Temperature reactions obtained on the addition of 1 per cent. hypochlorite (bleaching powder) to yeast, white of egg, and urea. The mixture was in each case made up to 300 c.cm.

Experiment.	A.	B.	C.	D.	E.	F.	G.
Organic matter used in experiment ...	Yeast 5 per cent.	Yeast 5 per cent.	White of one egg	White of two eggs	Urea 6 per cent.	Urea 1 per cent.	Urea 1 per cent.
Maximum temperature in (°C.) attained ...	28.1	28.1	28.7	28.4	26.8	26.2	25.8
Rise of temperature (°C.) during experiment ...	9.5	9.0	9.0	9.0	6.8	6.0	5.8
Number of minutes in which maximum temperature was reached	46	46	26	26	2	2	2
Calories per gram available Cl ...	950	900	900	900	680	600	580

three sets of experiments, but especially in the urea experiments, some of the energy is used up in doing work of recombination; but a large proportion manifests itself in the form of heat capable of raising the temperature of the considerable volume of water in which the reaction takes place. This, however, provides no measure of the temperature attained at certain points, especially where ferment-producing organisms, such as yeasts, are present. It gives a general indication as to the energy set free, but little direct information as to the amount or concentration of energy liberated and acting in the fields in which the most active processes are going on—that is, with yeasts, *Bacillus coli communis*, etc.—in the organisms or at their surface in the presence of the enzymes formed; or, again, in connexion with certain protein or nitrogen-containing molecules.

As we now know, the amount of hypochlorite required for the sterilization of water depends directly upon the amount of oxidizable organic matter, dead and living, present—that is, upon the amount of the sterilizing agent that ultimately can come into direct contact with, and react upon, the living organisms. Only when, but as soon as, a sufficient amount of hypochlorite can act upon the intestinal organisms (*Bacillus coli communis*, typhoid bacillus, cholera bacillus, etc.) are these organisms killed.

The micro-organisms, when present in water in small numbers, are scattered relatively wide apart, and it is obvious that the energy evolved from the small amount of hypochlorite added is not sufficient to raise the temperature appreciably of the large volume of water in which it acts, though developed locally in contact with the above non-spore-bearing organisms it is sufficient to ensure their death almost instantaneously.⁵

Through what phase or transformations the energy may have gone before it manifested its presence in the form of heat I am not yet in a position to demonstrate, but it may be pointed out that if in a darkened room a solution of bleaching powder be run into a flask containing urine a distinct phosphorescence may be seen, if care be taken to rest the retina for twenty minutes or half an hour in the dark room before attempting to make the observation. In this, a reaction we anticipated from our other observations and from those made on pyrogallol by E. Newton Harvey,⁶ we have evidence of a rapid transformation of ultra-violet light wave energy through energy of visible wave lengths to the non-visible heat rays, the hypochlorite acting on the organic nitrogenous matter contained in the urine and setting free energy of different types or energy passing through different phases.

Into the question as to which of these phases of energy we owe the sterilization in any specific case I cannot enter at present, but it appears probable that in each instance the action is of greater intensity because so localized, and that the energy of shortest wave length of those examined is the most active bactericidal agent. Reading the accounts

of Professor J. M. Beattie and Dr. Lewis's experiments on the sterilization of milk by means of the passage through it of an electric current,⁷ I am led to the conclusion that here, as in my own experiments, it is not general or mean temperature that decides sterilization, but the energy set free and acting *in situ* on the micro-organisms contained in the milk.

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A CASE OF OSTEOMALACIA TREATED BY OÖPHORECTOMY.

BY

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THE curative effect of the removal of the ovaries in osteomalacia was discovered by Fehling by observations made on patients who had undergone Porro-hysterectomy for contracted pelvis, but the opportunity of treating this disease is so rare in this country that it is of interest to record individual experiences.

Mrs. A. S., aged 38, has always lived in the West Riding of Yorkshire and has always had good and sufficient food and average healthy surroundings. Her sister, who is a well-developed florid woman, says that the patient used to be in as good condition as herself. A. S. weighed 10 st. 4 lb. and her height was 5 ft. 5 in. She worked as a weaver from 14 to 31, and had no serious illness. She married at 31 and has had four pregnancies. The second child was born five and a half years ago without any dystocia; eighteen months ago she had an abortion in the second month of gestation. After the birth of her second child she did not regain her strength properly. She lost weight and had pains all over her, which she thought were rheumatic, and she was able to walk only with difficulty. After a time she got much better and at Christmas, 1916, could walk well. Then she fell off again. About Easter, 1919, one collar bone broke spontaneously and the other at Whitsuntide. At this time also she fell downstairs, and has never walked properly since.

