Scholar Publishing Group
International Journal of Art Innovation and Development
https://doi.org/10.38007/IJAID.2022.030402
ISSN 2789-7192 Vol. 3, Issue 4: 14-27

Application and Biological Safety of Nano Materials in Dragon and Lion Dance

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Keywords: Dragon and Lion Dance, Nanometer Material, Biosafety Testing, Animal Model

Abstract: Dragon and lion dance is an important part of Chinese culture, which plays an important role in carrying forward the excellent traditional culture and implementing the strategy of sports power. The traditional dragon and lion dance equipment in the selection of materials is more casual, there are many deficiencies. At present, under the background of modern sports, higher requirements are put forward for the equipment selection of dragon and lion dance. At present, the mainstream approach is to integrate nano material technology. However, due to the characteristics of nano particles, nano materials pose a potential health threat to human body. Therefore, this paper puts forward the application of nano materials in dragon and lion dance exercise and its biological safety research. Through the study of basic theory and core concepts, this paper believes that the application of nano materials in competitive sports will have a direct impact on sports performance. According to the demand characteristics of dragon and lion dance, nano materials will be widely used in this field, and can effectively improve the comprehensive performance of sports equipment, optimize the experience and comfort. In view of the possible health threat of nano materials to human body, this paper established the corresponding experimental scheme of biological safety detection of nano materials. The experimental scheme adopts the way of animal model, which can better restore the use of human body. A number of comparative experiments including hemolysis rate test, cytotoxicity test, bacteriostatic rate and relative cell proliferation rate were carried out. Through the analysis of experimental data, it can be seen that nano materials have no toxicity, hemolysis and other reactions in the normal use process, and have good biological safety. The research in this paper has achieved ideal results and made a contribution to the biosafety research of nanomaterials.

1. Introduction

China's Dragon and lion movement has a long history, broad and profound, and its

long history has created a huge social value of the dragon and lion movement. The dragon and lion movement have obvious national characteristics. Its emergence and development conform to the traditional culture of the Chinese nation, and it is a valuable cultural heritage of the Chinese nation. As a traditional national sport, dragon and Lion Sport has a long history and a broad mass base, which is a popular form of sports. It is also the epitome of the rich culture of the Chinese nation. As a part of the national traditional sports culture, it is also an important part of the Chinese national culture. It is the concrete embodiment of national spirit, national wisdom and national character. However, we cannot deny that development is the inexhaustible power of things. The perfection of dragon and lion movement not only needs to develop, but also needs to keep pace with the times in the process of development. At the same time, the inheritance of traditional culture is not merely duplication, but is to remove the dross, extract the essence and critically inherit. Competitive dragon and lion dance inherit the excellent educational concept of traditional Chinese dragon and lion dance. It challenges the limit and encourages people to transcend their hearts. Under the guidance of the Olympic spirit of "higher, faster and stronger", through indomitable scientific training, their bodies have been reasonably transformed in body and technology. In the background of modern sports, it is one of the conventional methods to integrate the latest material technology into competitive sports equipment, such as adding nano materials in the process of making sports clothes to enhance the toughness and softness of sports clothes.

Nanotechnology is a new technology gradually developed in the 1980s. It is a new technology to study the motion characteristics of atoms and molecules in nano scale, and to make new materials by using monoatomic molecules. Nanoparticles refer to particles with a diameter of 1-100 nm, sometimes also known as ultrafine particles, ultra-small particles, etc. As far as the current knowledge and technology are concerned, nanoscale is still a limitation, which requires us to study new effects, new concepts and new technologies. The research of nanotechnology is actually dealing with the polymerization of atoms and molecules or even single atoms or molecules, and using the novel physical, chemical and biological characteristics of atoms, molecules and substances on the nano scale to produce products with specific functions. When the particle size reaches nanometer level, it has quantum size effect, volume effect, surface effect and macroscopic quantum tunneling effect. Therefore, it shows many unique properties: higher reaction activity, higher catalytic activity, unique optical properties, magnetic and mechanical properties. In recent years, the application of nano materials is also expanding. Competitive sports practice has proved that the application of the latest achievements of material science in sports equipment directly affects the improvement of sports performance. Therefore, this paper puts forward the application of nano materials in dragon and lion dance exercise and its biological safety research, which will lay a foundation for improving the competitive level of dragon and lion dance in China and the application of nano materials in this field.

