Buerger's original contention that the disease occurred most frequently in the Jewish race has long been disproved. Pathologists have often commented upon the fact that atheromatous changes are sometimes found in the arteries of young adults who come to necropsy as a result of fatal accidents and other conditions which do not primarily affect the cardiovascular system. If proof were required that such changes can be the basis of obliterative arterial disease it is amply provided by the studies of Newman (1946, 1951) and Poe (1947) on cases of coronary artery occlusion in young adults. Newman reviewed 100 cases of coronary occlusion which occurred in patients under 35 years of age, and found that in all of them the pathological changes in the coronary arteries were similar to those found in older patients—namely, atheroma. What happens in the coronary arteries may also occur in the arteries of the limbs, and therefore the possibility of arteriosclerosis obliterans, the pathological basis of which is atheroma, cannot be dismissed merely on account of the patient's youth. Involvement of the arteries of the upper limbs is not uncommon in cases of arteriosclerosis obliterans. The two criteria which remain as reliable indications for a diagnosis of thrombo-angiitis obliterans are its constant association with tobacco-smoking and its predilection for the male sex. The value of these criteria is lessened by the fact that smoking is an almost universal habit, and that, except in diabetics, all forms of obliterative arterial disease are commoner in men.

In its classical form thrombo-angiitis obliterans presents as an acute or episodic type of obliterative arterial disease occurring in a young adult male who smokes; it begins in the arteries of the lower leg or foot, may be preceded or accompanied by superficial migratory phlebitis, and is often associated with fungus infection of the feet. In cases of this type pathological examination of the affected arteries or veins almost invariably reveals lesions similar to those found by Buerger in his original cases. Many cases do not conform to this classical picture, and the clinical diagnosis can then be only a tentative one. Nevertheless, as Buerger (1924) states, "a careful clinical study of thrombo-angiitis obliterans will dissipate all doubt as to the possibility of separating this disease, as a clinical entity, from the other types of organic vascular disease as well as from all those neurogenic varieties of vasomotor and trophic disorders that may be clinically confounded with it."

Summary

The criteria necessary for a clinical diagnosis of thrombo-angiitis obliterans are reviewed with particular reference to a personal series of 85 cases. The view is put forward that the diagnosis should be based principally upon knowledge of the natural history of the disease and that such factors as race, age, and involvement of the arteries of the upper limbs are of secondary importance.

The majority of the patients were under the care of Sir James Learmonth, to whom I am indebted for the opportunity to study them. I wish to thank Dr. C. C. Burt for help in case-taking and for providing me with follow-up data on many of the cases.

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SIMPLIFIED METHOD OF DRUG TREATMENT FOR THYROTOXICOSIS USING A UNIFORM DOSAGE OF METHYL- THIOURACIL AND ADDED THYROXINE

BY

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The thiouracil drugs are now used widely both for the pre-operative management and for the prolonged medical control of thyrotoxicosis. The use of these drugs over long periods carries two potential disadvantages; first, the possibility of overdosage, which will cause further goitre enlargement and worsening of the eye signs along with subclinical or obvious myxoedema; and, secondly, the remoter risk of agranulocytosis or other lesser toxic effects. It is known from animal experiments that goitrogenesis during antithyroid drug administration depends on the increased output of pituitary thyrotrophin which is induced when the level of thyroid secretion is lowered, for it can be avoided by giving enough exogenous thyroxine (Purves, 1943; Astwood *et al.*, 1943) or by hypophysectomy (Griesbach *et al.*, 1941). The worsening of the eye signs of Graves's disease, which may also be seen as a manifestation of overdosage during thiouracil treatment, probably depends on the same mechanism. Thus the risks of thiouracil overdosage are those of its over-suppression of thyroid function.

Clearly these risks of overdosage should be avoidable either by adjusting the thiouracil dosage to levels just short of those which over-suppress thyroid function or merely by daily supplemental administration of thyroxine or thyroid. The former is the basis of the usual clinical practice of adjusting the thiouracil dosage to the patient's individual requirements; but this requires frequent and careful supervision, which can readily worsen the nervous state of such patients. We have therefore attempted to evolve a simpler procedure by giving thyroxine with the methylthiouracil and so adopting the latter method of avoiding the risks which may follow undue suppression of thyroid function. A uniform basic dosage scheme giving both drugs should suffice, unmodified, for most cases if it provided enough methylthiouracil to block thyroid hormone production

adequately in all cases and also supplied enough thyroxine for the normal daily needs of thyroxine. If the basic or standard dosages were correctly chosen the drug control should consist simply in watching the goitre size and adding thyroxine if goitre enlargement appears; while, to the occasional cases in which thyrotoxicosis does not seem controlled by this basic dosage, extra methylthiouracil could be given without any added risk of goitrogenesis. We have combined the basic dosage scheme into a single pill, so that one methylthiouracil co. pill is given thrice daily during the maintenance phase; and extra thyroxine is prescribed if goitre enlargement appears.

