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Review and Expectation of Application of the Mechanism of the Biological Immune System in Work Safety Management

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Abstract

The mechanism of accident prevention is similar to the hazard immunological recognition of the biological immune system. In a word, an enterprise (or industry park) is like an organism and the safety management system is similar to the biological immune system. Thus, safety management measures are the accident immune factors, which identify and manage the hazardous factors so as to avoid accidents. In this paper, the development of the preparation and application of the biological immune system in work safety management was reviewed, and the corresponding problems are discussed and forecasted. The author points out that the accident immune model based on the biological immune mechanism, which has the functions of assessment of danger immunological tolerance, prevention & early warning of accident, emergency response to accident, and rapid recovery after accident, is the main direction of current research.

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1. Introduction

Work safety is the basic premise and safeguard for economic and social development, and the important focal point and entry point of the socialist harmonious society [1]. In recent years, China has made gratifying achievements in work safety, the system of safety theory, laws and policies has been formed and established, the safety supervision system has been improved and perfected. The situation of work safety has gained steady improvement, but remains serious, for example, the accident gross is large, serious accidents have not been effectively contained, economic loss is serious. Therefore, making further efforts to innovation of safety management and implementation of the safety responsibility is an important topics in future economic and social sustainable development.

Immunity is the specific physiological responses of organisms, and is composed of the organs, tissues, cells, immune effect molecules and genes. When the biological system is aggrieved by external viruses, it activates the immune system itself to ensure that the basic physiological functions of entire biological system operate normally. Organism's immune mechanism is widely used in engineering practice, for example, in the coordinated control of complex systems, fault detection and diagnosis, machine monitoring, ideograph identification, noise detection, security of computer and network data, image and pattern recognition and other aspects of the actual products.

There are some similarities between principle of work safety management and biological immune mechanism, work safety management is a systematic project, which effectively controls the potential risk of various accidents and injury factors through the establishment of a safety management system, to make workers safety and health; biological immune system is an adaptive system, which is able to distinguish between self and non-self. It does not rely on central organ and has the ability to process distributed tasks. It has three functions of immune defence, immunological homeostasis, and immune surveillance, to effectively protect the body from harmful factors, against pathogens, cancer and other diseases. Therefore, establishing a new safety management system similar to biological immune mechanism is a novel and effective ideas and approaches. This paper summarizes the recent research progress on the safety management relevant to biological immune mechanism, and predicts the important developing direction of future, based on the analysis of the basic principle of biological immune system.

2. Biological immune system

Biological immune system (BIS) is a biological barrier against external pathogenic invasion, a highly distributed, parallel and complex adaptive system with immune memory [2]. Immune system is usually divided into two categories: the innate immunity and acquired immunity. Innate immunity also known as nonspecific immunity is natural defenses for the body gradually built up in the evolutionary process, and it is inherent to the defensive role of various pathogenic micro-organisms, and has no special relevance. It is first line of defense for the body to defend alien invasion, and mainly by the skin, mucus and other organizations to implement. Acquired immunity also known as specific immunity is a defense function to specific virulence factors and is the immune system continuous learning environment, and acquires the accumulation. Specific immunity is a manifestation of the body to adapt to the environment, and is the main object of study in immunology. Architecture of the immune system is shown in Figure 1.

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