First of all, the core concepts of dragon and lion dance and nano materials are deeply studied in this paper. Through the research, this paper believes that dragon dance, as a sport with both entertainment and competition, is quite different from general sports in its development mode. In the selection and production of sports equipment, it is necessary to ensure the ornamental and biological characteristics. For this reason, there are high requirements for the selection of materials, and now the latest nano material technology has solved the problem perfectly. However, due to the ultra-fine particle characteristics of nano materials, there is a potential threat to the

health of athletes. Then, in order to solve this problem, this paper established the biological safety test method of nano materials. In this paper, animal model is used to reduce the application background of nano materials. Experimental mice are implanted with nano solution to make experimental samples, which are grouped according to the experimental requirements. The detection of samples mainly includes OD value determination, resuscitation cell value and MTT detection. In order to ensure the quality of the experiment, the corresponding evaluation indexes and operation rules were established. In the final comparative experiment, a number of comparative experiments including hemolysis rate test, cytotoxicity test, antibacterial rate and relative cell proliferation rate were carried out. According to the experimental data, nano materials will not cause hemolytic reaction in the process of use, and is non-toxic, and can also play a certain antibacterial effect, which is suitable for wide application in dragon and lion sports [1-3].

2. Dragon and Lion Dance and Core Concepts of Nanomaterials

2.1. Origin of Dragon and Lion Dance

Dragon and lion dance are one of China's traditional sports, which is the result of our ancestors' hard work. As early as the Western Han Dynasty, dragon dance as a sport has appeared in the cultural and entertainment life and friendly exchanges of the Chinese nation. According to records, dragon and lion dance was very popular in the Sui Dynasty and played a connecting role. After years of war in the northern and Southern Dynasties, the Sui Dynasty unified the country and the people lived and worked in peace and contentment. At that time, dragon and lion dance were the most important entertainment activities for people. At first, the dragon and lion dance were just entertainment in the palace. The royal family regarded the dragon and lion as the symbol of the emperor, representing power. Later, people used dragon and lion dance to pray for good weather in the coming year. In ancient times, the dragon and the lion can be said to be people's spiritual sustenance. If we believe that the dragon and lion are gods, we can see from the ancient royal life how high the status of the dragon and lion in people's mind.

There are different opinions about the origin of lion dance in China, such as the origin of Tang Dynasty, the origin of Northern Wei Dynasty and the origin of Tang Dynasty. It is said that in the northern and Southern Dynasties, the Taibei of Jiaozhou was ordered to attack Linyi, and the king of Linyi, Fan Yang, fought with an elephant. Song Junlian was defeated. Song Xianfeng's officials came up with a clever plan. They used hemp and cloth to make many lion's clothes overnight. Each dress was covered by two soldiers and hidden in the grass. Suddenly, when the elephant's paw and the lion's paw were in battle, they jumped out of the water and chased the lion. Since then, it has been celebrated once a year on this victory day, gradually forming a fixed "Lion Dance", which has a long history. Dragon and lion dance are not only a sport, but also a traditional culture. It combines martial arts, dance, knitting, embroidery, painting and music in one. It is one of the traditional sports events that can best reflect the folk customs of our country. It combines the collocation and close cooperation between people, and imaginatively imitates the various forms and movements of "dragon" and "Lion". Dragon and lion dance are the expression of people's religious belief, national culture and customs, and an important part of the material and spiritual cultural wealth of the Chinese nation [4-6].

2.2. Classification of Dragon and Lion Dance

(1) South lion

The southern lion, also known as the star lion, is popular in Guangdong and Fujian in southern China. In recent years, with the vigorous promotion of China dragon and Lion Sports Association and the migration of Chinese, the southern lion movement has been widely carried out in the world.

Modern competitive lion dance originated in the 1980s. The length of single tail lion tail is 9-15 meters, the maximum is not more than 2.8 meters, and the minimum is not less than 1 meter. Lion's joy, anger and other expressions, by jumping, flashing and other different footwork and difficult movements to show. In the performance, its soothing and witty place makes people laugh, and when it jumps in the air, it makes people feel scared and excited. The southern lion is exaggerated and colorful. The drum sound of South lion is also very exciting. It can be said that the South lion is a traditional Chinese sports event, with a strong festive color and the ability to exaggerate the atmosphere, set the ornamental, artistic and competitive in one.

(2) North lion

The northern lion is one of the popular lion dance techniques in the north of the Yangtze River in China. Both the northern lion and the southern lion are rich and colorful folk-dance arts. The northern lion is famous for the green lion in Anhui Province and Baoding lion in Hebei Province. At present, the northern lion we usually see is based on the green lion in Anhui Province.

The basic movements of the northern lion dance are: startled and frightened. Its eyes, mouth and ears can move, which is more important than the action. Samurai's agility and bodybuilding not only show the lion's bravery and bravery, but also vividly show the knight's wit and wit, giving people a wonderful and exciting enjoyment. The shape of the north lion is similar to a real lion. It is not as big as the South lion. Its head has no color decoration, it's just the color of animal fur, but a corner is added to the top to show unusual animals. The whole Sphinx is made of tassels, and even the trousers and shoes worn by the performers are the same color as the real lion legs. Therefore, this is a magical and moving lion, giving people a real feeling. In the northern lion performance, there are three dancers, one lion head, one lion back (lion tail), and the other leads the dance as a warrior.

