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# AIR-BORNE INFECTION[1]

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AN increasing awareness on the part of the medical profession of the rôle played by the air in the transmission of respiratory disease makes it seem appropriate just now to survey briefly the recent rapid growth of knowledge in this field. While it has been long known that bacteria can be carried on air currents, the general belief has grown up that certain physical agents such as sunlight, heat and drying are very effective in destroying such air-borne microorganisms. However, during the past few years our knowledge of the wide distribution of bacteria in the air has been greatly increased. Apparently the whole of our atmosphere is contaminated since microorganisms have been recovered from the stratosphere and from freshly fallen snow in the south polar regions.

[1] An address given before the Rochester Academy of Medicine, N. Y., October 6, 1942.

Some of the most striking evidence of aerial transmission of infection comes from the investigation of the spread of certain plant diseases. Epidemics of wheat-stem rust have been shown to be wind-borne from infected areas far distant. Spores of this infection have been found to be carried as much as 1,000 miles in 48 hours and cause an outbreak of the disease a week or ten days later. Similarly, plant viruses have been shown to be disseminated to some extent by wind, at least in an indirect manner, through the agency of leaf-hoppers and plant-lice.

While we have no evidence that any specific agent of human disease is spread through the outside air, except in the case of insect vectors, there is a growing body of data in support of the conclusion that air transmission within enclosed spaces plays an important rôle in the communication of many bacterial and

those in stupor and coma. The intravenous injection of ether, saccharin or sodium dehydrocholate carry with them not only disadvantages but even dangers.

Occasionally, some subjects whose taste buds are not fully developed may not respond in the desired measure. For that reason, objective tests have been greatly sought. These have ranged from the use of sodium cyanide, histamine, 50 per cent. carbon dioxide, alpha-lobeline ether and, more recently, the use of fluorescein. These drugs are reported to produce objective results, but, as is the case with sodium cyanide, are often open to danger. Calcium gluconate can not be used in cardiac cases that have received digitalis therapy without serious complications.

The danger of complications following the intravenous injection of many of these substances is obviated by a new objective method we have devised. This method is based on the principle that light transmitted through various translucent tissues of the body, such as the ear, finger or toe tips, or flexible skin anywhere on the body (such as that over the calves of the legs, the arm pit or the skin web between the thumb and index finger), can be detected by means of a sensitive photoelectric cell.

The injection of certain non-toxic dyes, intravenously, such as 2 to 4 cc of a 1 per cent. solution of methylene blue, or 1.0 cc of phenol-sulphon-phthalein, acts as a temporary curtain to impede the transmission of light. Interference with the transmission of light by the dye can be observed by the deflection of the indicator of a sensitive galvanometer, connected with the photoelectric cell. The time elapsing between the injection of such a dye into the vein of the arm or leg and its arrival to the point where the light and photoelectric cell have been placed, can be determined by a stop-watch, or can even be recorded objectively, by connecting the leads from the photoelectric cell to a recording galvanometer.

Thus, an objective record determination of the circulation time is made possible, which no other method affords. The fluorescein method, the safest objective method to date, is open to the criticism that several individuals may not note it at the same time. The thickness of the skin or mucous membrane and its blood content may also modify the time of fluorescent visualization. The use of a dye with a light and photoelectric cell set-up, is not only of value in determining the circulation time, but also can be used for the determination of the time required for the blood to be cleared, as demonstrated by the return of the galvanometer needle to its pre-injection point. The determination of the circulation time is recognized today to be of value in differentiating thyrotoxicosis and cardiac decompensation from other conditions which may be confused with them.

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## CONTRACTION OF DENERVATED MUSCLE PRODUCED BY d-TUBOCURARINE

FROM a consideration of the physico-chemical properties and especially the polarographic behavior of the alkaloid obtained from *Chondodendron Tomentosum* (d-Tubocurarine), and other quaternary ammonium bases having high reduction potentials, it seemed very probable that the rapid intra-arterial injection of this alkaloid would cause contraction of denervated muscles. This was shown to be true for dog-gastrocnemius denervated ten days previously. A strong contraction followed the close intra-arterial injection of d-Tubocurarine. The contraction was followed by partial relaxation and terminated by a long contracture which persisted for approximately thirty minutes. During the contracture and for a considerable time after the muscle was found to be unresponsive to previously effective quantities of intra-arterially injected acetylcholine. Direct stimulation of the muscle provoked contraction during the period of curarine-induced contracture. Full details of the experiments and a discussion of their significance will be published later.

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## BOOKS RECEIVED

HARRIS, ROBERT S. and KENNETH V. THIMANN. *Vitamins and Hormones. Advances in Research and Applications.* Illustrated. Pp. xvii + 452. Academic Press, Inc. $6.50.

MACLAREN, MALCOLM. *The Rise of the Electrical Industry During the Nineteenth Century.* Pp. xi + 225. Princeton University Press. $3.75.

MARGENAU, HENRY and GEORGE MOSELEY MURPHY. *The Mathematics of Physics and Chemistry.* Illustrated. Pp. xii + 581. D. Van Nostrand Company. $6.50.

MOVIUS, HALLAN L. *The Irish Stone Age.* Illustrated. Pp. xxiv + 339. Cambridge University Press. Macmillan. $7.50.

PERKINS, HENRY A. *College Physics.* Illustrated. Pp. x + 593. Prentice-Hall.

RATNER, BRET. *Allergy Anaphylaxis and Immunotherapy.* Illustrated. Pp. xi + 834. The Williams and Wilkins Co. $8.50.

WALKER, HELEN M. *Elementary Statistical Methods.* Illustrated. Pp. xxv + 368. Henry Holt and Company. $2.75.

YERKES, ROBERT M. *Chimpanzees. A Laboratory Colony.* Illustrated. Pp. xv + 321. Yale University Press. $5.00.