machine where they are first sterilised and afterwards washed. After washing they are taken out and placed in the hydro, which, with the calender, is in a separate room. After being dried in the hydro they are passed through the calender and are then folded and returned to the wards. It has been found that handkerchiefs costing 11d. per dozen may be submitted to this method of sterilisation and washing about 50 times and will last for about four months. It is probable that a somewhat better quality of handkerchief would stand longer and so might prove rather more economical. At the Frimley Sanatorium, where there is a laundry with washing machines, but not a special combined steriliser and washing machine, both sputum and handkerchiefs are sterilised in the sputum steriliser. While the attendant is engaged in sterilising the sputum flasks and pots the handkerchiefs are allowed to soak in cold water to which soap and soda have been added. As soon as the

FIG. 3.

Tank for washing sputum pots.

sputum is disposed of the handkerchiefs along with the liquor are sterilised in their turn, a temperature of 250° F. being used, and after sterilising are dried. At the end of a week about 700 handkerchiefs have been sterilised and these are then removed to the laundry and washed in the ordinary way.

The drains from all the machines above alluded to are suitably trapped and ventilated. A sputum steriliser exactly similar to the pattern already described has been erected at the King Edward VII. Sanatorium.

Our experiments upon the sterilisation of sputum seem to have established a fact which has, up to the present, as far as we are aware, not been credited—namely, that articles infected with the tubercle bacillus may be rendered sterile at a temperature of 200° F. From this it follows that any articles infected with the tubercle bacillus may with certainty be rendered sterile by boiling them in water for half an hour under atmospheric pressure.

In conclusion, we desire to express our thanks to Dr. H. Batty Shaw and Dr. E. J. Steegmann for the help they have given us in conducting the first inoculation experiments, and to Mr. Leonard S. Dudgeon for his kind assistance in the sterilisation experiments with the new sputum steriliser.

OBSERVATIONS ON THE LIFE-HISTORY OF LEUCOCYTES.¹

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WHEN the fertilised ovum of a multicellular animal or plant segments a definite number of rod-like bodies appear during the process of division. These bodies are known as chromosomes. At each subsequent division of the cells in the building up of the body of the organism the same number of chromosomes appears. This number is constant in the species. Thus in the cells forming any of the body tissues of man there are 32 chromosomes, of a mouse 24, and so on. This continues in the cells of animals and plants in the building up of all the tissues until the time approaches when definite sexual elements are to be produced. At this time certain cells go through a particular type of division in which the number of chromosomes is reduced to one-half of what is found in the somatic or body cells. Thus the

FIG. 1.

A somatic division figure. The chromosomes are in the form of their rods, U's or V's.

sexual elements possess only half the somatic number of chromosomes, and consequently when fertilisation takes place, that is, when the male and female sexual cells fuse, the somatic complement of chromosomes is regained, and a new individual is created. For example, in the case of man where the normal somatic number is 32 a spermatozoon with 16 fuses with an ovum also with 16 chromosomes, the result being that the division figure observed in the first segmentation of the fertilised ovum exhibits 32 chromosomes and this number is maintained in all the subsequent divisions until the whole body is built up and until certain cells again go through the reduction process in order to produce sexual elements. This process of reduction includes two generations of cells—that is, two divisions following each other are involved before the process is complete. The whole has been called the meiotic process and the two divisions or generations of cells involved are the first meiotic (heterotype) and the second meiotic (homotype) divisions.

In animals the cells resulting from the second meiotic division are converted directly into sexual elements without any further division. In plants, on the other hand, there may be an indefinite number of cell generations following the second meiotic division and but few of these are destined to become sexual elements. The majority form tissues with somatic characters and functions, though, having passed

¹ Abstract of a paper read before the Royal Society on Jan. 18th, 1906

through the maiotic phase, they, of course, possess only half the somatic number of chromosomes. It has therefore always been assumed that herein there existed a difference between the cycle of cell generations of multicellular animals and plants, for while in animals those cells which have reduced are all converted directly into sexual elements, in plants only a few such cells may become converted into sexual cells, the rest performing the functions of supporting and nourishing the few. Moreover, in plants apparently any

FIG. 2.

A first maiotic (heterotype) division figure. There are one-half the number of chromosomes found in the somatic division. The chromosomes are in various definite forms.

number of generations of cells may intervene between reduction and the production of sexual elements.

The observations recorded in a communication to the Royal Society on the Life History of Leucocytes by myself claim to show that in the generations of leucocytic cells we have phenomena which run more or less parallel with the post-maiotic (reduced) generations that exist in prothallial tissue in plants. It is first explained that the term leucocyte is intended to include all the wandering nucleated cells of the animal body. In the male sexual gland the sequence of events among those cells that are destined to be sexual

FIG. 3.