(3) Dragon Dance

Dragon Dance refers to the traditional sports activities of dragon dancers. Under the guidance of the dragon, beads, dragon gears and drum music complete dragon swimming, jumping and other movements, fully demonstrating the essence, spirit and charm of the dragon. The Chinese nation is the most populous country in the world. Dragons are regarded as auspicious animals wherever they live. In festivals, celebrations, blessing, exorcism, sacrifice to gods and temple fairs, people will dance dragon [7-8].

2.3. On the Fitness Function of Dragon and Lion Dance

Dragon and lion dance require high flexibility and physical fitness, because performers must be accompanied by musical instruments to bring a festive and happy atmosphere to the program. Dragon and lion dance have its unique fitness and entertainment characteristics. It can relax during exercise. Many domestic scholars have conducted extensive research on the fitness effect of dragon and lion dance. It is generally believed that dragon and lion dance can enhance the cardiopulmonary

function of human body. The human body is a comprehensive precision machine to coordinate the work of multiple organs. Dragon and lion dance are also an aerobic exercise, which can exercise greater load intensity, improve the body's aerobic absorption capacity, and promote people's health [9-10].

2.4. Introduction to Nanomaterials

A nanometer is a measure of geometric length, one millionth of a millimeter, and a nanoparticle is about 3.5 times the size of an atom, smaller than the length of a bacterium. The size ratio of meter to nanometer is approximately equal to the diameter ratio of the earth and the table tennis ball. Nanomaterials refer to the materials whose structural units are in the range of 1 ~ 100 nm. In a broad sense, it refers to materials with at least one nanometer scale in three-dimensional space, including zero dimensional, one-dimensional, two-dimensional and three-dimensional materials. Most of them are hand-made, and some are natural materials, such as turtles, pigeons and butterflies. Nanotechnology can be defined as technologies that can form nanomaterials or nanodevices, such as dispersion technology or molding technology. From the material level, when any kind of material is refined to the nano level, it will show new characteristics that the raw material does not have. In this refining process, the surface area of the material increases, the crystal structure changes, and even the atomic structure between molecules recombines. There is surface effect, quantum size effect, small size effect and macroscopic quantum tunneling effect. These special physical and chemical properties of nano materials make them have broad application prospects in catalysis, environmental protection, energy and other fields [11-12].

2.5. Application of Nano Materials in Dragon and Lion Dance Sportswear

Nanomaterials have unique characteristics, especially high specific surface area, which can adsorb nanoparticles on the surface of textiles without affecting the accessibility and permeability of textiles. For example, the main material of nano waterproof cloth is polyacetic acid fiber. A layer of needle like silicon wire with a diameter of 40 nm is coated on the cloth to prevent rainwater from penetrating into the cloth. Compared with ordinary sportswear, nano sportswear has no difference in texture. In summer, it is mildew proof and antibacterial. Warm, waterproof, washable and breathable in winter can avoid viral myocarditis and cold symptoms of dragon and Lion Dance Athletes. For example, the main element of nano functional shoes is nano materials, namely the fusion of zinc oxide and zinc oxide. These materials are formed by in-situ compounding of specific substrates under certain conditions to form nano films with antibacterial, breathable and waterproof functions.

2.6. Biosafety of Nanomaterials

At present, nano materials used in sports engineering at home and abroad mainly include carbon nano materials, nano oxides and nano metals. The biosafety problems caused by nanomaterials have the following reasons:

(1) When the particle size of the material is reduced to nano size, the performance of the material will change suddenly. For example, inert materials can be used as catalysts, and stable materials can become combustible materials.

(2) Due to the small size of nanoparticles, the specific surface area of sheep sites can be as high as thousands, and the surface energy is very high. The surface atoms have very high activity, very stable, easy to combine with other atoms, and have

strong adsorption and aggregation ability.

(3) Epidemiological studies have shown that the deposition rate of ultrafine particles in the air in human respiratory system is higher, and the smaller the particles, the more difficult it is to be removed by macrophages. Ultrafine particles entering the body through respiration are easy to transfer to organs outside lung tissue and accumulate in these areas through blood-brain barrier and blood eye barrier.

(4) The settling velocity of nanoparticles is about one tenth of that of micron particles, which is far less than that of micron particles. When they are affected by diffusion and gravity, they are more likely to float in the atmosphere and dissolve.

Therefore, nanoparticles can enter human body or animal body through respiratory system, skin contact, injection or administration. It accumulates and transfers in vivo and produces biological effects, causing damage to cells, lung tissue, liver, kidney and brain tissue [13-15].

3. Biosafety Testing Methods of Nanomaterials

3.1. Laboratory Animals and Feeding Rules

Female mice, about 10 weeks (20-25g), were carried out animal experiments according to the "provisions on the management of experimental animals" approved by the ethics committee of our hospital and the "detailed rules for the implementation of the regulations on the administration of experimental animals in Beijing Municipality". The animals were fed at 21 ℃, 45% - 55% humidity, light and dark for 8 hours.

3.2. Experimental Apparatus

12 kinds of main instruments including electrothermal incubator were used in this experiment. The specific instrument names and suppliers are shown in Table 1.

