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30 STUDY ON BLOOD DYNAMIC VISCOSITY IN ARTERIES VIA CFD

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Objectives Blood is a typical non-Newtonian fluid, and poor fluidity of blood is key to the pathogenesis of thrombus. The dynamic viscosity (high blood viscosity) of blood is a key factor in blood vessel embolization, especially cardiovascular and cerebrovascular embolisms. Computational fluid dynamics (CFD) is an efficient method for Newtonian or non-Newtonian fluid flow simulation. The finite volume method (FVM) is also an efficient numerical method for fluid dynamics simulation. This study aimed to investigate blood flow characteristics in arteries, and the dynamic viscosity is taken into account via the non-Newtonian fluids and CFD theory.

Methods A series of numerical computations are presented to reproduce the process of blood flowing in arteries using the FVM code CFX. Blood flow simulation will be accelerated using the GPU parallel computation scheme with the CUDA-enabled GPU coprocessor.

Results The dynamic viscosity and flow field of blood will be computed and shown by the contours. The velocity, shear strain rate and dynamic viscosity of blood can be calculated and monitored for different ages of people.

Conclusions The dynamic viscosity and flow characteristics of blood in arteries can be reproduced using CFD and FVM. The mechanism of blood vessel embolization can be analyzed via the non-Newtonian fluids and CFD theory. Thrombus occurs when the rheology of blood is enhanced.

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31 PATENT BIBLIOMETRIC ANALYSIS OF BIO/PHARMA COLD-CHAIN LOGISTICS IN CHINA

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Objectives Our objectives are to study the development and historical evolution of the bio/pharma cold-chain logistics industry in China. Bio/pharma cold-chain logistics has attracted a large number of scholars whose research has resulted in patents. Cold-chain modes like cold-chain transportation, cold-chain circulation, low temperature and multi-modal transportation have played an important role in bio/pharma cold-chain logistics. The implementation of cold-chain logistics also guarantees that the bio/pharma will always be kept at a low temperature state during the circulation process. The highlighted issues of drug safety make this more important. Statistically, the rates of cold-chain circulation and cold-chain transportation in China are 20% and 30%, compared to more than 90% in developed countries.

Therefore, it is necessary for scholars to carry out scientific research on cold-chain logistics.

Methods A scientific literature database including a patent information services platform was used. Data visualization methods such as a patent management map, quantitative methods and bibliometrics were used to study patents.

Results The results revealed that the bio/pharma literature and cold-chain logistics technologies have increased substantially. Institutes and universities are the main forces behind basic research, and bio/pharma enterprises have begun to focus on intellectual property protection and technological innovation.

Conclusions Institutes and enterprises should be encouraged to carry out cooperative research on bio/pharma cold-chain logistics, to promote cold-chain resource integration and transfer to the Midwest, and to strengthen bio/pharma enterprises to speed up investment in the secondary market in China.

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Environment and Health

32 RESEARCH ON THE FACTORS AFFECTING THE DEVELOPMENT OF BIOMEDICINE INDUSTRIAL CHAINS

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Objectives The paper studies the factors affecting the development of biomedicine industry chains based on atmospheric pollutants and their concentration levels, and provides important scientific data for the quantitative evaluation of the value chain of the emerging biomedicine industry.

Methods This paper predicts and evaluates the effect factors and their influence on the development of biomedicine industry chains using the list method, graph overlays, ecological mechanism analysis and other approaches.

Results The study identifies the relationship curve characteristics among the different effect factors so that the impact of the effect factors can be determined and a scientific basis provided for their prevention and control to enhance the development of biomedicine industry chains.

Conclusions Factors affecting biomedicine industry chains include meteorological factors (temperature, relative humidity and dew point temperature, etc) and the social and economic characteristics of the population (sex, age, level of education, smoking history, etc), which have different non-linear relationships.

