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The micro-revolution in the sporting world-the application prospect of nanotechnology

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ABSTRACT

With the extended application of nanometer in the sport circle, nanotechnology would bring new change to the material of equipment, the enhancement of the performance as well as the cure of the injury. This paper analyzes the current situation of nanotech and predicts its prospect, maintaining that nanotech would play a even more important role in the performance improvement, injure cure and the nurient perfection.

KEYWORDS

Nanometer; Sports; Application; Prospect.



THE APPLICATION OF NANOMETER AND NANOTECHNOLOGY IN THE SPROTING WORLD

The concept of nanometer is totally different from other traditional scientific concept. Nanometer is the billionth of a meter. The development of science and technology demand the materials of superfine, intelligent, components of high integration, high density storage and super fast transmission and so on. Nanotechnology and nanomaterials of the above characteristics have broad development space^[1]. In terms of nanoscale electronics, optoelectronics and magnetism, macroscopic tunnel effect of nanoparticles established the limits of the miniaturization of microelectronic devices. The thinking of nano electronic circuits to solve the current can be divided into two kinds, one is using two-photon beam technology in the integrated circuit "quantum entanglement", it can be decreased to the limit of 25 nm. Another is to develop new materials to replace silicon, using protein diode, carbon nanotubes as molecular wires, and start new phase of miniaturization of electronics and optoelectronics. In nano medicine and biology, nano technology provides the new development opportunity for medical research. Proteins, DNA, RNA viruses, are on the scale of 1-100 - nm range in the nanostructures. Genetic sequence of self-assembly is arranged to the structure of the atomic precision, the information transmission and feedback of the nervous system is a perfect example of nanotech. At the same time, biosynthesis and biological processes has become source of inspiration the new research of nanometer structure. In the field of national defense and military, nanotechnology has brought a revolutionary impact. Nanoscale electronic devices, for example, will be used to connect to a virtual training system and real-time battlefield, a new type of nanometer materials can improve the conventional weapons and protective capabilities; micro robot of nanotechnological mechanism system can complete special reconnaissance and attack missions; By a small rocket, nano satellite can launch thousands of nano-sized small satellites, built satellite network from different tracks and to monitor every corner of the earth. In addition, the use of nanotechnology to change the defect of raw materials in the production and application of nanometer materials has become the innovative and consensus, the manufacture and application of nanometer materials research become the focus of striking in all areas.

Modern sport develops with the progress of science and technology, modern science and technology and its wide application bring vitality to sports. Nanotechnology as one of the key technologies in the related research in the 21st century countries, are increasingly used in sports equipment : the emergence of plastic runway, glass fiber reinforced plastic nylon material made of poles, five different fiber conjoined tight clothes, "crystal shoes" made of transparent, plastic bicycle frame, carbon fiber materials, the "shark skin" swimsuit are closely contacted with the development of nanotechnology^[2]. Nanotechnology tentacles is always more than people's imagine, and it played a more and more significant role in the optimization of sports training and the athletes' physical fitness. Nanotechnology applications in the field of sports equipment, sports training and so on embody the characteristic of individuality, humanity and science.

THE APPLICATION PROSPECT IN THE FIELD OF NANOTECHNOLOGY IN SPORTS

The influence of new technology on the competitive sports is striking. On the one hand, it improves the performance .on the other hand, its application has brought about a variety of modern facilities and high-tech equipment. Nanotechnology presents many excellent properties, pregnant with broad application prospects in the field of competitive sports, dramatically change the sports, so as to accelerate the development of competitive sports.

At the current stage, the preparation methods of nanometer can be divided into two main kinds . Namely, physical preparation methods and chemical preparation method. Physical preparation methods mainly include: high energy ball mill method, smash, sputtering, inert gas evaporation method, plasma method, etc^[3]. Chemical preparation includes chemical vapor phase condensation method, chemical vapor deposition method, precipitation method, sol-gel method, hydrothermal method, freeze drying, etc. The diversity of preparation methods of decideds the diversity of nano materials. Therefore, in addition to the existing application in sports equipments and training, nanotechnology research and implementation began to focus on the athletes' selection and to the athletes' function transformation and adjustment. In general, the application prospect of nanotechnology can be divided into the following several aspects.

