DISCUSSION

THE DISCOVERY OF INSECT TRANSMISSION OF PATHOGENIC MICRO-ORGANISMS

THE recent quotation which appeared in this journal[1] on "The Seventieth Birthday Anniversary of Theobald Smith" brings to mind another pioneer on studies of insect transmission of pathogenic micro-organisms, one who is frequently ignored by writers of medical text-books and of books and articles for popular consumption. Reference is being made to Merton B. Waite, the able plant pathologist who discovered, and first published in 1891,[2] that bees often carry the bacillus that is responsible for that disastrous scourge on pear, apple and other fruit-trees popularly known as fire-blight.

It is not at all surprising that investigators and "popularizers" of human and animal diseases should have overlooked the work of a plant pathologist, and it can not truthfully be said that the latter group are freer from sin in ignoring the work of other pathologists than their medical brethren. It is just another illustration of the great difficulty involved in coordinating knowledge, even though the branches run so closely parallel to each other as human, animal and plant pathology. The chief difference between Waite's work and Smith's is that while the former was studying a "passive" insect carrier the latter was working with an "active" one. Coming at a time when learned doctors were still arguing as to whether or not there could be such a thing as a bacterial disease in the plant kingdom, Waite's discoveries were truly remarkable. He not only helped settle that dispute[3] but made such further advances in the knowledge of bacterial diseases of plants, particularly the one mentioned above, that it has kept plant pathologists busy checking Waite's work up to this very day. While some of his views expressed more than thirty-five years ago may have to be discarded, there can be no question that as far as insect transmission of pathogenic micro-organisms is concerned his proof was ample. The great Erwin F. Smith has the following to say of this work:[4]

Waite isolated the pear-blight organism, grew it in pure cultures and proved its infectious nature by inoculations. With such proved cultures he sprayed clusters of pear flowers in places where the disease did not occur and obtained blossom-blight, and later saw this give rise to the blight of the supporting branch, found the organism multiplying in the nectar and re-isolated it from the blighting blossoms. On some trees he restricted the disease to the sprayed flowers by covering them with mosquito netting to keep away bees and other nectar-sipping insects. On other trees where the flowers were not covered he saw bees visit them, sip from the inoculated blossoms and afterwards visit blossoms on unsprayed parts of the tree, which then blighted. Finally he captured bees that had visited such infected blossoms, excised their mouth parts, and from these, on agar-poured plates, obtained *Bacillus amylovorus*, with colonies of which he again produced the disease. These experiments were done in several widely separated localities with identical results. I saw them and they made a great impression on me.

In conclusion it may be of interest to point out that Theobald Smith and Merton Waite were both members of the same institution when their epoch-making discoveries on insect transmission of disease-producing agents were made, one working in the animal division and the other in the plant division. Although Waite's first announcement of this phenomenon preceded Smith's[5] by two years the two men had evidently worked on insect transmission more or less at the same time and independent of each other. Waite, it should be noted, is still connected with and actively engaged in that remarkable public institution, the U. S. Department of Agriculture.

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THE RATE OF ABSORPTION OF EPINEPHRINE FROM THE SUBCUTANEOUS TISSUE

IT is experimentally established that the subcutaneous injection of 1 mg of epinephrine per kilo does not lead to a rise in blood pressure of rabbits, cats and dogs. This is generally ascribed to the fact that epinephrine is absorbed very slowly from the subcutaneous tissue. A five times smaller dose which we used in work on carbohydrate metabolism Cannon[1] designates as "huge" and as "far beyond physiological limits," because he believes that subcutaneously injected epinephrine leads to disturbances in circula-

[1] SCIENCE, 70: 193–194, 1929.

[2] *Bot. Gaz.*, 16: 259, 1891; *Proc.* Amer. Assoc. Adv. Sci., 1891: 315, 1892; *Trans.* Peninsula Hort. Soc. Fifth Ann. Session, pp. 32–34, 1892.

[3] The very heavy verbal artillery fired at the time by Erwin F. Smith at Alfred Fischer has tended to drown out the extremely modest verbal offerings of Waite and others. Up to the present moment he has not published a full account of his early experiments although enough, fortunately, has appeared in various horticultural and agricultural journals to enable one to get a fair view of his work.

[4] "Bacterial Diseases of Plants," Philadelphia, 688 pp., 1920.

[5] Bur. Anim. Ind., U. S. Dept. Agr. Bul. 1, 1893.

[1] W. B. Cannon, *Physiol. Reviews*, 9: 399, 1929.