exposed surface was carefully dried and dipped into melted paraffin. Care had to be exercised in this manipulation to avoid stratification and formation of bubbles between the hot and cold layers of paraffin. The block was cooled and trimmed as usual. Glands which had been soaked for a sufficiently long time sectioned perfectly, and the ribbon was flawless. The minimum length of time required for the water treatment varied between three days and two weeks, depending upon the size of the gland. Soaking for longer periods was not harmful to the tissues.

This method did not in the least impair the staining properties of the sections nor did it affect the histologic aspect of the tissues. Actual quantitative studies involving reconstructions proved the loss of tissue was so slight as to be insignificant.

The results of the work with the adrenals were so encouraging that our studies were extended to other tissues which, although prepared by ordinary histologic methods for sectioning, presented similar difficulties. Several blocks of spleen which previously it had been impossible to section were subjected to the water treatment. Quite satisfactory sections were then obtained from this material. Sections of human autopsy material, including intestine, ovary, liver, kidney and stomach, were noticeably improved. In Table 1 are listed the various types of tissues tested in this study. The results in every case were distinctly satisfactory.

An interesting feature was the absence of electrification of sections. It was noted that bone tissue, not materially softened by water, sectioned much more satisfactorily after water treatment, by virtue of the elimination of static charge.

TABLE 1

Tissue	Animal	Fixative	Number of specimens
Adrenals	Rat	Wislocki	50
Intestine	Human (autopsy)	Zenker	3
Stomach	Human (autopsy)	Zenker	2
Liver	Human (autopsy)	Zenker	1
Ovary	Human (autopsy)	Zenker	1
Kidney	Human (autopsy)	Zenker	1
Kidney	Kitten	Bouin	3
Basisphenoid	Rat	Bouin	50
Hypophysis	Rat	Bouin	10
Muscle	Kitten	Bouin	2
Tongue	Kitten	Bouin	2
Spleen	Rat	Bouin	2

It is conclusively shown by this series of investigations on various types of mammalian tissues that exposure to water of a small area of embedded material will obviate (1) difficulties consequent to brittleness, and (2) electrification of sections.

ELIZABETH CHALMERS CUTULY
EUGENE CUTULY
MEDICAL SCHOOL
UNIVERSITY OF PITTSBURGH

SPECIAL ARTICLES

MONOCYTES AS AN INDICATOR OF CERTAIN STATES OF BLOOD SERUM

IT is already known that cell colonies can be used for detecting certain characteristics of blood serum. The mode of activity of living tissues depends in a large measure on the nature of their medium. Any anatomical structure consists of humors as well as of cells. The morphology of the cells is almost meaningless, if not related to the chemical constitution of the humors. Conversely, the composition and the physicochemical conditions of an organic fluid remain without great significance unless expressed in terms of their structural and functional effects. For instance, the transformation of blood monocytes into cells closely resembling macrophages, clasmatocytes, epithelioid cells and fibroblasts is indicative of the presence around the cells of definite media. Likewise, the serum of old, starved or sick animals is characterized by its retarding or accelerating effects on the growth of colonies of fibroblasts. Fibroblasts have often been used as an indicator of the state of the humors.[1] The value of the growth index of a given serum depends on ill-defined chemical changes undergone by an animal under the influence of physiological or pathological agencies. In old age or in animals having an abscess, the growth index becomes low.[2] It generally rises during starvation or in certain infections. In experimental tuberculosis, as Swift has shown,[3] the serum is growth-inhibiting at the beginning of the disease and growth-stimulating during the period of leucocytosis.

The colonies of fibroblasts react against the variations of blood serum by changes in their rate of growth. But they are not very sensitive to those variations, much less so than blood monocytes are.

1 A. Carrel and A. H. Ebeling, *Jour. Exp. Med.*, 34: 599, 1921; 38: 419, 1923. L. E. Baker and A. Carrel, *Jour. Exp. Med.*, 45: 305, 1927.

2 A. Carrel and A. H. Ebeling, *Compt. rend. Soc. biol.*, 90: 170, 1924. A. Carrel, *Compt. rend. Soc. biol.*, 90: 333, 1005, 1924.