She became pregnant about the end of 1918, and in February, 1919, her left leg began to swell. She had to take to her bed in June, her back being swollen and painful. She seems to have developed albuminuria and anasarca. In July she was admitted to the Maternity Hospital under the care of Dr. Rhoda Adamson. At that time the urine was nearly solid on boiling. There was a mitral systolic bruit and anasarca up to the

scapulae. There was a bed sore over the sacrum, and the left leg was very painful. She had spinal curvature, and the contraction of the pelvis and the rostration of the symphysis were very marked. Labour was induced, but craniotomy was needed on account of the lateral contraction of the pelvis.

Condition on Admission.

On August 8th, 1919, she was admitted to the Leeds Infirmary under Dr. G. Watson, who kindly transferred her to my care. The albumin had disappeared, but she was in a weak, distressing, and most miserable condition. The osseous system showed many anomalies. The pelvis was rostrated (distance of anterior superior spines, 8½ in.; intercrystal distance, 9 in.; external conjugate, 6½ in., P.V.). There was marked approximation of the pubic rami, the promontory was reached with difficulty, and examination was painful. There was kyphosis in the upper part of the spine and lordosis in the lower. There was angular displacement in both clavicles at the seat of fracture. The chest was deformed. There was fracture of the upper part of the left femur with about 2 in. shortening.

The results of x-ray examination were especially interesting. The bones were so little opaque to the rays that it was impossible to obtain a good skiagram. The shape of the osteomalacic pelvis was obvious. There was a well marked fracture of the upper end of the left femur with upward displacement of the lower fragment. Several fractures could be made out in the pelvic bones and another in the right tibia.

Operation.

On September 15th, 1919, I removed the ovaries. They were normal in appearance, and the uterus had undergone normal involution. On October 15th she was very much better; she was bright and cheerful; all pain had gone, and she was able to rise from bed and hobble a short distance with a stick. The urine was normal.

Condition Twelve Months later.

The patient attended at the infirmary on September 15th, 1920. She seemed very much better in all respects. She was bright and cheerful, and had gained fifteen pounds since operation. She was free from pain, and able to walk some distance without crutches, although the shortening of the leg makes her lame. The skiagram shows that the bones are certainly more opaque than at the last examination, and there seems to be some new bone formation at the iliac crest.

I am indebted to Miss Wheatley for assistance in the clinical records of this case.

It is said that 80 per cent. of osteomalacia cases recover under this treatment. Left to themselves the women, who are as a rule very prolific, grow worse with each succeeding pregnancy, and ultimately die from exhaustion, bedsores, and so on, or from phthisis or other intercurrent disease. It is said that occasionally the disease affects males, but I have never heard of such a case in this country.

A CONTRIBUTION ON BLOOD PRESSURE IN GRAVES'S DISEASE.

BY

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Owing largely to the results of such workers as Berry in England, Dunhill in Australia, and the Mayos in America, the surgical treatment of Graves's disease is coming more and more into prominence.

The question of the operative risk in Graves's disease is one that requires most careful consideration, as operations on exophthalmic goitres are usually regarded as particularly dangerous (though with increasing experience actual figures show that the mortality is little, if at all, above that of abdominal operations). Every case must be judged on its merits, and, in addition to such general considerations as the type, stage, and the severity of the disease, it is important to gauge accurately the condition of the heart and the blood pressure. The cardio-vascular condition very largely assists one in determining (a) whether an operation can be undertaken without undue risk, (b) the nature of the operation—for example, whether preliminary ligation should be performed or immediate excision of part of the gland be undertaken.

Referring to the literature, one is impressed with the great diversity in the records of different observers, some regarding a high tension as typical, others a low, while

still others consider the condition to be inconstant at any one period of the disease. The apparent divergence is probably explained by the stage at which the observations are recorded, and curves showing the tension over long periods are conspicuously wanting.

