scutula at its periphery (Fig. 2). The hairs in this zone were grey and lustreless, and under Wood's light fluoresced along their entire length. A definite "mousy" odour was detectable.

Case 4.—A girl aged 12, the eldest daughter of Case 3, had had crusting of the scalp since she was 6. She presented with several areas of atrophy and alopecia showing peripheral erythema and scaling, and long fluorescent hairs were again seen.

Case 5.—A second daughter of Case 3, aged 8, had suffered from a scaly scalp since shortly after birth. She had received hospital treatment for this during the previous year, but favus had not been suspected. On examination a widespread scaly condition of the scalp and several small scutula were found; long fluorescent hairs were demonstrable with Wood's light.

Case 6.—A third daughter of Case 3, aged 6, was found to have several scaly patches associated with scutula over the vertex of her scalp; within these areas long fluorescent hairs were found.

Case 7.—The twin sister of Case 6 presented no clinical evidence of favus. Careful examination of her scalp under Wood's light revealed two fluorescent hair stumps in the occipital region which showed the characteristic appearances of *T. schoenleini* infection when examined microscopically. The fungus was not grown.

All these patients, except the last, were treated by hair removal with *x* rays. Complete epilation was achieved except in Case 3, in which a few remaining infected hairs required removal with a diathermy needle. No infected hairs reappeared except in Case 5, in which some infected hair stumps developed; these were treated by follicular cauterization. Case 7 was successfully treated by manual epilation of the hairs involved.

Discussion

The familiar characteristics of a typical case of favus of the scalp represent late manifestations of the disease. Scutula, alopecia, and atrophy were present in Cases 3 and 4, in which the disease had persisted for 28 and 6 years respectively, but no alopecia or atrophy occurred in Cases 1, 2, 5, and 6. Broken hairs are rarely found in this disease, though they were the one diagnostic feature in Case 7. Initially the hairs are usually macroscopically normal, but later lack lustre; under Wood's light a dull, greenish fluorescence may be seen along their entire length—an invaluable method of detecting early infection. This feature is useful, too, in distinguishing favus from *Microsporum* infections, in which bright yellow-green fluorescent hair stumps occur, and from other *Trichophyton* infections where fluorescence is lacking. The mild symptoms and signs of this disease and its insidious progress lead to delay in seeking medical advice. The appearances may be unlike typical ringworm and may resemble those of psoriasis, impetigo, seborrhoeic dermatitis, folliculitis decalvans, and sometimes lupus erythematosus and lupus vulgaris. Consequently, failure to prescribe adequate treatment is not uncommon, and local applications prescribed haphazardly may further confuse the clinical picture.

In all doubtful cases, unequivocal evidence of favus can be obtained only by microscopy and culture. Microscopical examination of hairs in potash reveals mycelium and chains of spores within the shafts, and characteristic elongated air-spaces are seen at the sites of degenerated mycelium. Colonies of *T. schoenleini* grown at 26° C. on Sabouraud's agar are deep cream in colour, compact and glabrous, and have an irregularly corrugated surface. Their rate of growth is very slow, taking about three weeks to reach a size sufficient for macroscopic identification. Microscopical examination of the partially submerged growth may reveal characteristic antler-like hyphae after ten days.

Favus is essentially a human infection caused by *T. schoenleini*, and should not be confused with mouse favus, caused by *T. quinckeanum*. When the latter infection occurs in man it produces acute, vesicular, and circinate lesions within a few days. In man, hair infections are rare, and the scutula seen in murine infections do not occur.

Unlike most other varieties of ringworm of the scalp, untreated favus may, as in Case 3, persist beyond puberty into adult life; spontaneous retrogression occurs only occasionally. Treatment is effective if administered before atrophy and permanent alopecia supervene; epilation with *x* rays is accepted as the most satisfactory method of treatment. Examination with Wood's light is necessary in order to detect infected hairs which have not fallen, and to exclude reinfection of new hairs. Local applications are sometimes successful in early cases but necessitate close supervision.

The group of infections in the family living in Kent appeared to be the source of disease in the first case. The fact that so few children were involved in the day nursery is explained by the low infectivity of the fungus. As in the outbreak described, it is a disease of the family rather than of the school. Every effort should be made to trace the source of infection, since the disease may otherwise go unnoticed and cause disfiguration.

Summary

Seven cases of favus of different degrees of severity are reported from the London and Kent areas. Their diagnosis and the identification of the source of infection are described.

Acknowledgment is made to Dr. G. B. Dowling, Dr. R. H. Meara, Dr. H. T. H. Wilson, and Dr. R. J. Cairns for access to their patients, and to Dr. R. W. Riddell for advice and criticism.