Table 1. List of main experimental instruments

name	supplier
Qm-3 SP2 ball mill	Nanjing University Instrument Factory
Electrothermal incubator	Huangshan medical equipment factory
Single- and double-sided cleaning table	Suzhou purification equipment company
Overspeed refrigerating centrifuge	Hettich, Germany
Ldzs-2 centrifuge	Beijing Medical Centrifuge factory
Stainless steel abrasives	Hettich, Germany
-20 ℃ low temperature refrigerator	Sanyo, Japan
-80 ℃ ultra low temperature refrigerator	Sanyo, Japan
Enzyme linked immunosorbent assay	Thermo, USA
Micro sampler	Changchun Baotai Technology Co., Ltd
Inverted phase contrast microscope	Sanyo, Japan
Ultrapure water machine	Millipore, USA

3.3. Experimental Reagent

A total of 15 main reagents including sodium chloride were used in this experiment. The specific instrument names and suppliers are shown in Table 2.

Table 2. List of main experimental reagents

name	supplier
sodium chloride	Beijing chemical plant
Pentobarbital sodium	Sigma USA
Hanks equilibrium salt solution	Hyclone, USA
Paraffin oil	Beijing chemical plant
sodium bicarbonate	Beijing chemical plant
Hematoxylin Stain	Biyuntian Biotechnology
Eosin dye	Biyuntian Biotechnology
Formaldehyde solution	Sinopharm group
Xylene solution	Beijing chemical plant
hydrochloric acid	Beijing chemical plant
Anhydrous ethanol	Beijing chemical plant
Sodium dihydrogen phosphate	Beijing chemical plant
Disodium hydrogen phosphate	Beijing chemical plant
ammonia	Sinopharm group
neutral balsam	Sinopharm group

3.4. Establishment of a Temperature Measurement Model in Vivo

The rats were fasted 10 hours in advance. When they were caught, they were unarmed, with their abdomen upward and their heads down. 0.4% Pentobarbital Sodium Solution (100mg / kg) was intraperitoneally injected. No. 11 intragastric needle was inserted into the stomach from the side of oral cavity of mice. There were two kinds of obvious sense of loss at the junction of oropharynx, esophagus and cardia. There were no symptoms of shortness of breath and restlessness in mice, suggesting that the intragastric needle had entered the stomach. Draw out the intragastric needle and mark the length of the stomach. The optical fiber temperature probe lubricated with paraffin oil is inserted into the stomach from one side of the mouth to the required length, which should be continuous and smooth. After entering the stomach, the resistance of esophageal smooth muscle disappeared. The mice were placed horizontally in the spiral coil of magnetic field generator to observe the reaction of mice and the temperature change of temperature display instrument. After that, the temperature probe remained still, the mice were executed, and the abdominal cavity was opened to confirm whether the position of the optical fiber temperature probe was correct.

3.5. Material Sample Preparation

The average molecular weight (MV) of the nano materials is 2.5 × 105, and 3-5g nano powder is weighed and placed on the operation table of the plate curing machine. 5 cm × 5.5 cm × 0.5 cm, 140 ℃ and 20MPa, washed with distilled water, acetone, 75% ethanol and distilled water for 15 minutes, dried naturally under sterile conditions, and finally exposed to ultraviolet radiation for 2 hours. Put the sample in the aluminum plastic packaging bag with humidity less than 0.03%, and store it in the dark after drying.

3.6. Preparation of Material Extract

The preparation method of raw material extract refers to GB / T16752-2008. Nanomaterials are washed with distilled water, 80% alcohol and normal saline for 35 minutes. After natural drying, they were incubated in 36 ℃ incubator according to the

standard of 250mg / ml normal saline for 48 hours. The extraction solution was filtered with 0.25um micro membrane and stored in refrigerator at 5 ℃. The preparation method of medical grade L-PLA extract was the same as above.

3.7. Experimental Steps

(1) The mice were fasted 10 hours in advance, and the mice were anesthetized by intraperitoneal injection of 0.4% Pentobarbital Sodium (100mg / kg).

(2) Take 5ml gastric acid neutralization solution orally to neutralize gastric acid.

(3) After 20 minutes, mice in group A were perfused with different doses of composite magnetic nanoparticles. The optical fiber temperature probe was lubricated with paraffin oil and entered the stomach from one side of the mouth. The mice were placed horizontally in a supercooled coil so that the gastric plane was in the center of the coil. Connect the temperature measuring probe with the thermometer and turn on the magnetic field generator to generate alternating magnetic field. The frequency and intensity of the magnetic field were adjusted to make the stomach temperature rise to 45 ℃ for 15 minutes. The researchers observed and recorded the temperature rise of mice under different doses.

