balance the mass of evidence in favour of the intestinal origin of urobilin. I am aware that urobilinuria is often regarded as evidence of "floating gall stones" or of cholangitis. I can only say I have far more often seen this diagnosis made than confirmed, when based on this test.

Bile salts in jaundice are by no means always to be found. Matthew Hay's test with flowers of sulphur is the simplest way of detecting them. I have found them present at the beginning of obstructive jaundice, and in one case even before bile pigment appeared in the urine. But later on they are generally absent, probably in part because the biliary cycle is interfered with. When bile is drained through a fistula the amount of bile salts in it soon sinks to one-tenth of the normal (Copeman). This suggests that the reabsorbed bile salts are used over again ten times. Naturally, then, in obstructive jaundice such bile salts as escape into the urine at the beginning are permanently lost, and the amount available sinks below the kidney threshold. In toxic jaundice bile salts are not likely to appear in the urine at any stage, both because they can get into the bowel and because their formation throws greater labour on a diseased liver than the excretion of bile pigment. The presence of bile salts, therefore, in the early stages of jaundice suggests an obstructive rather than a toxic cause.

IV. TESTS FOR PANCREATIC INADEQUACY.

I can deal quite briefly with this part of my subject, because our views have now crystallized into something like definite form.

(1) Signs of Defective External Secretion.

(a) *Failure of Tryptic Digestion.*—Unaltered muscle nuclei may be found in the faeces after a meat meal, but this is not always easy to do, nor does it help much to stain the muscle fibres and give them with lycopodium grains as a guide. Sahli's method of administering iodine in gelatin capsules hardened by formalin, and testing for iodine in the urine and saliva, cannot be recommended. It is also claimed that trypsin can be demonstrated in normal stools by placing a small quantity of faeces on a gelatin plate, when a small area of digestion will result. Apart from detection of muscle nuclei I have not found these methods much help. A negative result is of no value.

(b) *Failure of Starch Digestion.*—Starch granules may be detected in the stools after unboiled starch has been given. Boiled starch can be digested by saliva. Chronic pancreatitis may cause oxaluria from intestinal fermentation of carbohydrates (Cambridge and Mayo-Robson).

(c) *Failure of Fat Digestion.*—As already explained, the steatorrhoea of pancreatic defect takes the form of an excess of neutral, unsplit fat. This is the most valuable of the tests for deficient external secretion.

(2) Signs of Defective Internal Secretion.

(a) *Diminished Sugar Tolerance.*—This may be expressed in glycosuria, and almost certainly in hyperglycaemia, two hours after a dose of 50 to 100 grams of dextrose. The normal tolerance for dextrose is 150 to 200 grams. It must be remembered, however, that this may be a comparatively late symptom, and that it can be also produced by chronic alcoholism, hyperthyroidism, hyperpituitarism, and probably by hyperadrenalism.

(b) *Diastase Test.*—This has already been discussed. In my opinion it is one of the best tests for recent pancreatic damage.

(c) *Adrenaline Eye Test.*—Loewi showed that if adrenaline is instilled into the eye the pupil does not normally dilate. But if the pancreas is inadequate the pupil dilates in twenty to sixty minutes after one drop of the 1 in 1,000 solution is instilled, and another drop five minutes later. This is based on the antagonism between the adrenals and pancreas, of which there is other evidence. But if there is hyperthyroidism the test may also be positive, as this upsets the balance by reinforcing the adrenals. The dilatation is often an eccentric one. The test may fail if repeated within a week. Taken in conjunction with other signs, it is a simple test of some value and is easily applied. Recently, however, I saw a positive reaction in a case of acute appendicitis.

(3) Signs of Pancreatic Disintegration.

(a) If pancreatic lipase escapes into the circulation it can be found in the urine by the ethyl butyrate method (Opie).

(b) A pentose may sometimes be found in the urine from the breakdown of pancreatic nucleoproteins. This is also the

basis of Cambridge's test, which, however, does not seem to be very much relied upon at the present time.

To sum these tests up: If the adrenaline eye test and the diastase test are negative it is seldom worth while to undertake more elaborate investigations. If they are positive, and there is excess of unsaponified fat in the stools, it is very suggestive of pancreatic disease. If there are also muscle nuclei in the stools, it greatly strengthens the diagnosis. If all these signs are present in addition to glycosuria, the diagnosis is almost certain.

But here, and still more with the liver tests, clinical evidence must not be neglected. When Falstaff asked his page, "Sirrah, you giant, what says the doctor to my water?" the boy replied, "He said, Sir, the water itself was a good healthy water; but for the party who owned it, he might have more diseases than he knew for." I think I know that doctor; entrenched in the laboratory, he is quite prepared, without seeing the patient, to diagnose the existence of many more diseases than the medical attendant ever "knew for" or even suspected. The reaction against this was shown in a recent discussion on renal tests, when several surgeons expressed their willingness to abide by clinical signs alone. I am neither so bold nor so sceptical, but I would urge that these laboratory tests are still themselves on trial; and that the ultimate diagnosis must rest on the clinical as well as the biochemical findings.