Nanometer technology to make selection "accurate"

Scientists in the United States successfully separated blood cells of the fetus from his mother using nanotech, in order to accurately determine whether the fetus have a genetic defect. Therefore, with the development of nanotechnology, it can be used to determine the baby's movement potential . According to the survey: plateau residents' "insert" polymorphism of angiotensin converting enzyme, is the reason why their endurance is better than others. Compared with the "missing" genes homozygous people, the "insert" ones, their strength is 11 times bigge under the same training. The study showed that some of the human genome is closely related to the movement ability. The difference of gens led to the difference of the athletes' movement ability and the training effect. Therefore, we can analyzes genome data of elite athletes and find out the genetic characteristics of excellent athletes use of nanotechnology. Thus realize fast and accurate noninvasive genetic selection.

Nanotechnology to make athletic performance "miracle"

"Swifter, higher, stronger" is the ultimate goal of competitive sports, while the approach to the target is realized through refresh of performance. The widespread of nanotechnology created a rare opportunity for the improvement of performance. Nanotechnology makes mechanical miniaturization become a reality^[4]. The production of nano biological

motor (nanobots) by some developed countries plays an important role in muscle contraction, cell migration, differentiation and vesicle transport, signal transduction, DNA replication, curly and translation. Athletes can implante in his own body nano pump to increase their power; The gymnasts can improve the stability, flexibility and durability. The swimmers also get faster speed and durability. Meanwhile, people can implante a micro biological chip under the skin, this chip play a similar role to the perfect detection system, through the monitoring of blood sugar levels in the body in the process of movement, releases sugar and other material according to the needs of people timely, make glucose in the body to maintain a relatively constant level, effectively improve the body's ability to exercise. Studies have shown that: with the development of nanotechnology, nano with oxygen function pumps red blood cells into the blood system of athletes, this can solve the problem of oxygen lack and effectively improve the sports ability of athletes. At the same time, the use of nanotechnology transform athlete body chemistry and gene, so as to realize the improvement of the sport ability.

Nanotechnology to make sports injury cure "rapid"

Fierce antagonism is a feature of the competitive sports, so the sports injuries are inevitable. Therefore, the cure of injured body is more important than prevention. Chinese medicine sticking is the commonly used methods for treatment of sports injuries, but this method works more slowly, the technical difficulties to be resolved is how to make more drugs enter into the bloodstream through the skin, so that the drugs would be more effective. Research has shown that nanotechnology can play a role in the field of promoting drugs through the skin barrier. Nano TCM due to the small size, large adsorption capacity, strong penetrating power, can let more nano drug into the bloodstream through the skin barrier. On the other hand, nano ceramic material production and clinical application of artificial organs, such as artificial joints, artificial tooth and dental implant, ear auditory ossicle restoration etc have broad application prospects. Additionally, calcium nitrate, ammonium phosphate as raw material, dimethyl formamide as dispersant, can produce the crystal structure under pressure which is similar to bone tissue of nanoscale hydroxyapatite needle crystal. This can be used as human bone tissue materials for cure. Thus the development and application of nanotechnology in the repair of injury will be promising.

Nanotechnology to promote sports nutrition "efficient"

In the field of medicine, nanotechnology plays an important role in improving the bioavailability of drug, controlling release system, enhancing drug targeting delivery system as well as setting up the new in such aspects. It provides a larger space for study in the change of sports nutrition. In terms of trace element additive, the utilization rate of inorganic trace elements is only around 30%, low utilization rate is apparent while the utilization of nanometer trace elements can reach almost 100%, absorption rate and efficiency are excellent^[5]. Therefore, nanometer powder or nutrients in the form of suspension, can improve the absorption of human body and plays a better bioactivity of nutritional supplements.

CONCLUSION

To sum up, with the progress of nanotechnology, the economic, ecological, social and philosophy value are remarkable. The application of nano technology in sports is increasingly important, its "personalized" application in sports facility, "humanity" application in sports equipment, "scientific" application in sports training, has to some extent, change the status quo of the competitive sports. And in the future, with more extensive and in-depth application of nanotechnology, it will also bring brand-new change in the selection, performance improvement, injury cure, etc. And it would make the equipment "accurate", athletic performance "miracle", sports injury repair "rapid", sports nutrition "efficient".

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