(4) After heating, the temperature probe was pulled out and the cervical vertebra dislocation mice were killed. The abdominal cavity was opened to observe the general situation of stomach and other abdominal organs. The gastric tissue was separated with dissecting scissors and incised along the great curvature of stomach. The gastric contents were washed with normal saline and the surface of gastric mucosa was observed. The degree of gastric mucosal injury was evaluated according to Guth score. The gastric antrum was taken from the normal mucosa and the lesion. One of them was fixed in 15% neutral formalin buffer. HE staining was used to observe and judge the degree of histological damage according to Barkin grading standard. It was carried out by professional staff of pathology department. The fixed tissue was dehydrated, transparent and embedded in wax. After embedding, it was put into a slicer with a thickness of 10 cm. after drying, it was stained with he.

1) Tissue sections were soaked in xylene for 10 min and repeated 3 times.

2) Soak in absolute ethanol for 5 minutes and repeat 3 times.

3) Soak in 98% 93% 82% alcohol for 1.5 minutes and rinse with tap water for 1.5 minutes.

4) Hematoxylin staining for 3 minutes, washing with tap water for 1.5 minutes.

5) Soak in 1% hydrochloric acid alcohol for 25s, 1% dilute ammonia water for 10-15s, and rinse with tap water for 3min.

6) Eosin staining for 10 minutes, rinse with tap water.

7) Dehydration with 85% ethanol for 25 s, 90% ethanol for 25 s, 98% ethanol for 3 min, repeated for 3 times, anhydrous ethanol for 3 min, repeated for 3 times.

8) Soak in xylene for 3 minutes, repeat twice and seal with neutral glue.

9) The staining results were observed under the microscope.

3.8. Determination of OD Value

The supernatant was centrifuged at 2800 R / min at 36 ℃ for 45 min. The absorbance of the supernatant at 585 nm was determined by UV spectrophotometer. The average value of each group was taken as OD value, and the hemolysis rate was calculated. According to ISO10993 biological evaluation standard of medical devices, 6% hemolysis rate was used as reference. If the hemolysis rate is greater than 6%, it means that the material has hemolysis; if the hemolysis rate is less than 6%, it means

that the tested material has no hemolysis.

3.9. Resuscitation Cells

The cryopreservation tube was put into a 36 ℃ water bath to melt the cryopreservation solution. The cryopreservation tube was removed from the water bath box and the cell suspension was inhaled into the centrifuge tube. After centrifugation, the supernatant was discarded and washed once with the medium to enter the fresh medium. Appropriate dilution of the medium, inoculated into the culture bottle, put into the CO2 incubator, each mouthful of culture medium.

After resuscitation, mouse fibroblasts were subcultured twice. After stable growth, the logarithmic phase cells were digested with 0.28% trypsin to prepare single cell suspension. The cells were incubated in 98 well cell culture plate with 6% carbon dioxide and 36 ℃ saturated humidity for 48 h. these cells were randomly divided into three groups with 6 wells in each group. RF and E were added into the two experimental groups, 15% calf serum was contained in the extract of Max material, and DMEM medium containing 0.72% phenol and 15% calf serum was added into the positive control group. In the negative control group, only DMEM medium containing 15% calf serum was added and cultured on 98 well plate for 2, 4 and 6 days.

3.10. MTT Detection

5 hours before the end of culture, 0.8% MTT (25 μ L / well) was added. After 5 hours of continuous culture, 250 ml DMSO was added and placed at room temperature for 20-25 minutes. In order to make the staining uniform, shake the plate for 15 minutes, and determine the OD value of each pore under the wavelength of 500nm by enzyme-linked immunosorbent assay (ELISA), and calculate the average value of each group. The cell morphology was observed by inverted phase contrast microscope, and the cell proliferation rate was calculated. According to the GB / 16752-3 scoring standard, the cytotoxicity grade (0-5 grade) was determined. The cell proliferation curve was drawn with time as the horizontal axis and light absorption value as the vertical axis.

3.11. Statistical Analysis

All measurement data were expressed by mean ± standard deviation ($\bar{x} \pm s$), and the differences between groups were compared by analysis of variance (ANOVA), and the ratio was compared by chi square test. All data were processed by SPSS13.0 software.

4. Biosafety Test Results and Analysis

4.1. Hemolysis Rate Test

According to the analysis results in Figure 1, the hemolysis rate of sample 1 is 1.45%, that of sample 2 is 1.82%, that of sample 3 is 1.87%, and that of sample 4 is 1.65%. In addition to actively controlling the hemolysis rate of the experimental group and the control group, the hemolysis rate of the experimental group and the control group was lower than 5% of the standard, which showed that the oxidation coating of nano materials did not cause hemolysis reaction, nor did it occur in the exercise of lion dance and Dragon dance.

