

Unconventional emergencies precontrol management mode based on immunology

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Abstract

Firstly, This article analyzed the general process of immune surveillance and response. And then combined with the biological immune process, the nature of risk identification and prevention about the unconventional emergencies was analyzed too. Furthermore, the main mode of unconventional emergency prevention and control was proposed based on the immunology, including immune isolation, vaccination, small energy release etc. Finally it was considered to combine different measures of prevention and control methods.

Keywords: Biological Immunity; Unconventional Emergencies; The mode of Prevention and Control

1. Introduction

The unconventional emergencies, such as Influenza a (H1N1), H7N9, wenchuan earthquake, the heavy rain event of Szechwan etc, had brought about great harm to the human society, and drawn great attention of countries all over the world, even the whole international society. How to prevent and control the unconventional emergency is an important and challenging subject. The research on unconventional emergency management mode has become one of the core basic scientific problems of emergency management^[1, 2, 3].

Biological immune system was proved to be an effective and good adaptability defense system through biological evolution. Based on the analysis of the differences and similarities about the biological immune system and management system of unconventional emergencies, and using for reference of general process of biological immune response, occurrence and development of unconventional emergency could be effective identification, prevention and control. Then we could also discuss that how to monitor unconventional emergency by biological immune response process, monitor the process of its discovery and capture, and research unconventional emergencies prevent and control management mode.

2. General process of immune surveillance and response

Immune response means a series of complex reaction process of the immune system stimulated after the antigen entering the body. Under normal circumstances, automatically generate immune cells in the body can found and process (kill, destroy) a small amount of abnormal cells in the body. Immune cells can recognize the body mutation cells which carried with a new antigenic determinant, and can timely kill or destroy the mutant cells^[4]. Stimulation process of the body's response to antigen is the process as the immune cell recognition, the immune cells intake, processing antigen, then ac-

tivation, proliferation, differentiation and producing immune effect, including t cognitive phase, central phase and effect or phase^[4,5].

2.1. Initial response of the immune process

Initial response is that immune system locates and finds abnormal cells which are completely different with the abnormal cells found before. There is no similarity since the similarity can produce twice response. Human body discovers the cells after the invasion through the immune surveillance with different antibodies randomly generated by the immune system to identify the abnormal antigen, and gradually produce antibody can effectively recognize the antigen through the clonal selection process. These processes are under surveillance, specific process as shown in figure 1.

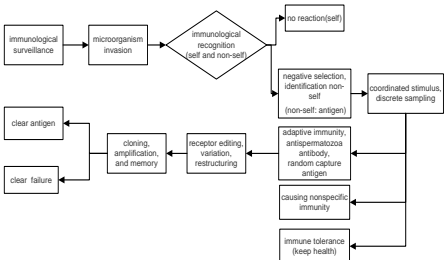


Fig. 1: Primary immune response process

2.2. Secondary response of the immune process

Secondary response of the immune process and initial response of the immune process has significantly difference, and the secondary response of the immune process is not referring to the second times, but both expressed the measures taken to eliminate when similar second encounter abnormal cells, can also be expressed as a third, fourth, and the Nth, that is once again encounter similar abnormal cells of the immune process.

In the initial acceptance antigenic stimulation, the body produces primary response; once again received the same antigen stimulation, the body produces secondary response, or anamnesis' response. Secondary response happens when body received the same antigen stimulation once again; the body can occur secondary response, also known as immune response again.

The mechanism of secondary response is after the initial immune response, the body produces a large number of memory cells, when re-exposure to the antigen, a large number of memory cells proliferation rapidly to produce large amounts of antibodies. Specific process is as shown in Figure 2.

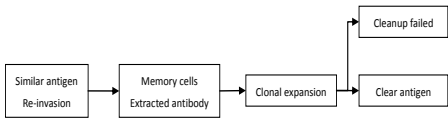


Fig. 2: Secondary response of the immune process

Secondary response reflects the ability to adapt to the organism of abnormal cells, Biological organisms can effectively memorize the antibody that has matched it long-term. When the invasion occurs again, fast extraction of such antibodies will happen to eliminate such antigen.

3. The essence of risk identification and prevention of unconventional emergencies

Reference to the biological immune mechanism, it is a new way to understand risk identification of unconventional emergencies and how to prevent fundamentally. It is meaningful to mine the essence.

