemistry, Physics and Physiology, etc., in the Institutes of Science and in Medical Colleges in the Provincial capital Cities, and which is, at present, not done and which is not likely to be done at Dehra Dun.
- (c) Medical Research has a great bearing on clinical work, which is impossible at Dehra Dun and which is only possible in Provincial capital Cities with their large Hospitals where Clinical and Pathological material is available in abundance.
- (d) The presence of informed and educated Medical opinion which is available in the Provincial capital Cities and which stimulates work would be absent at Dehra Dun (The comparative failure of the Tata Research Institute at Bangalore illustrates this point).

(e) The presence of a large Central Research Institute in a City where Medical Colleges and teaching Hospitals exist, would act as an incentive to many young Medical graduates to undertake investigations, and thus help the country generally. This would not be the case in a place where no Medical instruction is imparted and where no Medical graduate would be ordinarily available.

(f) The Chandbagh building at Dehra Dun needs extensive alterations to make it hospitable for a Medical Research Institute. A sum of at least six lakhs is necessary for alterations in the Building itself. As to how much more money will be necessary for constructing new buildings, in future, for opening other sections of the Institute, which are at present left out from the scheme suggested by the Fletcher Committee, is not known.

2. *The Indian Research Fund Association.*

The governing body, as at present constituted, consists entirely of Government Officials. Neither the Legislature nor the Independent Medical Profession are represented on it. As in the case of the Governing body of the Agricultural Research Council, there should be two Members of the Assembly and one of the Council of State, as also the representatives of the Independent Medical Profession, on the Governing body of the Indian Research Fund Association which obtains its grants from Government. Representatives of the Independent Medical Profession and Research workers should also be on the Advisory Body whose composition should more or less correspond with that recommended for the Agricultural Research Institute.

3. *Recruitment and Appointments Board.*

The "Recruitment and Appointments Board" recommended by the Fletcher Committee (*vide* page 64 of the Fletcher Report) is heavily weighted with I. M. S. Officers. Such a

Board should have on it a few representatives of the non-Official Medical Colleges. It should not have more than half the number of service Officers on it.

4. *Reservation of posts in the Research Department of I.M.S. Officers.*

On page 62 of the Fletcher Committee Report it is stated that "in the latest Government resolution, which dealt with only 30 appointments, 23 were reserved for I. M. S. Officers and 7 were to be open to non-I. M. S. Medical men". Though Government have agreed—not to reserve any new appointments in the Research Department for I. M. S. Officers, no reason is made out why 23 posts should continue to be reserved for service Officers, whatever reasons there may have been for such reservation in this post.

All the posts at the Central Medical Research and Public Health Institutes should be kept open for selection from whatever quarter competent men be available. The I. M. S. Officers, if eligible, may certainly compete for selection.

5. *Salaries.*

In the proposals submitted by Government to the Standing Finance Committee, the salaries of the Directors at the Central Research Institute and the Professors at the Public Health Institute have been shown at Rs. 2,500 per mensem each, the salaries of the Assistant Directors at the Central Research Institute are shown at Rs. 1,600 per mensem and of the Assistant Professors at the Public Health Institute at Rs. 400 per mensem. No reason has been given for such marked disparity. So far as the Directors or Professors are concerned, their salaries could be fixed on the grade of Rs. 2,000—100—2,500, and the Assistant Directors or Professors should be recruited in the grade of Rs. 1,000—50—1,500.

A class of Officers called Research Assistants would be also necessary to help in Research work. Their grade in the Research Department may be fixed at Rs. 450—25—750, 750—50—1,200, 1,200—50—1,500 with efficiency bars at 750 and 1,200. The Assistant Directors and Professors may be recruited from capable Officers in this grade. A local allowance for places like Calcutta and Bombay will need to be given to the Officers in the Junior grade.

6. Research Scholarships.

As in the case of Agricultural Research a number of Scholarships of the value of about Rs. 150 or Rs. 200 per mensem each, would need to be instituted for the encouragement of promising young graduates to undertake investigations. These Scholarships may be tenable at the Central Medical Research and Public Health Institutes and at the various Medical Colleges and Hospitals in the country.

7. Clinical Research.

As in the case of Agricultural Research a portion of the annual grant, voted by the Assembly, should be ear-marked for helping research at the various Medical Colleges and Hospitals throughout the Country. It is also essential to establish a complete research unit to start with, at one of the Medical Colleges.

8. Non-publication of the Fletcher Report.

Though a definite request was made by the Bombay Medical Union as early as last September to publish the Fletcher Report for eliciting medical and scientific opinion, the department has not yet acceded to the request, and such far reaching proposals have been rushed through without inviting the opinion of the Medical Faculties of the Universities or of Medical Colleges.

In reply to Mr. Aney's question (No. 1054, dated 14th March 1929) in this connection, Mr. Bajpai replied "It was not

considered necessary to circulate the report for eliciting further professional or academic opinion."

THE ALL-INDIA OPHTHALMOLOGICAL SOCIETY.

The above Society was recently organised to bring together medical men who are interested in ophthalmology and to facilitate exchange of ideas amongst them.

The membership of this Society is open to all Medical Practitioners who practise ophthalmology as a speciality or are interested in ophthalmology and whose qualifications are satisfactory to the Committee.

Applications for membership should be made in writing to one of the Secretaries and recommended by a member of the Committee. This rule holds good for this year. Thereafter all applications should be supported by two members and the election will be made by the Committee.

The management of the Society is in the hands of a Committee consisting of a President, two Vice-Presidents, two Secretaries, two Treasurers and ten other members, one of whom at least will be from each of the following Provinces, Madras, Bombay, Bengal, Punjab, Central Provinces, United Provinces and Mysore.

The present Committee consists of the following gentlemen :—

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The subscription for membership is Rs. 15 per year payable in advance.

The Society will meet once a year at a time and place decided on by the Committee. At this Annual Meeting paper will be read and discussed and patients and pathological specimens will be exhibited.

Any member wishing to read a paper should intimate the Secretaries at least one month previously and forward a copy of the paper with a short abstract to be published in the papers.

All communications made to the Society by and through members and considered by the Committee suitable for publi-

cation will be published in the form of "Proceedings" of the Society as soon as possible after the Annual Meeting. A copy of the proceedings will be sent to every member whose subscription has been duly paid up.

The first meeting of the Society will be held in Bombay during the third week of December. The proceedings are expected to occupy two or three days.

All medical men who are eligible for membership are earnestly requested to enrol themselves and to send in their subscriptions to Dr. G. Zachariah, Joint Secretary, "Fritcham" Marshall's Road, Egmore, Madras, as soon as possible.

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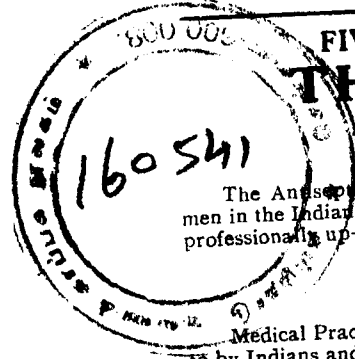
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