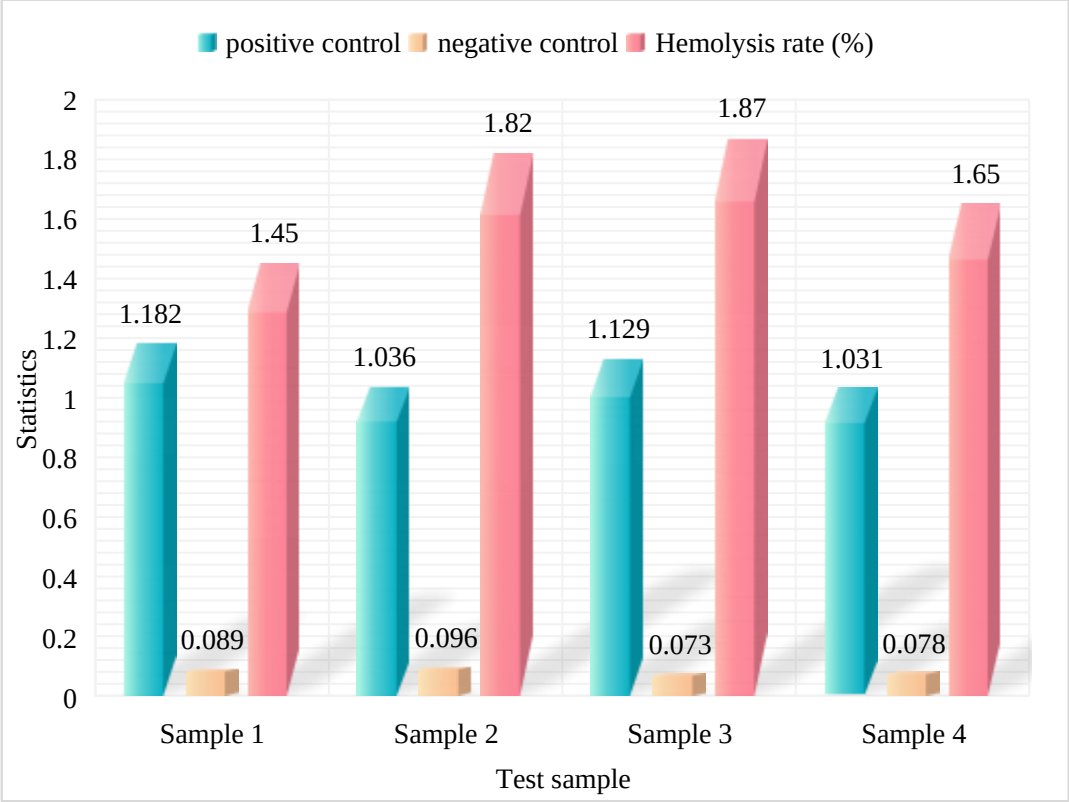

Figure 1. Hemolysis rate test results and analysis of each group

4.2. Cytotoxicity Test Results

The results of MTT test showed that there was no significant difference in the number of cells in 100% extraction group and 75% extraction group and 50% extraction group at 1, 3 and 5 days after observation. According to the analysis of the results in Figure 2, there was no significant difference between the experimental groups with different extraction degrees. The higher the extraction degree, the higher the absorbance, but the difference was not significant ($P > 0.05$). There was no significant difference in absorbance value between different extraction groups and negative control group ($P > 0.05$). The toxicity grade of the materials was evaluated according to the toxicity level 6 standard. The results showed that the nano materials had no cytotoxicity and had no obvious effect on cells.