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THE USE OF RADIUM IN THE TREATMENT OF DISEASE.

BY

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IN CHARGE OF RADIUM TREATMENT AT THE EDINBURGH ROYAL INFIRMARY.

IN a previous paper published in this JOURNAL (January 20th, p. 100) I discussed the dosage of radium; I now desire to deal briefly with the principal conditions in which radium has been found useful in the Edinburgh Royal Infirmary. They include malignant disease, exophthalmic goitre, spleno-medullary leukaemia, Hodgkin's disease, keloids, and naevi.

The records show that radium has been chiefly used for malignant disease, and on the whole with encouraging, and in some cases with excellent, results. As cases of undoubted malignant disease, confirmed by operation and pathological examination, which remain perfectly well for more than seven years after the primary treatment are relatively rare, I quote the following case of recurrent sarcoma:

A woman, aged 49, recommended by Dr. MacLagan of Ayrton, had developed sarcoma four years before. Several operations for the removal of the growth were unsuccessful. She was admitted to the Royal Infirmary by Mr. Miles on July 15th, 1915. A large nodular mass projected in the left suborbital region; it interfered with vision and was adherent to the maxilla. Pathological examination showed that it was a large spindle-celled sarcoma.

As Mr. Miles considered the tumour inoperable, radium treatment was recommended. By internal and external applications a dose of 5,180 milligram hours was given. In November, 1915, a further external dose of 5,180 milligram hours was given. During the applications the growth diminished markedly. In February, 1916, the tumour had greatly shrunk and was movable; it had been fixed before. The patient was better, stronger, and could see normally. The condition had so much improved that Mr. Miles removed what was left of the growth; this was followed by a prophylactic dose of 4,120 milligram hours. In November, 1916, the growth had disappeared and Mr. Miles could detect no sign of recurrence. Seven years have now elapsed since the radium treatment was begun, and Dr. MacLagan writes on January 19th, 1923: "The patient keeps well without any trace of recurrence."

Of malignant affections, rodent ulcers, epitheliomata, lympho-sarcomata, spindle-celled sarcomata, malignant disease of the cervix, sarcomata of the nasal passages, and of the non-malignant affections, exophthalmic goitre, early keloids, and certain naevi are, in my experience, very amenable to radium treatment. They might be termed first-class subjects, because they admit under favourable conditions of actual cure. Under second-class subjects—meaning thereby conditions which may be ameliorated but in which a cure can rarely be expected—might be placed carcinomata, lymphadenomata, and spleno-medullary leukaemia.

Small rodent ulcers not affecting the mucous membrane or bone are easily cured by a dose of from 500 to 800 milligram hours through a filter of silver, 1½ mm. thick. A much smaller dose would suffice to cause the ulcer to heal over, but it would probably recur. Rodent ulcers at the side of the nose where the alae nasi join the cheek are more refractory; so too are those affecting the ear and just below it. Unless completely cured by the first applications they tend to become radio-resistant and further exposures may do harm.

Small epitheliomas of the lip are quite amenable to surface applications. I have had tubes prepared with an eyehole at each end so that they can be sutured by both ends to the lip and maintained in close apposition to the growth for the necessary time. When the floor of the mouth, tongue, or fauces are attacked the condition is difficult to benefit materially by radium.

Of all new growths the most susceptible to radiations are the lympho-sarcomata. They melt away in a surprising manner but tend to recur or form metastases. Sarcomas affecting the nasal passages are favourably influenced by radium. The writer has had cases which have remained free from the disease for many years and still are free.

Much experience has been gained in recent years regarding the use of radium in gynaecology, but I must limit myself in this article to a few general remarks. In malignant disease of the external genitals treated by radium the prognosis as a rule is bad; in early and limited disease of the vaginal wall the prognosis seems better, and I have seen one complete cure. It is in early malignant disease of the cervix that the best results are obtained; all observers are agreed upon this. Big doses of 6,000 to 10,000 milligram hours should be given, and at the first treatment. Smaller doses repeated are a mistake. Recurrence, after a longer or shorter interval, is, however, the rule, because of the difficulty of efficiently raying the more distant portions of the disease. Few cases are sent for radium treatment which are not in an advanced condition; even in these cases, however, some improvement is always observed both locally and generally. Pain is relieved, discharges cease, ulceration heals, and the patient gains in general health, strength, and weight. An important question is, How far does the beneficent activity of radium extend? Professor Bumm found in *post-mortem* examinations of the radiated cervix that cancer cells were only destroyed to a distance of three centimetres from the radiating source. It must, however, be remembered that the sphere of beneficent activity would depend upon the length of the exposure as well as upon the quantity of radium—the longer the exposure the greater the cumulative effect upon outlying cells; moreover, those cancer cells, which appeared to Professor Bumm to be normal, may yet have been rendered incapable of proliferation. Wassermann radiated small bits of mouse cancer *in vitro*. In certain experiments the tumour retained its vitality when inoculated, but did not grow. He concluded that the rays did not kill the cancer cells, but stopped their power of proliferating.¹

