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Medical Significance of Diapause and Hibitation

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ABSTRACT

The human regulatory physiological system contains dormant functional systems of normal ancestral ontogenesis. Disease is their awakening. Some diseases arise from the awakening of functional systems that provided adaptation to the environment in ancestors when they were active and not prepared for diapause or hibernation, others - from the awakening of functional systems that provided preparation of ancestors for hibernation or diapause. Deciphering dormant functional systems that provided diapause and hibernation is the way to deciphering the functional systems of diseases caused by their awakening, and, therefore, the way to developing methods for their prevention and treatment.

Keywords: Carcinogenesis; Narcolepsy; Evolutionary Medicine

Introduction

The unit of activity of the organism is a functional system. A functional system is a set of coordinated processes aimed at achieving a result useful for the organism. Motivational excitation is required for its emergence. It arises due to one or another need of the organism. The functional system is developed by synthesizing signals coming from endo- and exoreceptors, making a decision, forming an action and evaluating the achieved result (Anokhin [1]). New functional systems arose in human ancestors when they changed their environment. And they changed it countless times during evolution. When new functional systems arose, obsolete functional systems did not disappear completely. They were preserved in an inactive, dormant state. Therefore, the human regulatory physiological system has a multi-stage hierarchical nature. It contains functional systems that ensured adaptation to the environment first in human unicellular ancestors, and then in invertebrates and vertebrate ancestors (Orbeli [2]). Along with the functional systems of normal ontogenesis, there are pathological functional systems. They ensured the satisfaction of needs that humans do not have, but which their ancestors had. To understand the nature of a particular disease, it is necessary to find out what need was the evolutionary predecessor of this disease and compare not individual processes in humans and their ancestors, but functional systems (Anokhin [1]).

Diapause is a state of physiological rest in invertebrates, hibernation is a state of physiological rest in fish, amphibians, reptiles and vertebrates. The motivational excitation necessary for the emergence of functional systems of diapause and hibernation is the need to survive when the environment becomes unsuitable for life. These functional systems are developed by synthesizing signals coming from endo- and exoreceptors. Endoreceptors send a signal about the organism's readiness to go into diapause or hibernation, and exoreceptors send a warning that the environment will soon become unsuitable for life. The organism learns about this as a result of the action of a signaling factor on it. A change in the duration of daylight hours or another signaling factor serves as a warning that the environment will soon deteriorate. Let us consider what disease in invertebrates, as well as in vertebrates, including humans, is caused by the awakening of the functional diapause system. The first Metazoa on Earth were probably sessile and colonial invertebrates. Their early embryos that arose from somatic cells diapaused. The assumption that such embryos of the first Metazoa on Earth diapaused is based on the fact that sessile colonial invertebrates diapause in this way in our time– sponges, hydroid and coral polyps, bryozoans, intraporotic and colonial ascidians (Ivanova-Kazas [3]). These invertebrates do not have carcinogenesis (Krieg [4]). The evolutionary predecessor of this disease ensured the passage of normal ontogenesis in them (Makrushin [5]). If we compare the processes that ensure carcinogenesis and the processes that ensure the transition to embryonic diapause in the listed invertebrates, we can see their similarity. It is as follows.

1. The formation of a malignant tumor is the result of cell malignancy, and malignancy is their dedifferentiation. The formation of somatic embryos preparing for diapause in the listed invertebrates is also (Ivanova-Kazas [3]) the result of dedifferentiation of somatic cells from which the embryos are formed.

2. Carcinogenesis is the result of the redirection of the flow of nutrients from healthy tissues and organs to the tumor. Somatic embryos preparing for diapause in the listed invertebrates also grow (Ivanova-Kazas [3]) as a result of the redirection of the flow of nutrients to them from tissues and organs.

3. As a result of this redirection, a cancer patient becomes exhausted and dies. The listed invertebrates, which enter embryonic diapause, also become exhausted and die as a result of this redirection (Ivanova-Kazas [3]).

This similarity suggests that carcinogenesis is probably the awakening of a dormant functional system of embryonic diapause in our very distant invertebrate ancestors. Death from cancer is an atavistic adaptation inherited from colonial invertebrate ancestors, preparing them to survive the unfavorable season in a state of diapause. A malignant tumor is an atavistic growing somatic embryo preparing for diapauses (Makrushin [5])

Let us now consider what disease is caused in humans by the awakening of the sleeping functional system of hibernation. I.G. Karmanova [6] suggested that the awakening of this functional system causes narcolepsy or periodic hibernation. Periodic hibernation is a rare mental disorder. The patient is subject to attacks of irresistible daytime sleep. The attack takes him by surprise in the most unsuitable conditions for sleep, for example, while walking or talking. It is impossible to overcome narcoleptic sleep. Narcoleptic sleep can last for hours, days or months. There is a known case of a person sleeping for 22 years (Sukhorebsky [7]). In a person who has fallen asleep in narcoleptic sleep, as in animals during hibernation, breathing and pulse are slowed, blood pressure and muscle tone are reduced. Animals eat a lot before hibernation in order to accumulate fat. Patients with narcolepsy also have an insatiable appetite.

Therefore, they often suffer from obesity. The transformation of diapause into carcinogenesis and hibernation into periodic hibernation during evolution was accompanied by the organism's escape from the control of stabilizing selection. Those who fell ill left no offspring or left very few. Mutations that distorted these functional systems were no longer eliminated. They survived. Therefore, there are many different forms of cancer and different forms of periodic hibernation (Wayne AM [8]). Deciphering the dormant functional systems that ensured diapause or hibernation is the way to deciphering the functional systems of diseases caused by their awakening, and, therefore, the way to developing methods for their prevention and treatment. The author knows only two groups of diseases caused by the awakening of the functional systems of ancestors when they were preparing to survive an unfavorable season in a dormant state. But there are probably many more such diseases.

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