Risk identification of unconventional emergencies plays an important role in the early intervention effectively. The efficiency of the risk identification affect

the latter part of risk management and risk control .Risk identification is the basic of risk accident management. Risk identification of unconventional emergencies refers to before the unconventional emergencies occur, use several of methods synthetically, and recognize the unconventional emergencies systematic and continuously .and then analysis the potential causes of the unconventional emergencies in the process. Risk identification of unconventional emergencies contains two aspects: risk perception of unconventional emergencies and risk analysis of unconventional emergencies.

Risk perception of unconventional emergencies refers to people understand the various risks of the real world exists objectively or hidden. It is the basic of risk identification. Only perceived risk in advance can we analysis risk on the basic of it .in order to find trigger condition that may produce the risk accident. Thus protocol the risk treatment plan serve for the risk management decision. Risk analysis of unconventional emergencies refers to analyzing a variety of internal or external factors that may cause risk accident. It is the key of risk identification.

Combined with the aforementioned immune response, we can get the risk identification process of unconventional emergencies by contrast with it. The risk identification process of unconventional emergencies can also be divided into two aspects: One is the first event identification, one for the second similar event risk identification. The first event identification refers to the event that never happened before is the first occurrence. If we have an event monitoring like immune surveillance. Then we can monitor discovery and capture, and early prevention and control. The second similar event risk identification that most unconventional emergencies belongs to can carry out daily monitoring and find signs of extracting measures from the existing plan.

Risk prevention of conventional emergencies requires an antidote against the disease. Only after understand the root cause of risk, namely the energy accumulation, then use a variety of means of risk prevention such as biological immune mechanism, can we prevent the risk from the source or reduce the harm of risk.

4. Pre-control mode based on immunological analysis

After compared the biological immune process with unconventional emergencies (Table 1), analysis is conducted on single event and the pre-control mode adopted by the linkage event to get the effect and different pre-control mode from the two aspects of emergencies.

Table.1: Mapping on pre-control system of unconventional emergencies and the immune system

	Biological System	Immune System	Pre-control System
System	Antigen		The risk of unconventional emergencies
	T cells & B cells		Risk identification device(Including device of self and non-self recognizer)
	Antibody		Pre-control mode
System Function	B cell proliferation and differentiation in the initial response, leaving the memory cells		Memory learning
	Antigen capture, degradation, proposed and identify		Monitoring and early warning
	The generating of the primary response of high affinity antibodies or a portion of memory also produced antibodies		Pre-control strategy generating
	Antibody crossing and variation		Self-learning and evolutionary of strategy
	Clonal selection		Optimization
System terminates	High-affinity antibody remove antigen		Risk removed

The real evolution of single event and linkage event is that the system itself and the interaction of the individual excitation the energy production, leading to an accumulation of internal energy, make the system in the critical edge, resulting in concentrated outbreak within the system, and even lead to the outbreak of contact system energy burst process. To improve this evolution, the main purpose is to make the internal energy can't be accumulated, or individual without transmission function, or to release some energy. Active defense can be taken can be achieved from the following ways: including the evolution of the individual's immune system within the isolation mode, immunization mode, as well as the internal system small scale energy release mode, or the combined use of several mode.

4.1. Immune isolation mode

Immune isolation is similar with the public health events that if somebody has function should be sent to the isolation ward immediately, so that it can't contact with the outside, and don't produce infectious virus outside. This mode can prevent another infection effectively among individuals. But isolation mode proposed in this paper is general. It can be an isolation of different populations in the health events; it also can isolate the zone that has emerged in the earthquake and fire. It's a broad sense of isolation mode.

No matter what type of event, immune isolation mode refers to the isolation operation adopted inside the system unit whose condition is found outbreak state in the unit.

(1) The isolation mode of single event evolution

Isolation of single event is the isolation measures of the system in a single event in the individual, to stop transmission to other individuals, but can't make it stop evolution. This isolation can reduce the

interaction between individuals, thereby inhibiting the overall process of system, so that system can't reach a critical edge, and preventing the outbreak finally. Because it's a single event whose isolated objects involves only the individual case within the system and has no relations with the outside world, if we can control better, the isolation measures is able to play a role in preventing the outbreak of event. The main attention here is to select the isolation point in time, In Chapter 5, the calculation of an experimental model, simulates the control effect of event under different isolation efficiency at different time points.

(2) Linkage evolution isolation mode

Linkage evolution isolation mainly on the linkage system for implementation of individual isolation operation, its aim is to achieve the evolution of the system associated with the control. Mainly applied to this case that some event is not harmful but it produces huge personal and property damage for the linkage system.

The evolution characteristics of linkage is associating system's outbreak following the priming system, the time of intermediate buffer is very short, in such a short time to take quarantine measures may not play a corresponding effect, so the linkage evolution isolation mode will occur failure state, but to use other means to achieve control.