Present Investigation

A trial of this procedure seemed necessary to ascertain not only the optimal dosage schedule and whether it avoided the risks of thiouracil overdosage, but also whether its avoidance of over-suppression of thyroid function altered the frequency of permanent remissions after termination of the treatment. We have analysed the preliminary results of this treatment in our first 51 patients, particularly as regards the avoidance of goitrogenesis and of worsening of the eye signs during treatment, and the remission rate obtained after completion of treatment, comparing these with the published results of other methods of prolonged thiouracil treatment.

Selection of Cases.—This analysis concerns all our 51 patients (10 male, 41 female) who started this prolonged thiouracil treatment before August, 1951, and completed it before February, 1952; in all patients the diagnosis of thyrotoxicosis had first been confirmed by radio-iodine excretion test (Fraser *et al.*, 1952). All cases have been followed for one year or more after treatment ceased. The ages of these patients ranged from 11 to 68 years, with an average of 37.7 years. At first all cases of thyrotoxicosis were treated with methylthiouracil co. unless the patient expressed a preference for surgery. Later, radio-iodine treatment was used for all patients over 45 years of age and for a few younger subjects judged to have a life expectation of less than 20 years. Also, with increasing experience, surgical treatment was preferred for young patients with an initially large or nodular goitre or with evidence of a marked allergic diathesis, and for those patients considered insufficiently reliable for a prolonged drug treatment which needs precise regularity.

Methods

For the treatment two strengths of methylthiouracil co. pills were used—100 and 50 mg. During the evolution of this procedure there has been a change in the amount of thyroxine added to these pills, and so in the need for added thyroxine. We now believe that the new methylthiouracil co. pills, containing 0.1 mg. of L-thyroxine against the 0.075 and 0.05 mg. of the "old" methylthiouracil co. pills, provide the optimal added thyroxine (0.1 mg. t.d.s.) for the basic maintenance dosage schedule; clearly, giving the same dosage of these two drugs separately should provide equivalent control.

During the induction phase the patients received two 100-mg. methylthiouracil co. pills thrice daily until they were considered to be restored to a euthyroid state; this phase usually lasted six to eight weeks. They were then put on a maintenance dosage of either 50 mg. or 100 mg. (usually the former) of methylthiouracil co., taken in each case three times daily. Additional thyroxine was given at the first sign of enlargement of the thyroid gland and sometimes if the eye signs were initially severe.

Most cases were treated as out-patients, but in a few instances treatment was begun in hospital. Patients were seen at intervals of one to three months, when progress was assessed mainly from the body weight, the state of the circulation, the eyes, and the size of the thyroid gland. All patients were warned to report to hospital if a sore throat or other illness supervened. A white-cell count was done at the start of treatment but was not repeated unless any such symptoms developed.

The course of treatment was for a minimum of nine months, but was prolonged if the patient's physical state was unsatisfactory or if worries or stress were known to exist. Patients completing the course were treated for one month with thyroxine, 0.1 mg., and potassium iodide, 1/6 gr. (11 mg.) daily, the former to depress thyrotrophic hormone production during the restoration by the latter of the thyroid's depleted iodine store. All patients were reassessed clinically at three and twelve months after treatment, on one or both of which occasions a radio-iodine test was performed.

Results

The subsequent analysis concerns the 32 patients who completed a full course of nine months' treatment; 19 failed to complete a full course for the following reasons:

Agranulocytosis (later recovered)	3
Patient ceased attending	9
Other treatment preferred	7
Chosen for I^{131} therapy	3
Surgery for large goitre	3
Surgery because of cardiac state	1

Status After Ceasing Treatment (Remission Rate).—

The results are shown in Table I; all of the 18 remitted cases have been observed for 12 or more months. They

TABLE I.—Clinical Status Six Months or More after Finishing Prolonged Treatment with Methylthiouracil Co.