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A TABLET TEST FOR BLOOD IN URINE

BY

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Many chemical tests for blood in urine have been described (Caplan and Discombe, 1951), but because they are insensitive or inconvenient none is in general use. The most sensitive are modifications of the *o*-tolidine method, first described by Ruttan and Hardisty (1912); a blue colour results from the oxidation of *o*-tolidine owing to the peroxidase activity of haemoglobin. The modifications previously described include those of Zwarenstein (1949, 1952) and Baron (1951), but all require the use of glacial acetic acid and are therefore unsuitable for use at the bedside. In the test here described the reagents are compounded into a tablet, and it is only necessary to add water.

Experimental

Tablets were made, each containing citric acid, 50 mg.; barium peroxide, 35 mg.; *o*-tolidine, 12.5 mg.; and sodium carbonate, 2.5 mg. If the tablets are kept in a container with a screw cap, and the cap is replaced immediately one is removed, they have been found to retain their full sensitivity for at least twelve months.

Tablet Test.—Various quantities of urine were tried (see Table I), and the following method was selected as giving the best results. One drop of the urine to be tested (0.05 ml. from a teated pipette) is placed on an inch square (2.5 by 2.5 cm.) of filter paper (Whatman No. 1) and allowed to

TABLE I.—*Various Methods of Performing the Test Compared (Time in seconds after moistening the tablet for a definite "positive" to appear)*

Method Used	No. of Red Cells per c.mm.				
	500	50	25	12·5	0
1 drop urine followed by 2 drops cold water ..	40	110	200	240	15 min.
2 drops urine followed by 2 drops cold water ..	35	80	150	180	15 ,,
1 drop urine followed by 2 drops hot water (60° C.)	15	40	110	140	3 ,,
1 drop urine followed by 2 drops urine	60	140	180	200	15 ,,

spread. Then one reagent tablet is placed on the centre of the paper and two drops of cold tap-water are allowed to flow over the tablet. If a significant amount of haemoglobin is present a blue ring develops around the tablet within two minutes; any colour appearing in the paper after this interval and any discoloration of the tablet itself are disregarded.

Microscopy.—The tablet test was used to examine 100 specimens of urine sent to the laboratory for routine investigation, and the results were compared with those of microscopical examination. 10 ml. of urine was centrifuged at 1,500 revolutions per minute for five minutes, and after 9.5 ml. of supernatant fluid had been removed the deposit was examined as an ordinary wet film with the $\frac{1}{6}$-in. (4-mm.) objective; twenty fields were examined and two or more red cells per field was considered abnormal.

Urine Specimens.—Blood from the same volunteer was added to freshly voided urine to produce a series of dilutions from 1:1,000 to 1:1,000,000, giving a concentration of 5,000 to 5 red blood cells per c.mm.

Results and Discussion

The results are shown in the tables, and, unless otherwise stated, all tests were performed by the described method on urine without alteration of *p*H or temperature.

A definite blue colour appears around the tablet within two minutes if the urine contains at least 50 red cells per c.mm. or the equivalent concentration of haemoglobin (150 μg. per 100 ml.). If a smaller quantity is present a blue colour develops after two minutes; and if none is present the tablet and filter paper remain colourless for at least fifteen minutes.

The test is equally sensitive throughout the temperature range 4–37° C. If the urine is heated to 60° C. or boiled, the test is much less sensitive (Table II).

TABLE II.—*Effect of Temperature (Time in seconds after moistening the tablet that a definite "positive" appears)*

Treatment of Specimen	No. of Red Cells per c.mm.				
	500	50	25	12·5	0
Room temperature (20–25° C.)	40	110	200	240	15 min.
60 min. refrigeration at 4° C.	55	110	180	250	15 ,,
60 min. incubation at 37° C.	45	100	180	230	15 ,,
30 ,, ,, ,, 60° C.	100	15 min.	15 min.	15 min.	15 ,,
60 ,, ,, ,, 60° C.	15 min.	15 ,,	15 ,,	15 ,,	15 ,,
½ min. boiling	80	15 ,,	15 ,,	15 ,,	15 ,,
1 ,, ,, ...	15 min.	15 ,,	15 ,,	15 ,,	15 ,,

TABLE III.—*Influence of pH (Time in seconds after moistening the tablet that a definite "positive" appears)*

*p*H	No. of Red Cells per c.mm.				
	500	100	50	25	0
10	15	90	180	300	15 min.
9	15	90	180	300	15 ,,
8	15	60	90	240	15 ,,
7	25	60	100	140	15 ,,
6	30	60	100	120	15 ,,
5	35	60	120	150	10 ,,
4	40	70	150	200	8 ,,
3	40	80	150	200	8 ,,

Variation of urinary *p*H within the range of *p*H 5–8 has no significant effect on the sensitivity, which is, however, slightly reduced if the urine is either very alkaline or very acid (Table III). This can be avoided, if necessary, by adjusting the *p*H until just acid or alkaline to litmus. In practice it is of little consequence.