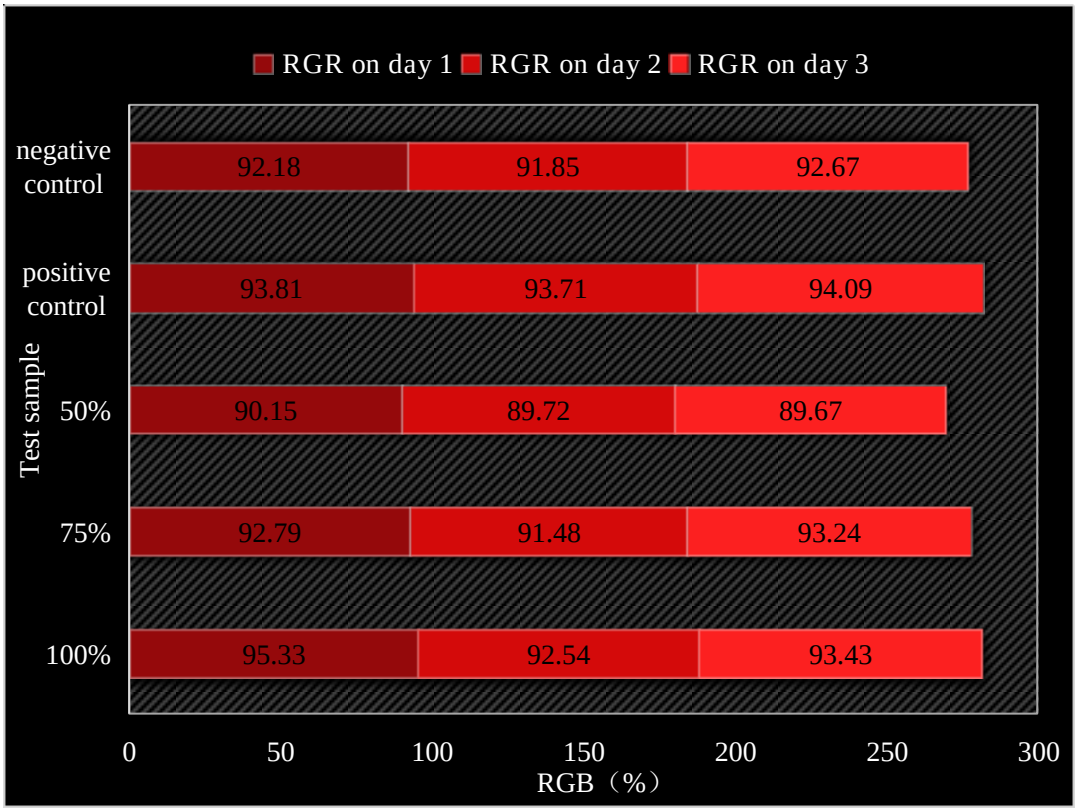

Figure 2. Cytotoxicity test results and analysis of samples in each group

4.3. Results of Bacteriostatic Rate

In order to test the antibacterial properties of the nano materials, Candida albicans and Streptococcus mutans were used to test the antibacterial rate of the nano coating with different doping amount to the above two microorganisms by mucosal method. According to the analysis results in Figure 3, the nano materials synthesized in this study have good antibacterial properties. The lower the content of antibacterial agent, the higher the antibacterial rate. The results show that the antibacterial property of the coating is improved with the increase of the content of antibacterial agent. According to the industry standard of antibacterial coating, when the antibacterial rate of the material is more than 99%, it belongs to the product with strong antibacterial force and belongs to class II antibacterial coating. When the antibacterial rate is more than 90% and less than 99%, it belongs to antibacterial products and belongs to class II antibacterial coatings. The results show that the antibacterial rate of 3% doped nano coating is more than 99%, which belongs to class I antibacterial coating.

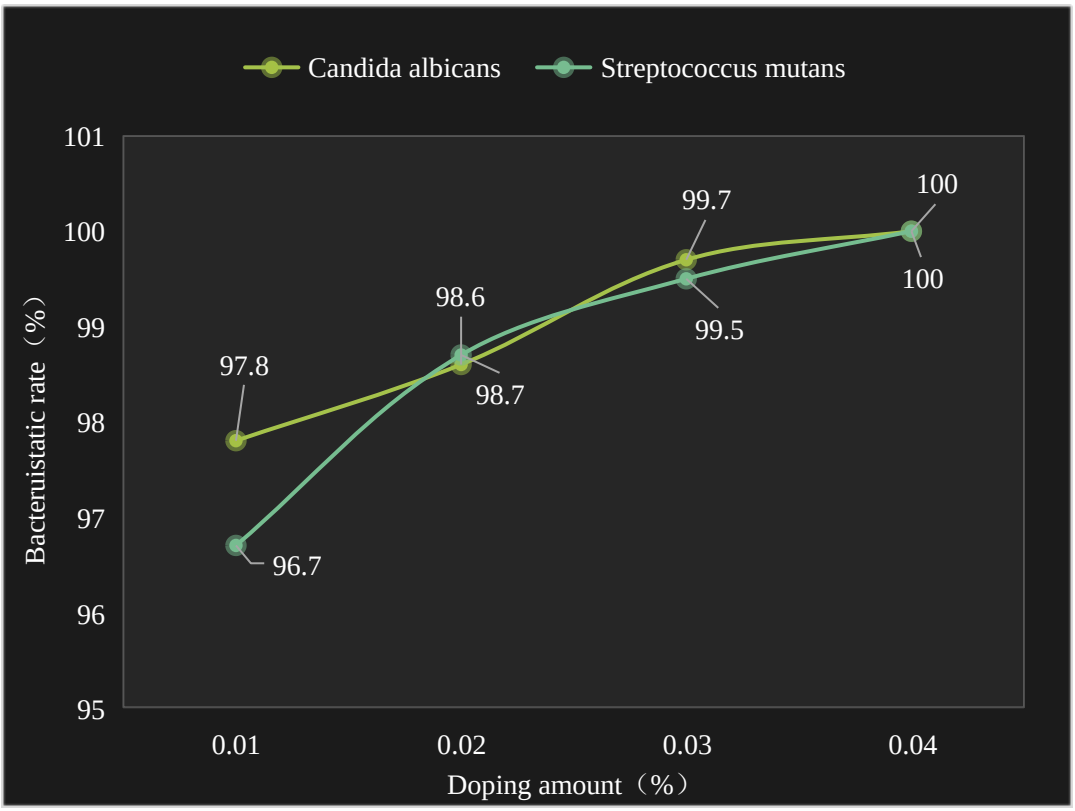

Figure 3. Results and analysis of bacteriostatic rate of each group of samples

4.4. Relative Cell Proliferation Rate

It can be seen from the data in Figure 4 that nano materials can promote cell proliferation to a certain extent, and the relative proliferation rate of cells without nano materials is 99.9%. By SPSS software analysis, there was no significant difference between the control group and the 0% group ($P < 0.05$), which indicated that the biological samples without nano materials had no inhibitory effect on cells. It can be seen from the data analysis results in Figure 4 that the relative proliferation rate of 2% and 3% groups is higher, especially the 3% group, which has a significant promoting effect on cell proliferation.