Exophthalmic goitre is a condition for which in recent years radiation has been found consistently useful. The writer has now treated with radium upwards of 200 cases, and with two exceptions all derived more or less benefit both in their general condition and special symptoms. Thus the patients regain strength, put on weight, and lose the tired feeling, and at the same time the tachycardia, tremor, and breathlessness are diminished and may disappear altogether. Not much change need be expected in the size of the thyroid or in the exophthalmos, except in early cases. It is well to warn patients of this lest they suffer disappointment; but operative measures might now be considered, to reduce the size of the gland, both because its vascularity is diminished and because the patient is better able to stand an operation. A dose of 300 to 500 milligram hours, properly screened so as to avoid injury to the skin, may be given to each lobe, to the isthmus, and over the thymus. The latter organ should not be neglected. I have had cases which were somewhat refractory so long as the applications were confined to the thyroid but which yielded rapidly when the thymus was exposed.

Under second-class subjects recurrent scirrhus nodules, even when attached to or growing from the bone, will disappear; but they recur. Carcinoma of the rectum is refractory except in limited annular strictures, where, by placing tubes inside the stricture considerable benefit may follow. In Hodgkin's disease amelioration may be expected by applications over the glands or by burying tubes inside them. In

spleno-medullary leukaemia, by exposures over the spleen it will be reduced in size, the white blood corpuscles diminished, and the general health improved; but in a few months the patient will return with a recurrence; this will again yield to treatment, but will be followed by another recurrence, and each recurrence requires larger doses, and in time the patient succumbs. The following case with graph illustrates the fall in white blood corpuscles following the application of radium.

A man, aged 32, suffering for the last nine months from spleno-medullary leukaemia, was recommended by Professor Gulland for radium treatment in April, 1921. The spleen was considerably enlarged but did not cross the middle line. The white blood corpuscles numbered 310,000. He was given a dose of 3,000 milligram hours, screened by 1½ mm. of silver over the spleen. This produced a good effect, the spleen decreased, and in two months, when he was discharged, the white blood corpuscles numbered 9,600.

For four months he remained fairly well, but was then readmitted; the spleen had crossed the middle line and was also lower down. The white blood corpuscles had increased to 316,000. A dose of 5,120 milligram hours was now given under the same conditions as the previous one. In a fortnight the white blood corpuscles numbered 136,000 and he was discharged.

He had no further treatment until June, 1922, when the spleen was found to be just over the middle line and the white blood corpuscles numbered 250,000. A dose of 4,800 milligram hours was given. In a week's time he felt much better, the white blood corpuscles had fallen to 152,500, and he was discharged.

In three months (November, 1922) he was readmitted in a worse condition; the spleen was hard and reached to within one inch of the umbilicus, the liver was enlarged and painful, and the white blood corpuscles were up to 300,000. He was now given a larger dose, amounting to 9,000 milligram hours. In a week he felt better, and the white blood corpuscles had fallen to 80,000. He was able to return home, but a month later died suddenly.

In the treatment of exophthalmic goitre and of naevi in children by radiation, radium has the following advantages as compared with the x rays: (1) Absolutely constant emission of rays, and therefore exact dosage possible. (2) Greater penetration of its rays, so that the deeper parts are reached. (3) Saving of time, as the radiation is maintained night and day until the necessary dose has been administered. (4) No noisy, exciting apparatus, so that the treatment can be applied at the bedside without in any way alarming or disturbing the patient.

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SUDDEN DEATH FROM ANAPHYLACTIC SHOCK.

BY

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In my capacity of medical officer to a girls' school in Simla I was called, in October, 1922, to see a sick girl; the condition of the throat was suggestive of diphtheria, and a throat swab confirmed the suspicion. I advised the head mistress that all contacts be given a prophylactic hypodermic injection of diphtheria antitoxin and be segregated for fourteen days, and that the rest of the school be placed out of bounds. This was agreed to.

The syringe I used for inoculation was one of 10 c.cm. capacity; it was thus capable of holding the contents of several 2½ c.cm. bottles (each containing 2,000 units), and it