Well, and normal I^{131} test	9 (28%)
" " " I^{131} test, but residual eye signs	6 (19%)
" " " but abnormal I^{131} test	3 (9%)
Thyrotoxicosis relapsed	14 (44%)
Total	32

appear to be quite well and free from clinical signs of thyrotoxicosis, though the radio-iodine test suggested that three had hyperactive thyroids. One of these patients also had nervous symptoms, associated with an unhappy domestic situation. In six patients there were residual eye signs—two had minor ocular paresis and four had only slight degrees of exophthalmos or lid retraction. Of the 14 (44%) patients who relapsed, six did so in the first six months, six between 6 and 12 months, and two later. It seemed that the relapsed cases had had a longer illness before treatment, that they included more patients with

TABLE II.—Goitre Size and Eye Signs During and After Prolonged Treatment with Methylthiouracil Co.

Grading Before Treatment:	Goitre Size			Eye Signs of Graves's Disease			
		Less Than 2½ Times Normal (21)	More than 2½ Times Normal (11)		Severe (6)	Mild (17)	Nil (9)
Temporary change during treatment	Enlargement controlled by extra thyroxine	(7)	(7)	Possible worsening	(2)	(1)	—
Status on finishing treatment	Smaller than initially, and: Less than 2½ times normal	20	5	Nil	—	13	9
	More than 2½ times normal	—	6	Mild (lid retraction or mild exophthalmos)	3	3	—
	Larger than initially	1	—	Severe: Proptosis only	—	1	—
				Muscular paresis	3	—	—
				Significant worsening	—	—	—

nervous or unstable personalities, and that they had more often (in 9 out of 14) had some persisting cause for anxiety during the period after ceasing treatment.

Control of Goitre Size.—As is shown in Table II, the size of the goitre increased temporarily during treatment in almost half the cases (14 out of 32), but when extra thyroxine was given the added enlargement almost always subsided. In only one case did the goitre size at the end of treatment exceed that noted at the start of treatment, and in 25 out of the 32 cases the goitre was then judged to be less than two and a half times normal size. Among the 19 patients not completing a full course of treatment there were three who had surgical treatment for a large goitre. All of these patients had initially large goitres which had at first further enlarged during thiouracil treatment; one case is of particular interest in that the goitre continued to enlarge despite the administration of L-thyroxine totalling 0.6 mg. daily. After surgical removal the thyroid in this case was found to weigh 300 g. This was the only case in the whole series in which thyroxine up to this dosage failed to prevent further goitre enlargement.

The Eyes During Treatment.—Eye signs were initially present in 23 patients: in 17 they were mild and in six severe (that is, including ocular palsy and/or obvious conjunctival congestion). As shown in Table II, in no case did eye signs develop or worsen significantly during treatment. The possible worsening noted at some stage in three patients was only temporary and slight. At the end of treatment relatively minor eye signs persisted in all six of those patients who had originally had severe eye signs and in four other patients. In six of these ten cases this was either mild exophthalmos or lid retraction, though two still had some diplopia and one had slight ptosis. Extra thyroxine was given to three of the patients with initially severe eye signs, so that their total daily thyroxine ranged from 0.3 to 0.6 mg.

Adequacy of Basic Dosage Schedule.—**Suppression of Thyrotoxic Features.**—During treatment these features were controlled in all patients, though in a few the usual maintenance dose of 50 mg. of methylthiouracil co. three times a day had to be increased to 100 mg. to achieve this. In one patient there was at first some doubt whether control was satisfactory; but as the symptoms persisted despite 7.2 g. of methylthiouracil daily it was concluded that these symptoms were of nervous and not thyrotoxic origin. **Use of Extra Thyroxine.**—At some stage 18 patients were given 0.1 to 0.3 mg. of additional thyroxine daily, apart from that included in the old compound tablets. This was prescribed in 15 instances because of goitre enlargement and in three because of severe eye features. In three patients this additional thyroxine was continued because pregnancy supervened. Extra thyroxine was given for less than three months in five cases and for longer periods in the remainder. Only five patients had received an average daily total of more than 0.3 mg. of L-thyroxine, which is the amount they would have received using only the new compound tablets now in use.

Control During Pregnancy.—Pregnancy occurred successfully in three patients. One patient, however, gave birth to a child with a large goitre, but this subsided rapidly with small doses of thyroxine for three months, and the child has since developed normally. The mother in this case had been maintained throughout most of her pregnancy on methylthiouracil co., 100 mg. t.d.s. (which included 0.225 mg. L-thyroxine daily) with 0.1 mg. t.d.s. of extra thyroxine until the last four weeks before delivery, when by accident the extra thyroxine was omitted. After this experience we have been careful to maintain pregnant patients on small doses of methylthiouracil co. (usually 50 mg. t.d.s.) with relatively large doses of added thyroxine (usually 0.3 mg. daily), and the results have been satisfactory. Only one child was breast-fed, and during the period of lactation the mother was maintained on methylthiouracil co., 50 mg. t.d.s., with 0.3 mg. of extra thyroxine daily.

