conclusions can be reached about the role of endogenous growth hormone in postoperative anabolism.

**SUMMARY**

Daily injections of human growth hormone (2.5–10 mg. per day) had no effect on the catabolism of protein immediately after inguinal herniorrhaphy.

The post-operative urinary excretion of sodium, potassium, and calcium was unaltered by growth hormone.

We wish to record our thanks to the endocrinology study section of the National Institutes of Health for supplies of human growth hormone.

We also wish to thank Prof. R. B. Welbourn for his help and encouragement; Miss M. Pountain and Miss M. Martin for laboratory assistance; and Staff-nurse J. Duff and the dietetic department of the Royal Victoria Hospital for help with the metabolic balance studies.

The post-operative urinary excretion of sodium, potassium, and calcium was unaltered by growth hormone.

**THE BOWIE AND DICK AUTOCLAVE TAPE TEST**

At a recent symposium one of us (J. H. B.) described a standard package for testing high-vacuum sterilisers. There was also a reference to a simpler form of the test developed by Mr. J. Dick in which thermocouples were replaced by heat-sensitive indicator tape. This test has since proved so convenient and so reliable that we consider that it should be more widely known. There is urgent need to check the performance of new sterilisers.

The test we now describe should be within the capabilities of any hospital and should permit information to be quickly collected over a wide area.

**TEST AS ORIGINALLY DESCRIBED**

29 huckaback towels were washed and folded into four along their length and then doubled across to give

*Tape.* Our experience has shown that the only suitable type available is "type 1222" made by the Minnesota Mining and Manufacturing Company. Other tapes have been tried but have proved to be unstable in storage, sensitive to dry heat, or oversensitive to steam. It is convenient to apply the tape to 10 by 8 in. sheets of unglazed paper which can then be placed between the towels. It may be of interest to use several such sheets at various levels in order to plot the residual air space, but a single sheet at the centre of the stack is sufficient to indicate a satisfactory or unsatisfactory run.

**Interpretation of Test**

The original test agreed with thermocouple readings to within about 2°C. The tape then used is no longer marketed, but the 1222 tape recommended has been checked against thermocouples, Brown's tubes, and thermophilic spores. There was sufficient agreement to warrant the tape test being proposed for rapid screening purposes.

This test is essentially a test of steam penetration and not of time-at-temperature. A uniform colour change may be obtained without adequate initial air removal if the holding time is artificially extended. Such a uniform colour change should not be accepted if the sterilisation-holding time as recorded from the chamber drain exceeds 3.5 minutes at 134°C or 12 minutes at 126°C. We have no experience of using this test at 121°C or at temperatures above 134°C. If penetration is shown by this test to be virtually instantaneous, the time and temperature relationship on the recorder chart can be accepted—provided that the accuracy of the recorder is assured.

In most high-vacuum sterilisers installed in this country, the sterilisation process consists in the four-stage sequence: pre-vacuum, steam, drying, and breaking vacuum. In these sterilisers a satisfactory test result indicates both adequate air removal and the absence of significant air leakage into the chamber. In some sterilisers, steam is admitted during the pre-vacuum period and before the steaming period proper. If enough steam is admitted, penetration will occur and the load temperature will consequently rise before the end of the
workers will use it, perhaps in conjunction with more rapid steam penetration. We hope that other tests are not unrealistically strict.

We have given consistently good results for more than 3 experiments. Allen & Hanburys, for allowing us to see the results of their Drayton Castle Company, and Mr. G. R. Wilkinson of Messrs. the Portsmouth Group Laboratory, Mr. K. M. Henfrey of the Grounds they can accept any given extension of holding-time. Those who would continue to allow such sterilisers to be used must bear the responsibility of deciding whether and on what principle capable of producing sterile goods. An unsatisfactory test result indicates that steam penetration is delayed, the adequacy of the holding-time is in doubt, and in consequence the chief advantage of the high vacuum method has been lost. We fear, from our experience and that of others, that this test would show many so-called high-vacuum sterilisers now in use to be defective. We would condemn these as unsafe and seek engineering aid as a matter of urgency. Those who would continue to allow such sterilisers to be used must bear the responsibility of deciding whether and on what grounds they can accept any given extension of holding-time as providing an adequate assurance of safety. We know of sterilisers from several manufacturers which have given consistently good results for more than 3 years—and are still doing so. This suggests that the tape test is not unrealistically strict.

In this communication we have described a simple test of rapid steam penetration. We hope that other workers will use it, perhaps in conjunction with more refined methods, to examine sterilisers to which they have access. In so doing they will not only collect much-needed information about the current status of sterilisers in this country, but will also define more precisely the usefulness and limitations of the tape test itself.

We should like to express our thanks to Dr. E. M. Darmady of the Portsmouth Group Laboratory, Mr. K. M. Henfrey of the Drayton Castle Company, and Mr. G. R. Wilkinson of Messrs. Allen & Hanburys, for allowing us to see the results of their experiments.

J. H. BOWIE M.B. Edin., F.R.C.P.E.
J. C. KELSEY M.D. Cantab., DIP.BACT.
G. R. THOMPSON M.B. N.U.I.

New Inventions

GEORDIE WINDLASS

In treating fractures of the shaft of the femur by fixed traction on a Thomas' splint, there is often difficulty in getting the traction tapes sufficiently tight. A 6 in. nail is often used to twist the tapes; but as these become tighter it is increasingly difficult to obtain further tension, since the nail is longer than the distance between the bars of the splint and has to be partly withdrawn for each rotation of 180°.

A device which has been in use in this department for over twelve months has overcome this difficulty. It consists of a brass sleeve 1/4 in. in diameter and 3 in. long, with 1/4 in. thick walls; a winged screw is let into the sleeve which is used to lock into place a 6 in. brass rod (fig. 1). This size is adequate for most children's and adult splints. Skin or skeletal traction is applied, and the tapes are attached tightly to the foot of the splint in the usual way. The brass sleeve is introduced between the tapes and rotated about its mid-point, thus tightening the tapes (fig. 2). The brass rod is inserted and locked into position with the thumb screw (fig. 3). The splint is suspended in the usual way.

Instructions are issued that no-one except the surgeon in charge is to remove or increase the traction force, since, with repeated tightening, distraction of the fracture is always possible.

I wish to thank the engineering department of the Royal Victoria Infirmary for making this device and the photographic department for the photographs.

Orthopaedic Department, Royal Victoria Infirmary, Newcastle upon Tyne, I

J. C. WARDILL M.B. Cantab., F.R.C.S.E.