4.2. Immunization mode

Immunization mode is a completely beforehand active defense mode, as long as this event has a certain ability to foresee. Such as in the zone of earthquakes or tsunami-prone, vaccination can be taken to take corresponding measures to reinforce the house or move directly. Another example is some known infectious diseases, vaccination in advance. It also has been adopted to prevent large-scale outbreaks of infectious diseases in an effective way.

Whether it is a single event or a linkage evolution can use this active defense mode, because this way has a big difference with the immune isolation, it doesn't need to wait until the event starts evolution, it is entirely possible in some case to predict, in advance (or even a very long time) implement immunization measures for the internal system unit.

Similarly, immunization measures mentioned in this article is still broadly, not limited to a method that Vaccinated a human or an animal in public health events, It can be extended for a variety of individuals within the system to enhance defense capabilities, so that in the evolution of the role of transfer from other individuals, and the state itself is stable, the system is not in the outbreak situations finally.

(1) Single event immunization

Single event evolution of immunization immunizes the individuals within a single system before the evolution occurs. And the individuals that get the immunity no longer involved in the evolution of the overall system, and ultimately control the evolution of the effect. The key of this mode is the immune efficiency.

(2) The immunization of linkage evolution

The immunization of linkage evolution is also for the immunization of individuals, ignoring the vaccination of individuals for the priming system. Such as public health events triggered by the earthquake, the populations of the seismic zone can be vaccinated, to prevent the secondary disasters, and the earthquake itself may be unable to effectively control

Linkage evolution of vaccination is still pre-inoculation, if you can't guarantee beforehand, at least in the first moments on the incident, thereby changing the evolution process of the entire linkage system, the key point is still immunization efficiency.

4.3. Small-scale energy release mode

Small-scale energy release mode get inspired by the process of disease outbreak of living organisms, when living organisms release the virus, the condition will improve gradually. This mode departure from the root cause of outbreak to prevent the accumulation of energy, when the individuals in the system interact inevitably, it releases small-scale energy at different time points to make the system stay the critical state before the critical edge, so that it can't reach the critical state of outbreak, this energy released can also release several times at different time points to get a better effect of control of energy accumulation.

(1) Small-scale energy release of a single event

Small-scale energy release of a single event mainly refers to a single event in the evolution of the process, when the energy accumulated in the system exceeds the warning value releases the energy with a certain percentage to stop the system reach the critical edge of the evolution, thereby preventing the harm from the outbreak of the large-scale energy released. Such as the prevention of forest fires, can burn at a regular intervals, burning off the branches, firewood and other flammable substances which could trigger massive fire.

(2) Small-scale energy release of the linkage evolution

Small-scale energy release of the linkage evolution refers to releasing a part of energy in the process of accumulation in order to avoid the capacity outbreak of a larger scale.

Such as an earthquake or a variety of security incidents involving crowd can cause secondary disasters, need to disperse the crowd as soon as possible and reduce the number of individuals in the linkage system to reduce the energy accumulation of the internal system and

control the secondary disasters of unconventional emergencies. No matter what kind of small-scale energy release of evolution, the key factor is the time point selection and the release ratio of the energy released.

4.4. Multi-strategy combining defensive mode

Some unconventional emergencies combined with these strategies above can achieve more desirable defense effect. Such as in the event of the influenza A H1N1, on the one hand you can isolate the patients, on the other hand you should vaccinate susceptible individuals for better defense effect to prevent the event evolved into a more serious situation.

In the realistic situation, when an emergency broke out, there are often a variety of strategies for joint action in order to achieve the best control effect.

5. Conclusion

After taking immune isolation, immunization, small-scale energy release, and the combination of multi- strategy in evolution of the single or the linkage event, we could analysis to get the table 2 of comparison of the effect implement.

Table.2: Comparison on the effects of active defense mode

Active defense mode	A critical evolution	Multiple linkage evolution
Immunization	Well	Good
Isolation	Better	Poor
Small-scale energy released	General	General
Combination of multi-program (vaccination+ isolation)	Well+	Good+

Conclusion the table displayed, a single event is easy to control relatively, among immune isolation, immunization and small-scale energy release, the effect of immunization is the best, the effect will be better if adopted the multi- strategy. The effect is poor if the linkage events adopt the isolation measure. To draw a conclusion, if the pre-vaccination can be implemented, almost every kind of unconventional emergencies can be mightily defended. Otherwise, different measures should be taken as many as possible.

6. References

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