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For the CANADIAN BEE JOURNAL.

POLLEN NECESSARY FOR BEES AT ALL TIMES.

IN Gleanings for March 1st I stated that bees cannot continue to digest sugar syrup, for any considerable time, without nitrogenous food. In previous discussions the necessity for this kind of food in winter has been assumed to be confined to the demand for the repair of tissues; but in addition to the renovation of the tissues it is required to form a constituent of the secretions, for all secretions which possess active properties owe them to the presence of a nitrogenous principle. That this principle is also essential for other purposes, in supporting life, will appear further on.

It is admitted that the digestion of cane sugar depends upon the action of ferments in the secretions of certain glands. These secretions are nitrogenous, and their active principle is obtained from the nitrogenous constituents of the food through the blood, or, in its absence, by absorbing this element from the tissues, a process which it is evident can be kept up for a limited time only. That the digestive secretions are nitrogenous; and that a constant supply of nitrogenous food is essential for their production, is apparent from the following: Dr. Parkes says, "Even the non-cellular liquids passing out into the alimentary canal at various points, which have so great an action in preparing the food in different ways, are not only nitrogenous, but the constancy of this implies the necessity of the nitrogen, in order that these actions shall be performed; and the same constancy of the presence of nitrogen, when function is performed, is apparently traceable through the whole world. Surely such constancy proves necessity." (Manual of Practical Hygiene, vol. I. page 204.) Dr. Pavay says: "We have seen that nitrogenous matter forms an essential part of the living structures. It holds the same position in the case of the secretions. These owe their active properties with which they are endowed, chiefly, if not entirely, to a nitrogenous constituent. This is drawn from the blood by the glands, just as it is drawn by the tissues; and on passing from the blood it is modified or converted, by the agency of the gland, into the

special principle encountered. Nitrogenous-matter is thus as essential to the constitution of the secretions as it is to the tissues. And as the amount of the secretions required is in proportion to the general vital activity, a corresponding demand for nitrogenous matter is created. (Food and Dietetics, page 26.) Under favorable conditions the vital activity of bees is reduced in winter, but not to the same degree that it is in the case of animals whose hibernation is most profound. The extent to which this reduction takes place may be measured either by the amount of respiration or by the temperature, because, between these and vital activity, there is, in every case, a constant relation. "In the case of the marmot (woodchuck) whose hibernation is complete, the pulse falls to about fifteen beats in a minute, and the respiration to about fourteen in an hour, while in the waking state these are respectively 150 and 500." (Todd and Bowman.) Its temperature in the waking state is say 98°, but during its sleep it falls to 38°; its burrow, to which it retires, is warmly lined with moss and fine hay, and the apertures leading to it are closed up very solid. The temperature of 38°, in such a case, is probably little if any above that of the adjacent walls of its dwelling. If animals in this state are exposed to a very low temperature, they freeze to death without waking. Speaking of bees in cluster as a unit, we have a maximum temperature of say 95°, and a minimum of 65°, and this latter temperature is kept up, no matter whether the surrounding medium is at 40° above or 40° below zero. In the case of the marmot, the heat-producing material, which is appropriated involuntarily by absorption, is stored within the body. No nitrogenous matter is now required for digestive secretions, the digestive act having been completed during the waking state. Its sleep, from which it is awakened with difficulty, continues unbroken from September until April. Not so with the bees; when the rations which their honey stomachs contain are consumed, they are obliged to wake up and renew the supply, and we learn from the observations of Prof. McLain and Dr. Tinker that this occurs at intervals of about a week. Instead of one long deep sleep, they take at best only a series of light short naps, from which they are easily aroused. To maintain their elevated temperature of 65°, a corresponding quantity of food is consumed, requiring for its digestion copious secretions of nitrogenous fluids, and for its combustion, active respiration, rendering necessary a proper supply of air. From all these it is not difficult to see that their nervo-muscular, as well as their vital activity in general, is comparatively active. Since the dis-