Discussion

This preliminary report has been made on a small series because it suggests that control of thyrotoxicosis is possible by this fairly standardized and simple procedure, using methylthiouracil combined with thyroxine.

With one exception, which required surgical treatment, goitrogenesis has been adequately averted—provided extra thyroxine was prescribed if indicated. In no cases have the eye signs significantly worsened during or after therapy. Very few other reports give more than brief mention of the effects of prolonged antithyroid drug treatment on the goitre size and eye signs. Williams (1946), however, found that thyroxine was necessary because of goitrogenesis or worsening of the eye signs in 31 out of 247 cases treated with thiouracil; and among those patients receiving prolonged treatment the goitre enlarged in 7%. Dunlop and Rolland (1950) found that slight goitre enlargement "was not uncommon" during methylthiouracil treatment, while Frisk (1948) reported enlargement in 50% of cases. Obviously the frequency of goitre enlargement will depend on the degree of thyroid suppression attained. Astwood (1948) has suggested that it is better to keep the patient at a slightly hypothyroid level; if this is attempted goitrogenesis will probably be a very definite problem.

With this group of cases extra thyroxine was often necessary (in 14 out of 32) to avoid goitrogenesis. Our current practice, however, is to give a larger basic or standard dosage of thyroxine, to provide 0.3 mg. a day. The compound tablets now each contain 0.1 mg. of L-thyroxine with either 100 mg. or 50 mg. of methylthiouracil, so that either strength given thrice daily should provide a maintenance dosage. With this modified or "new" standard dosage extra thyroxine is rarely needed. There should be no hesitation about giving this extra thyroxine (0.1–0.3 mg. a day) in doubtful cases. The thyrotoxic features have usually been controlled with the 50 mg. of methylthiouracil co. thrice daily and always with the 100 mg. strength thrice daily. Thus the compound thiouracil tablets have provided satisfactory control in every case, and the use of these tablets does simplify the treatment. Ordinarily the patients follow a routine schedule and are maintained on 50 mg. of methylthiouracil co. three times a day. If the control of thyrotoxicosis then seems defective this is changed to the stronger compound tablets, 100 mg. three times a day, the only other dosage control required being to give extra thyroxine if goitre enlargement is noted. In a straightforward case there is no necessity for the patient to be seen more often than at three-monthly intervals during maintenance treatment.

When one considers the relapse rate there is less cause for satisfaction, though our results are probably similar to those achieved with the usual prolonged thiouracil treatment. Admittedly the results reported in the literature vary widely, and it is difficult to know which figures to choose for comparison. Starr *et al.* (1949), using propylthiouracil, failed to achieve a single lasting remission, whereas Frisk (1948), using methylthiouracil, claims a remission rate of 90%, though some of his patients had been followed for only six months after treatment, and several patients had required two courses of treatment. Williams *et al.* (1947) and Dunlop and Rolland (1950) followed patients for a year or more after prolonged thiouracil treatment, and reported remission rates of 46% and 47% respectively, which compares with our remission rate of 56%. Other recent reports claim remissions in 41% (Stirrett *et al.*, 1952), 70% (Murray, 1950), 85% (Astwood, 1948), and 88% (Iversen, 1951, but here relapses within six months of stopping treatment were excluded).

Final evaluation of these drugs must await further experience; possibly both case selection and variations in the technique of using thiouracil may have contributed to the varying results. A drug treatment is needed for those

patients who do not desire surgery and cannot have radio-iodine, and is used with many other patients for varying reasons.

We would suggest that the procedure outlined above, while simplifying the management of such cases, diminishes the risk of goitrogenesis and of worsening of the eye signs without impairing the therapeutic effects.

We should expect the procedure to be similarly suitable for preparing the thyrotoxic patient for operation, provided iodide is given in addition over the last two weeks. We are at present investigating the latter method.

Summary

A preliminary report is made of the practicability of treating thyrotoxicosis with both methylthiouracil and thyroxine to simplify the control of dosage. The results were apparently as satisfactory as the published results obtained with antithyroid drugs alone.