A second maiotic (homotype) division figure. The chromosomes are in the same form as in the somatic division but are found to be only one-half the somatic number. This type of division is the most common among the cells of the bone marrow.

elements is as follows. Up to a certain point the cells in question divide in a similar manner to the cells forming the ordinary body tissues and exhibit the full somatic number of chromosomes. This is known as the somatic type of division. The somatic are followed by amitotic divisions. That is without the appearance of any spindle figure or chromosomes—a similar division, in fact, to that of a drop of viscous fluid into two drops. After this come further somatic divisions, followed immediately by the first and second maiotic divisions. The cells resulting are converted directly into sexual elements. Among the leucocytes and their immediate ancestors a very similar series of events occurs.

First we have amitosis and somatic mitoses alternating with each other just as in reproductive tissue. Then follow divisions which are similar to the first and second maiotic divisions, where the chromosomes are reduced in number to one-half of that found in the somatic cells. Here the similarity to animal reproductive cells ends and that to the reduced tissues in plants begins. Apparently there is an unlimited number of post-maiotic generations among the leucocytic cells. Furthermore, in another communication to the Royal Society² it is claimed that these reduced leucocyte cells may produce tissues possessing characters and functions similar to somatic tissues. If these observations are correct we have therefore a further parallel between the phenomena exhibited by animal and vegetable cells. The reduced cells of both animals and plants are out of coördination with the soma from which they have been derived. I consider that the evidence in this respect with regard to leucocytes is in favour of the correctness of my observations.

The bearing of these observations upon what happens in malignant growths may here be mentioned. It has been recorded³ elsewhere that one of the earliest phenomena in the occurrence of malignant tumours is the invasion of the tissue cells by leucocytes with the subsequent common division of both nuclei. This produces a race of hybrid cells, half tissue cell, half leucocyte. It has also been recorded by the same authors that the cells of malignant growths reduce in a similar manner to the cells of reproductive tissues. All the forms of cell division seen in malignant tissue are also seen in normal leucocytic tissue, and both leucocytes and malignant tissue are out of coördination with the true soma. According to the present observations, then, the hybrid cells act just as would be expected and possess the characteristics, to a certain extent, of both their ancestors.

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ACUTE LOBAR PNEUMONIA IN A PYGMY.

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ON the evening of Oct. 14th, 1905, I was asked by Colonel J. J. Harrison to see one of the pygmies whom he brought back from the Ituri Forest. I found the patient, Matuha by name, a male, stated to be aged 23 years, lying on a mattress.⁴ His temperature was 103.2°F. , his pulse was 120, and his respirations were 20. By the aid of an interpreter it was found that he complained of pain in the left infra-axillary region. Three days before the patient had suddenly stopped dancing in the middle of a performance, complaining that he was tired and that his back hurt him. He was seen by a medical man and treated for a sprained muscle. No evidence of a rigor could be obtained, but the difficulty of getting any evidence of prodromata was considerable.

On Oct. 15th the temperature was 103° , the respirations were 24, and the pulse was 118, with a dry hacking cough. There was a small amount of albumin in the urine. On examination, slight dulness with some fine crepitations and rhonchi were found over the base of the left lung. There were also rhonchi over the right base, but these disappeared in a day or two. On the 16th the dulness had increased and the inflammation finally involved the whole of the lower lobe of the left lung. He was at first treated with a mixture containing one and a half drachms of antimonial wine, two drachms of spirit of nitrous ether, three ounces of solution of acetate of ammonia and water to make up six ounces, the dose being half an ounce every four hours. This was afterwards changed to a powder containing one grain of sulphate of quinine, ten grains of citric acid, and some sugar of milk, given every four hours in half an ounce of a mixture containing two drachms of bicarbonate of potash, 36 grains of carbonate of ammonia, and half an ounce of syrup of orange dissolved in six ounces of water. The diet consisted of milk, broth, and eggs. The first named

² On the Origin of the Sertoli or Foot-cells of the Testis, Walker and Embleton, Proceedings of the Royal Society, 1906.

³ Farmer, Moore, and Walker: On the Behaviour of Leucocytes in Malignant Growths, Transactions of the Pathological Society of London, 1905. Ibid., on the Cytology of Malignant Growths, Proceedings of the Royal Society, 1906.

⁴ See in THE LANCET, August 12th, 1905, a paper by Dr. G. E. Smith and Dr. A. Looss upon Matuha and his companions. Matuha's age was then estimated by various osteological data as about 18 years.