The Anti-virus Properties of Nano-Chinese Medicine Microcapsule Treated Fabrics

Jin-Mei Wang[1*], Xiao-Wei Xu[2], Ying Zhou[1]

[1] *Xi'an Polytechnic University Xi'an710048, P.R.China;*
[2] *Shanghai Daweike Biological Co. Ltc Shanghai200000, P.R.China*

Abstract: The extracted components of Chinese medicine were prepared by following different methods and were used to make microcapsules of the medicine. The two agent samples of the nano-Chinese medicine microcapsule agent and the Chinese medicine Microcapsule agent and two treated fabrics, was used to determine the anti-virus properties of influenza virus and Herpes simplex virus by fluorescent quantification polymerase chain reaction (FQ-PCR). The testing conditions included the agent concentrations of original liquid, 1/10, 1/100, 1/1000 and 1/10000, and virus contents of 5.00 $\times 10^7$, 5.00×10^5, 5.00×10^3, 5.00×10^2copies/ml. The results indicated that all of the two agent samples of the nano-Chinese medicine microcapsule agent, the Chinese medicine microcapsule agent and the treated fabrics have good anti-virus characteristics. The nano-Chinese medicine microcapsule agent was more effective than the Chinese medicine microcapsule agent. The original style and good properties of the woollen fabrics were basically kept.

Keywords: microcapsule, nano meter, Chinese medicine, anti-virus, fabric.

1. Introduction

Micro organism scatter very extensively, playing numerous positive roles in the life of mankind, although they also contribute towards corrosion, and cause decay in industrial devices, as well as affect the human body to easily contract disease by triggering food poisoning,, cancer and even death. It takes a great deal of microorganisms in the general environment to adversely influence the human body. According to a report [1.2], not only do more than 10^6 of bacteria attach onto the hands, and 500-5000 /cm^2 of microorganisms are found on the human skin, but also it is unlikely that microorganisms will be completely eradicated through many rinses. In fact these microorganisms may become more serious in specific environments. The numbers of microorganisms in a cotton quilt was as high as 10^5/g, as found in an examination of a sickroom of a hospital in Peking [3]. Diseases such as AIDS, influenza, bird flu, rabies, and particularly the SARS virus in 2003 that had spread from south to the north of china at an incredible speed, made us realize the nuisance caused by virus[4-6].

The development and application of anti-microorganism fabric products have important consequence as clothes provide a unique natural cover for the human body. The anti-virus fabric and clothing has a long history. About 4, 000 years ago, the wrapped fabric on the mummy sphinx was already finished with a certain medicinal plant extract in ancient Egypt. The anti-virus fabric has developed quickly largely dictated by human requirements of health care and comfort in recent years. So the science and technology of the anti-virus fabrics have been studied in many countries, although the mechanism and function of the antivirus fabrics research may be very difficult because of virus structure, which makes it hard to distinguish between the existing, dead, and adsorbed on the fabrics. A series of antivirus material, such as Nano material [7,8], medicines extracted from drugs, were studied to determine the antivirus function outside the body, paving the foundation for application.

Adopt some chinese medicine such as honey-suckle etc. the medicine microcapsule with the releasing effect slowly were made of the extracted material of Chinese medicine[9,10], composed with

* Corresponding author's email: wjmxgk@126.com

the Nano material to form the compound fabric agents, was immersed onto woollen fabric. Experimenting with the outside-body virus development, this paper reports a series of results on the antivirus properties found in different combinations of (i) nano-Chinese medicine microcapsule agent, (ii) Chinese medicine microcapsule agent and (iii) finished fabrics. The antivirus property was evaluated by using flu virus (the RNA virus) as well as the herpes simplex virus (the DNA virus) and adopted fluorescent quantization polymerase chain reaction (FQ-PCR) virus testing technique [11-12].

2. Experimental

2.1 Materials

2.1.1 The Agent, Fabric Sample and Disinfection Processing:

Agent-1: The Chinese medicine Microcapsule agent; Agent-2: The nano-Chinese medicine Microcapsule agent;

Fabric-a: treated with the Chinese medicine Microcapsule agent; Fabric-b: treated with the nano-Chinese medicine Microcapsule agent;

Two kinds of agents and control sample, each 10 ml were taken and disinfected for 20min at 120 atmospheres, then maintained at 4°C. Fabric-a and Fabric-b were sheared to 1 × 1 cm and then were disinfected under the same condition with the agents.

2.1.2 Virus

Influenza virus 3b and Herpes simplex virus I were purchased from the cell and biological institute of the Chinese Academy of Science.

2.1.3 The Cell Series

The Hep II cell and the BHK cell were taken from the virus room of the PuTuo District disease prevention control centre.

2.1.4 The Reagents of the Real-time PCR

The reagents of the Real-time PCR were made of DaAn Gene Co. Ltd of Sun Yat-sen University.

2.2 Testing Instruments

The DHP-9052s give or get an electric shock at the hot constant temperature development box; super and cleaned work set, 100 class; The ZXC-II type ultraviolet ray disinfect device; the CA-920-3 perpendicular layer flowing cleaned work set, The centrifuge desktop 5417R; The Thermo cell HB-202 constant temperature metals bathe; The K308 stem type thermostat; The Real-time 7500 Sequence Detection System.

2.3 Experimental Methods

According to the technical specification of disinfect-2002 from the ministry of health and the testing design strictly following the guideline of the new Chinese medicine researched before clinical testing, we ensured that all experiments were strictly accurate, repeating each experiment three times.

2.3.1 The Virus Recovering

The virus (the flu virus 3B and the herpes simplex virus I) was kept in the liquid nitrogen that melted quickly at 37°C water baths, and placed onto the sensitive cell (the BHK cell, the Hep2 cells), which was grown with a fine and single layer, 10% foetus cow serum DMEM cultivate yeasts, cultured on the condition of 37°C, 5% CO_2.

In the next step, the virus were collected many times in the infection cell, which was altered from freezing to melt, with centrifuge at 10000 rpm, 20 min, and then filtered through the 0.22 μ super filter for dislodging the additional bacteria. It propagated 3-4 generations, and a great deal of virus would be collected if the virus had infected a cell, which would indicate pathological changes for two days.

The virus of the collections would be absorbed 100 ul to carry on the fixed concentration testing by the PCR, and the rest was saved at -20°C, the fixed concentration of flu virus 3B was 5.00×10^7 copies/ml,