Henry Plummer² finds an increased pulse pressure in hyperplastic toxic goitres. Hirschfelder³ in his most recent work quotes Pressaft that the maximum pressure is usually high, the minimum normal, the pulse pressure consequently raised, and he publishes a table from Krause and Friedenthal,⁴ showing readings in ten cases of Basedow's disease in which the maximal pressures ranged between 106 and 158 mm. mercury, the minimal between 62 and 66. Bain⁵ states the blood pressure is usually high. Scott⁶ finds it varies from hour to hour and day to day, and is often slightly raised, though it may be nearly normal or even much below. W. H. Cowing⁷ points out the difference in opinion, some claiming high, others low pressures as prevailing, but in such cases as have come under his observation there has been but little variation from the normal pressure shown. Janeway⁸ has, however, found that a moderately high blood pressure exists, but is inclined to think the extremeness of exophthalmic goitre cases may account for it. Percival Nicholson⁹ states that the pressure is variable, but as the disease is often accompanied by a hypertrophied heart, the systolic pressure is often raised; he quotes as typical a systolic from 140-160 mm. mercury with a diastolic from 90-110 mm. and a pulse rate of 120 or more.

Spiethoff¹⁰ is very emphatic in saying no constant changes in blood pressure show in lighter forms of Graves's disease, but in severe cases both high and low pressures occur. Donath also records varying pressures. Eve¹¹ has recorded a case, terminating in acute thyroid atrophy, in a woman aged 40, with a very variable blood pressure, rising from about normal to 240 mm. mercury, when its measurement became painful and caused petechial escape of blood from the tissues of the forearm. Professor W. T. Halstead¹² says that those cases associated with "thymus persistans" show vagotonic symptoms, among which low blood pressure may be mentioned. Herbert French¹³ states that an abnormally low blood pressure of moderate degree is apt to accompany Graves's disease. Hensen, Gross, Bing, Feldern, and Jackson consider the systolic pressure high, and are supported by Taussig,¹⁴ who finds an increased pulse pressure, and draws an analogy between the cardio-vascular phenomena in Graves's disease and those of aortic regurgitation. He finds the systolic pressure greater in the leg than in the arm in both diseases.

Turning to the experimental side of the question, we find certain observers recording a fall in tension produced by injecting thyroid.

Hale-White¹⁵ finds that the blood pressure falls when a decoction of the gland is injected, and states that the fall is vasomotor, for the heart is not affected. G. Oliver¹⁶ has shown that thyroid juice or other preparations of thyroid "seem to possess a special tendency to increase the calibre of the radial artery" in the human subject. Hutchinson,¹⁷ on the other hand, found no depression from injecting colloid alone, but a decided fall upon injecting extractives; upon separating these latter into the organic and mineral constituents he found the fall in the main produced by the former. Further, it has recently been shown that the therapeutic effects of the iodides in reducing arterial tension are probably the result of an increased output of thyroid substance produced by an increase in autolysis in the gland, consequent upon removal of the inhibitory effect of unsaturated fatty acids by their saturation with iodides.¹⁸ In this connexion it is interesting to note a case of hyperthyroidism described by Rendle Short,¹⁹ and produced by iodoform poisoning following application of this substance to an absorbing surface.

The foregoing all refer to normal thyroid secretion. What is the condition in exophthalmic goitre, however?

R. McCarrison,²⁰ believing that changes in the thyroid secretion are both quantitative and qualitative, considers that a substance is produced in the gland in Graves's disease which has a powerful action in reducing blood pressure.

Schoborn²¹ showed that the essential difference between the action of extracts of simple and exophthalmic goitres was that extracts of the latter produced a more marked fall in blood pressure. These results were confirmed by Gley,²² and important extensions were made by Blackford and Sandford.²³ Experimenting on dogs and using forty-six exophthalmic goitres, these authorities found that from quarter to half a minute after injecting saline extractives of the goitres a sudden fall in blood pressure, averaging about 60 mm. mercury, occurred; that this drop was greater than that caused by any other extract of organs; that whereas recovery occurred usually two or three minutes afterwards, this was delayed for fifteen in some cases, and that a tolerance against a second injection was established in each case. They found that simple goitres—for example, adenomas—often gave no demonstrable effect on the tension, and stated that normal thyroid juice, in much larger doses than that from the exophthalmic or simple goitres, gave only a moderate depression, not more than could be obtained by the injection of extracts of most cellular organs in large doses, but believed the supposition "that the depressor action of extracts of exophthalmic goitre to be a matter of dosage and common to all tissues" was not justifiable. They have further demonstrated that atropine did not inhibit the action of the depressor substance from