Flashback

Jelly Fit for a Queen

Worker or queen? It is not a matter of birthright, but of the right food – at least in the case of honeybees. If a larva is pampered exclusively with royal jelly, it becomes a queen, the majesty of the hive. More than 50 years ago, the young Ph.D. student Heinz Rembold, later to become a Max Planck researcher, discovered that it is not a secret ingredient in the jelly that determines the status of the bee, but is its especially balanced nutrients.

The worker bees attend to the queen, for only she lays eggs. To do this, he investigated how a queen bee develops within a bee colony. The queen is characterized by her long abdomen. For three days, the bees feed their progeny on this special food, the so-called supersaturated crystalline jelly. The queen lays normal eggs, which develop into worker females. But if only bees known as nurse bees produce in their pharyngeal glands a watery solution of such other substances as amino acids, minerals and vitamins, mineral salts and the diencephalon of the larva is still in an embryonic state. It is only at this stage that royal jelly seems to play a special role. He thus concluded that royal jelly would appear to be nothing more than an optimally balanced rich food designed to meet the special needs of the developing larvae.

In his quest to find out how royal jelly works, Heinz Rembold analyzed its chemical composition and discovered a 60 percent share of water. About 10 percent of the dry substance is fat, 38 percent is a sugar-rich protein, while the rest is made up of low-molecular-weight substances such as sugars, amino acids, vitamins, mineral salts and the diencephalon of the larva is still in an embryonic state. In this phase, the ovaries of the worker larvae shrivel almost entirely, while the reproductive glands of the female worker bees react immediately by preparing the cells to a mixture containing primarily pollen and honey. This change of diet is crucial in determining the status of these larvae, as it makes them workers.

In the final stage of their development, the ovaries of the worker bees shrink almost entirely, while the reproductive organs of the queen develop. This could be because royal jelly contains a substance that affects the gonads, and after the diet change, the worker bees no longer receive this substance. Researchers have long sought to identify this mysterious substance, but without success.

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In the mid-1950s, Ph.D. student Heinz Rembold analyzed royal jelly. He also used chromatographic columns to separate its components.

The future queen continues to eat this food until she hatches. Consequently, her endocrine system matures more quickly than those of the worker bee larvae, and in the same way, becomes active more quickly. The mix of nutrients in royal jelly protects the ovaries from undergoing the atrophy process that takes place in the same phase of development in the less well-nourished worker larvae, whose endocrine systems undergo this process. That is why not some mysterious substance, Rembold concluded, was the answer to his initial question concerning the function of royal jelly.

Of course Roald Dahl, the author of the story quoted earlier, could not have known this, as his discovery was only made toward the end of the 1950s. However, the companies that sell royal jelly and products containing it do know the facts. In their advertising, they claim that the only reason why queen bees live for about six years while worker bees live only around six weeks is because their diet consists exclusively of the royal jelly, whereas worker bees consume only pollen and honey – despite the fact that, 50 years ago, Heinz Rembold had already proved that the mysterious royal jelly does not actually have any specific effect even on bee larvae. The supposed elixir of life would appear to benefit its suppliers alone: 50 g cost almost 10 dollars.