If the ascorbic acid content of the urine being tested is high some false negatives may be encountered (Table IV). This is of little importance, however, for, unless ascorbic acid is being administered, the urinary concentration is rarely above 5 mg. per 100 ml. In order to achieve 10 mg. per 100 ml. it was found necessary to give 200 mg. daily for four days; and to achieve 100 mg. per 100 ml., 800 mg. daily for four days.

TABLE IV.—*Effect of Ascorbic Acid (Time in seconds after moistening the tablet that a definite "positive" appears. All specimens incubated for one hour at 37° C. before testing)*

Ascorbic Acid, mg. per 100 ml.	No. of Red Cells per c.mm.					
	5,000	1,000	500	50	25	0
0	5	20	35	110	200	15 min.
5	5	20	40	120	240	15 ,,
10	35	80	100	300	15 min.	15 ,,
25	40	80	120	15 min.	15 ,,	15 ,,
50	40	100	240	15 ,,	15 ,,	15 ,,
100	40	120	280	15 ,,	15 ,,	15 ,,

False-positive results occurred if the urinary concentration of iodide was greater than 20 mg. per 100 ml., a level that is obtained if the patient is taking Lugol's iodine, 10 minims (0.6 ml.) three times daily, or such mixtures as mist. stramon. et pot. iod. *N.F.* ½ oz. (14 ml.) three times daily. In such cases the urine should be boiled for one minute and immediately retested. If the colour is due to iodide it will now be deeper, whereas if due to blood a "negative" will be obtained.

Pus (unless red cells were also present), bromides, and sweat gave negative results, but any oxidizing agent will also give a false positive.

The desirable sensitivity of a chemical test for blood in urine depends upon the number of red cells that may be excreted by normal persons. It has been estimated by Larcom and Carter (1948) that up to 2 red cells per c.mm. may be present in the urine of normal adult males. Comparable figures for normal females are not available, but from the results obtained with the tablet (see below) it would appear that the figure may be ten times as great.

It has been shown that the tablet test will detect 50 red cells per c.mm. To demonstrate the rarity of significant haematuria below this level, and to show that a more sensitive test would give positive results with many normal urines, three separate series of experiments were made.

Series I.—One hundred specimens of urine sent to the laboratory for routine investigation were tested with the tablet and 42 gave positive results. Confirmation was obtained by microscopy of the centrifuged specimen. Neither false positives nor false negatives were encountered.

Series II.—Ordinary urine specimens from 100 male and 50 female patients, without known haematuria, were tested with the tablet and 13 gave positive results. In every case further investigation showed a pathological cause.

Series III.—It was found that, when 12.5 ml. of urine to which had been added 5 red cells per c.mm. was centri-

TABLE V.—*To Demonstrate that Urine from Normal Females may Contain 5–50 Red Cells per c.mm. (Series III in text)*

Before Concentrating				After Concentrating			
Male		Female		Male		Female	
Pos.	Neg.	Pos.	Neg.	Pos.	Neg.	Pos.	Neg.
0	50	0	50	0	50	32	18

The concentration of red cells in the urine specimens was increased tenfold by centrifuging 12.5 ml. at 3,000 revolutions per minute for ten minutes and removing 12 ml. of supernatant fluid.

fuged at 3,000 revolutions per minute for 10 minutes, and 12 ml. of supernatant fluid was pipetted off, the deposit gave a positive result with the tablet and presumably contained at least 50 red cells per c.mm. One hundred ordinary specimens, which on routine microscopy were not abnormal, were treated in this way and the deposits tested with the tablet. The results showed that urine from normal females frequently contains between 5 and 50 red cells per c.mm. (Table V).

Conclusion

The tablet has been used during the last six months as a routine test in a general medical ward and in the casualty department of a teaching hospital. In no case has haematuria been found by the pathological laboratory when the tablet had given a negative result. The tablet has been found particularly valuable as corroboratory evidence in a clinical diagnosis of cystitis or pyelitis, and as a daily test to discover when known haematuria ceases. It has also been found useful as an additional safeguard to prevent overdosage with anticoagulant drugs.

Summary

A tablet to detect the presence of blood in urine is described. The test is sensitive to a minimum concentration of 50 red cells per c.mm. or of 150 μg. of haemoglobin per 100 ml. of urine. It is reliable and simple to perform.

The influence of *p*H and temperature is described, and has been found to be small.

It is considered that the tablet is useful as a screening test and to decide when known haematuria ceases.