The results show that the doping of nano materials can promote the proliferation of cells, especially when the solid content of antibacterial agent is 3%. When the content of nano materials was further increased, the effect of promoting cell proliferation was weakened. The proliferation rate of 5% group was similar to that of control group. Therefore, in the application of nano materials, we cannot increase the content of nano additives in order to achieve the maximum antibacterial effect, which will not only cause waste of materials, but also affect the biological safety.

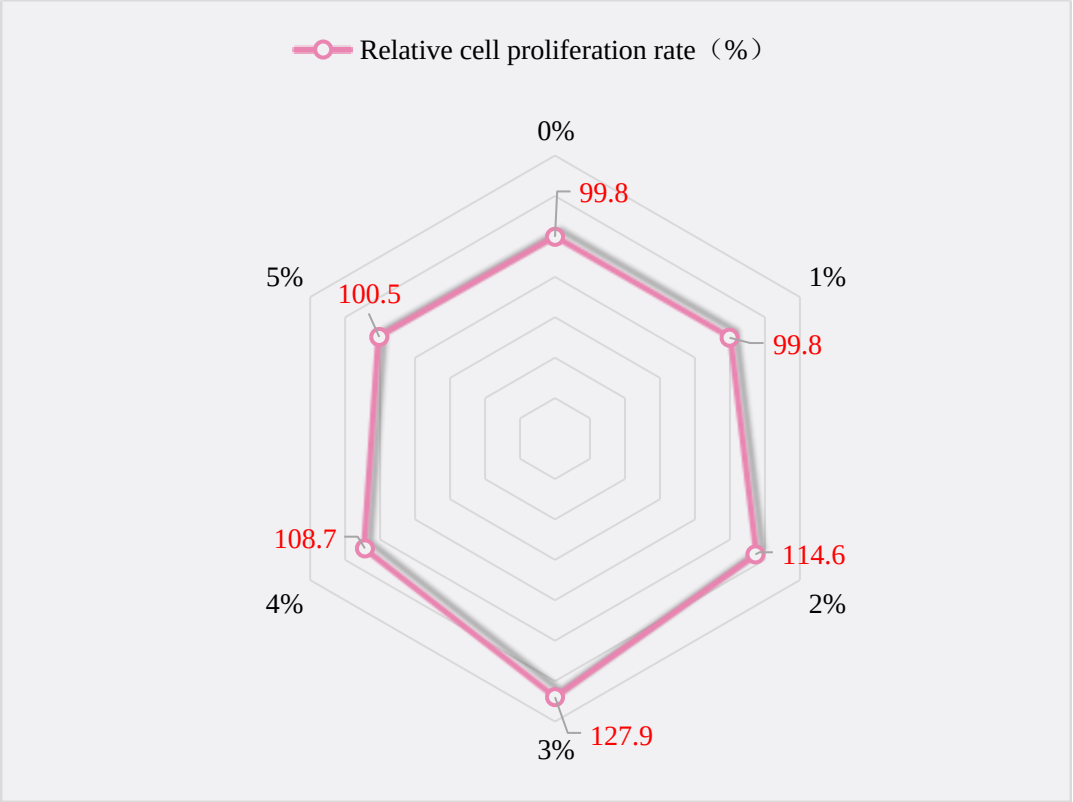

Figure 4. Results and analysis of relative proliferation rate of sample cells in each group

5. Conclusion

As a high-tech, nano materials have been widely used in competitive sports, and play an increasingly important role. The traditional dragon and lion dance in the process of exercise, the selection of sports equipment material is more casual, often ignoring its functional requirements. The use of nano materials can solve this problem. Some studies have shown that the ultra-fine particle characteristics of nano materials pose a potential threat to human health, but the current research on the biological safety of nano materials is almost blank. Therefore, the application of nano materials in dragon and lion dance exercise and its biosafety research, to a certain extent, play a filling role in this field. This paper makes a systematic analysis on the demand of dragon and lion dance, and points out that in the selection of materials, in addition to high plasticity, it also needs to meet better toughness. Nano materials are one of the most suitable choices at present. In order to further verify that nanomaterials may pose a threat to human health, the corresponding animal experimental model was established. In this model, the nano materials were ingested by the mice participating in the experiment, and the samples were collected and grouped according to the needs of specific experimental projects. According to the experimental data, nano materials have good performance in hemolytic test. In this paper, it is concluded that nano materials will not produce hemolytic reaction to human body in normal exercise. However, the data also show that the nano materials themselves are not toxic, on the contrary, they also have good bacteriostatic effect and play a better protective role on athletes.

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