3 H. F. Swift, J. K. Moen and E. Vaubel, *Jour. Exp. Med.*, 60: 149, 1934.

Colonies of monocytes have recently been found to be a better detector of certain conditions of serum than fibroblasts. We know that the rate of migration and multiplication *in vitro* of leucocytes is markedly modified by a great many substances. Moreover, their morphological appearance may change in an enormous number of ways. A monocyte readily modifies its size, shape, nucleus, neutral red vacuoles, fat granules, mitochondria, number of nuclei, undulating membrane and mode of association with other cells. As all these characters may undergo several variations, the number of the permutations of these variations is extremely large, and each monocyte and colony of monocytes is capable of having its individual aspect.

The morphological study of monocytes cultivated in fluid and gaseous media of known composition has been rendered easy by a simple technical progress. The flasks described as microflasks have lately been very much improved. The thickness of the wall is now less than 0.1 mm. Therefore, blood monocytes can be studied at a magnification of 1,000 or 1,500 diameters, while having at their disposal a large amount of nutritive fluid and gases. The leucocytes of an animal are cultivated in their own serum and in the serum of a normal or diseased animal of the same breed. The leucocytes of this second animal are also cultivated in their own serum and in the serum of the first animal. After five or six days, the cells respond to their medium by taking on an aspect that varies almost with each serum. The experiments have been made on chickens, dogs, guinea-pigs and cats. In practically every experiment, the cells acted in an identical manner. When the monocytes of an individual were grown in the serum of another individual, they assumed the appearance of the monocytes of this second individual grown in their own serum. This fact indicates that the appearance of monocytes in their own serum is a transitory character and expresses merely a certain condition of the serum. The same phenomenon occurs in a still more striking manner when the second animal is suffering from an abnormal or pathological state, such as starvation, anemia, immunization, eczema, cancer, etc. For instance, the blood monocytes of chickens inoculated in the breast with a Rous sarcoma become rounder and coarser and agglutinate in clumps when cultivated in their own serum. If placed in the serum of a normal chicken, they tend to lose their pathological character and to resemble the monocytes of this chicken. Conversely, the monocytes of the normal chicken, cultivated in the serum of the sarcomatous chicken, after a few days more or less closely resemble the monocytes of that chicken. A similar phenomenon was observed in other diseases. But the changes imposed on serum by the disease generally respect some individual characteristics. Very seldom does the blood serum of two normal chickens of the same breed, Plymouth Rock or Rhode Island Red, for instance, give an identical appearance to two cultures of the same monocytes. It is obvious that these cells are a very delicate indicator of the conditions of their medium. To summarize:

(1) The structure of blood monocytes and their mode of association depend, in a large measure, on certain qualities of blood serum.

(2) Monocytes from different sources tend to take on the same appearance in a given serum. Each serum imposes upon monocytes a definite character. Pathological monocytes become like normal monocytes in the serum of the latter. And normal monocytes assume the aspect of pathological leucocytes when cultivated in the pathological serum.

(3) The aspect of monocytes cultivated in a given serum expresses simultaneously the individual characteristics of this serum and the modifications of those characteristics under the influence of pathological agencies.

ALEXIS CARREL

THE ROCKEFELLER INSTITUTE
FOR MEDICAL RESEARCH
NEW YORK CITY

TEMPORARY PREVENTION BY CHEMICAL MEANS OF INTRANASAL INFECTION OF MICE WITH EQUINE ENCEPHALOMYELITIS VIRUS

IN a recent report in SCIENCE[1] we described a method for active immunization of guinea pigs against experimental equine encephalomyelitis, by means of subcutaneous injections of virus adsorbed on aluminum hydroxide. Mention was made of the production by the alumina gel-virus of local indurations lasting several weeks. It was later found that in the guinea pig 0.2 per cent. tannic acid[2] (tannin) could be substituted for the aluminum compound with no increase in pathogenicity, nor decrease in immunizing power of the virus, and moreover, with no production of cutaneous induration. These methods of immunization depend, however, on the action of living although, as used here, non-infective virus. In another article all the experiments including those relating to poliomyelitis will be described in detail.

During the course of this study, tannic acid alone was dropped into the nose of white mice. We found that this simple act induced resistance against the effects of intranasal instillation of eastern and western strains of the encephalomyelitis virus, a procedure ordinarily lethal in normal animals.

For example, 0.05 cc of 0.5 or 1 per cent. tannic

[1] H. R. Cox and P. K. Olitsky, SCIENCE, 79: 459, 1934.
[2] Mallinckrodt's Acid Tannic, Analytical Reagent.