A basic standard dosage was used (enough methylthiouracil to control all but exceptional thyrotoxicosis and the minimal normal thyroxine requirements—that is, methylthiouracil, 50 mg., and L-thyroxine, 1 mg., thrice daily); this standard dosage, unaltered, suffices for the maintenance treatment of most patients, provided signs of goitre enlargement are sought and when seen are countered by giving additional thyroxine. If the adequacy of the control of thyrotoxicosis is doubted the methylthiouracil dose can be increased.

Among the first 32 cases completing a course of nine or more months of such treatment, in 18 (56%) the thyrotoxicosis was still fully remitted one year later, in no case had the eye signs significantly worsened, and in all except one the goitre size had decreased.

We are indebted to Glaxo Laboratories Ltd., who supplied the pills for this trial.

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Aided by a grant from the National Institute of Mental Health of the United States Public Health Service, the Yale Centre of Alcohol Studies recently surveyed current American work on alcoholism. Their findings, originally printed in the *Quarterly Journal of Studies on Alcohol* (1952, 13, 421–511), have now been published as a separate booklet entitled “Alcoholism, 1941–1951: A Survey of Activities in Research, Education, and Therapy.” Although the main emphasis is naturally on American studies in this field, much of the material included in the book is of general application and likely to interest workers elsewhere. The book is comprised of six sections each written by members of the staff of the Yale Centre, and with an introduction by the Director of the Centre. The sections are entitled: Sources of Scientific Information; the Status of Physiological Knowledge; Social Science Research; the Treatment of Alcohol Addiction; Programmes on Alcoholism in the United States, 1952; and Activities of State Departments of Education concerning Instruction about Alcohol. Copies of the book may be obtained from: *Quarterly Journal of Studies on Alcohol*, 2162 Yale Station, New Haven, Connecticut, price \$1. per copy.

PITYROSPORUM OVALE AND SOME SCALY CONDITIONS OF THE SCALP

BY

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The part played by the organism *Pityrosporum ovale* in the aetiology of a number of conditions of the skin has been much debated. By some it is held to be the prime and only cause of dandruff of the scalp and “seborrhoeic” eczema of the body; by others it is denied that the organism is anything but a harmless saprophyte which thrives under the cultural conditions provided by certain diseases. The problem is not made any easier by the confused and confusing terminology which has been applied to the group of conditions variously labelled as dandruff, pityriasis capitis, seborrhoea, seborrhoeic eczema, pityriasis circinata, the eczemas, etc.; the list could be made very much longer. So far as this paper is concerned, I hope to avoid lengthy discussion of the problems of seborrhoea, male-pattern baldness, and seborrhoeic eczema, and to confine my attention to certain scaly conditions of the scalp. It is not entirely possible to do this, as the three diseases often coexist with the subject under consideration.

Review of the Literature

Sabouraud (1902) held quite firmly that the cause of dandruff, or pityriasis simplex of the scalp, was infection with *P. ovale*. In addition, when the scalp became infected with an organism variously named the polymorphic coccus of Cedercreutz or the morococcus (Unna), but which seems to be the same organism as the *Staphylococcus epidermis albus* of Welch, the nature of the scaling changes from a dry condition to one which appears to be greasy, and is termed pityriasis steatoides or serosa. To add to the problem the scalp might also be affected with the acne bacillus, held by Sabouraud to be the cause of increased sebaceous secretion on the skin, thus causing an oiliness of the scalp, with an aetiology differing from the supposed greasiness of pityriasis steatoides.

Darier (1920), however, propounding his doctrine of “kerose,” was of the opinion that pityriasis capitis is but a manifestation of the underlying state which is characterized by a brownish dirty-yellow complexion, slight thickening and hyperkeratosis of the skin of the centre of the face, scalp, and other areas, and enlargement of the pilosebaceous follicles with hyperkeratosis of their openings. He regarded the kerose as a constitutional condition normal to certain types of person rather than a disease, and that *P. ovale*, the acne bacillus, and the polymorphic coccus grew best on this type of “soil,” but were in no way responsible for any disease or for the varying manifestations of kerose.

Sabouraud was not able to culture *P. ovale*, but Macleod and Dowling (1928) cultured an organism which they thought to be *P. ovale*, and which they believed to be the cause of dandruff of the scalp. In addition, by inoculation experiments with their culture on the normal skin they produced lesions which they thought were identical with those of seborrhoeic eczema. However, it was later realized that the organism was not *P. ovale* but *M. pinoyi*, a fact acknowledged by Dowling (1939) himself. Unfortunately the original experiments are still cited in many modern textbooks of diseases of the skin and hair as if they are the proof positive that *P. ovale* is the cause of seborrhoeic eczema and dandruff. Why the later repudiation by Dowling