I wish to thank Professor C. H. Gray and Dr. Arthur Jordan for their advice and encouragement, and Mr. J. E. Cocking, chief pharmacist at Sheffield Royal Hospital, for help in preparing the tablets. While this work was in progress it was discovered that Messrs. Ames Co. Inc. had prepared a similar tablet. This tablet has been examined and found identical in all its properties, except that a negative remains colourless for only five minutes. It is hoped that their product will be available soon. My thanks are due to Messrs. Ames Co. (London) Ltd. for their co-operation and for supplies of both their own and my tablet.

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Medical Memoranda

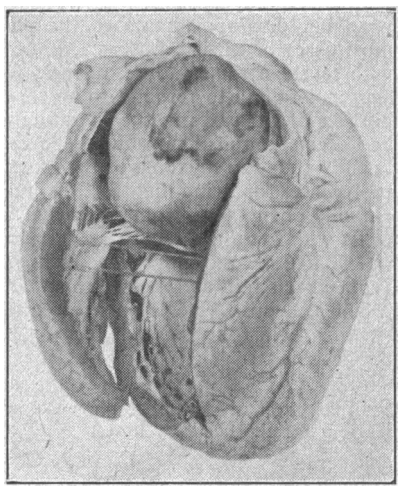
Myxoma of the Auricle

Upwards of one hundred cases of myxoma of the auricle have been reported in the literature; the present case is described not so much on account of its unusual features as to stress once again the importance of keeping in mind the possibility of a cardiac neoplasm. A diagnosis prior to necropsy is still virtually impossible, but the time must surely come when this condition will be revealed at thoracotomy in a case mistakenly diagnosed as mitral stenosis.

Case Report

A well-nourished man of 35 was first seen in February, 1953, complaining of dyspnoea on exertion for the past month. He had had a brief attack a year before. He was troubled by nausea and fairly frequent vomiting, loss of weight, and a sensation of great weakness. There was no history of rheumatic fever. He had a slight malar flush and slight cyanosis; the pulse was small and regular; there was no thrill, and the apex beat was 3½ in. (9 cm.) from the midline in the fifth space. A faint blowing systolic murmur was heard at the apex, and the faintest diastolic rumbling murmur was heard just inside the apex only when the patient was lying on the left side. There was no evidence of congestive failure. Radiologically the transverse diameter of the heart was increased and its left border straightened. Screening with a barium swallow showed moderate simple enlargement of the left auricle. Neurofibromatosis was also present in the form of small nodules on arms and back, with café-au-lait patches. A diagnosis of mitral stenosis was made: the prognosis was considered to be favourable.

He was seen again a month later, by which time the vomiting had stopped and the diastolic murmur had become inaudible. He seemed well enough to carry on with his job as a fitter. On April 30 he was still at work. The systolic murmur had become much louder.



Photograph showing the tumour.

On July 23 he was admitted to hospital in cardiac failure with gross oedema of the ankles, raised neck veins, hepatomegaly, and an apex beat 4½ in. (11.4 cm.) from the midline. The low-pitched diastolic murmur had reappeared and triple rhythm was apparent. He had had a "chill" in May and on getting up from bed after five weeks had first noticed that his ankles were swollen. He was treated with digitalis and mercurial diuretics but failed to respond, and after he had been ten days in hospital we began to doubt the accuracy of the diagnosis, casting about in our minds for an explanation of such acute cardiac failure without any new features in the heart sounds, apart from the triple rhythm, and without evidence of pericarditis or a recurrence of acute rheumatic carditis.

An *x*-ray film of July 29 showed gross generalized cardiac enlargement, small pleural effusions, and the appearance of an infarct in the right lower lobe. Little did we realize the true state of affairs. Steady deterioration, in spite of treatment, ended in death on August 16, the pulse remaining regular, and the anasarca increasing day by day.

Necropsy Report

External Examination.—The body was that of a young man showing gross oedema from the waist downwards. There were scattered café-au-lait spots and occasional neurofibromatous nodules in the skin. Some cyanosis was present.

Internal Examination.—C.V.S. : There was excess clear yellow fluid in the pericardial sac. The heart was enormously enlarged, mainly from hypertrophy of the left auricle, right auricle, and right ventricle. The myocardium was somewhat flabby but free from obvious lesions. The valves were normal except for some incompetence due to the dilatation. The whole of the left auricle was occupied by a shiny, sessile tumour measuring 7.5 by 6 by 4 cm. attached to the interauricular septum above the rim of the annulus ovale (see photograph). So tightly was the wall of the auricle stretched over the tumour that it was impossible to approximate the cut edges after the tumour had been exposed. The main vessels were normal, but the aorta appeared hypoplastic. *Respiratory System:* The larynx, trachea, and main bronchi contained blood-stained mucus. Both lungs showed numerous large infarctions and were grossly oedematous. About one pint (570 ml.) of clear yellow fluid was present in each pleural cavity. There was some fibrinous deposit over