33 PRACTICE BASED ON THE FULL-TIME VISITATION MODEL FOR PHARMACEUTICAL EDUCATION IN THE RIZHAO REGION, CHINA

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Objectives Pharmacists are in demand both because of their knowledge of medical therapy and also due to their skills in basic physical assessment as medical personnel. The traditional 'two stage' teaching approach for pharmaceutical education in China (theoretical teaching in the early stage and practice teaching in the later stage) has some drawbacks, for instance practice time is too concentrated and there is a large gap between students' theory and practice. The aim of this study was to improve the quality of the teaching of pharmacy students.

Methods We use the full-time visitation model in our teaching hospital for pharmaceutical education. A total of 98 pharmacy undergraduates taught using the traditional model and 176 pharmacy students taught using the full-time visitation model were studied from 2013 to 2015 so that an evaluation appraisal system could be designed. The outline of the method to confirm basic vital signs with simulators was first explained and then demonstrated. Simulations reproduced the effects of drugs on the patient's condition, and the students' knowledge and skill in advanced objective structured clinical examination through practical examinations was checked.

Results Pharmaceutical education was conducted using patient simulators for bedside training, seminars in our hospital pharmacies, and physical assessment practice. Using the full-time visitation model, the excellent results of pharmacy students in basic medical knowledge (80.6%), doctor-patient communication (78.02%), clinical ability and skills (70.41%) and other aspects of comprehensive evaluation (81.6%) were better than those of students taught using the traditional model ($p < 0.05$). However, basic theory was taught better using the traditional model (85.2%) than with the objective structured clinical examination (OSCE) model (79.6%). The results of case study exercises in which students perform physical assessments and collect basic information on patient background were excellent.

Conclusions The full-time visitation model can improve the clinical practical skills of pharmacy students and pharmaceutical education using simulation provides pharmacy students and pharmacists with experience in the different types of medical treatment provided by various healthcare professionals, leading to exploration of new roles for pharmacists in team medical care.

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Poster Session

Pharmaceutics and Drug Delivery Research

34 A PH-SENSITIVE POLYMER ENHANCES THE SPECIFICITY AND THERAPEUTIC EFFICIENCY OF LIPOSOMAL DOX IN VITRO

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Background Lipid nanoparticles (LNPs) were eagerly anticipated as promising delivery systems for cancer drugs due to their biocompatibility and tendency to accumulate in tumor tissues. 3-

Methylglutaryl poly (glycidol) (MGluPG) was insert into LNPs to form pH-sensitive polymer-modified liposomes which can delivery doxorubicin (DOX) into tumor cells by membrane fusion under relatively acidic conditions. In this study, we report that MGluPG-modified liposomal DOX can efficiently promote antitumor activity and target binding compared to non-MGluPG-modified liposomes.

Methods Briefly, eggPC, MGluPG, cholesterol and DOTAP were dissolved in chloroform and dried to a thin membrane on a rotary evaporator. The dried lipid mixture was further hydrated in a low-pH solution (6 mM ammonium sulphate, pH 5.5) under a vortex mixer to form polydispersity vesicles. The liposomes were then extruded through a polycarbonate membrane with a pore size of 80 nm to reduce particle size and dialyzed in a neutral buffer (pH 7.4) to establish the pH gradient. DOX was loaded by incubating with preformed liposomes at 60° C for 30 min with intermittent vortexing and finally the mixture was eluted using a Sepharose CL-4B gel-filtration column to remove free DOX.

Results The LNPs synthesized in this procedure had a particle size of 168 ± 10.6 nm and a ζ potential of 5 ± 0.78 mV. Drug encapsulation efficiency (EE) was over 85%, meaning most DOX was encapsulated into the liposomes. The release of MGluPG-modified liposomal DOX in phosphate buffer (pH 5.3) was significantly higher than in PBS (pH 7.4) after 24 hours of incubation at 37° C. The MTT test further demonstrated that the IC₅₀ of MGluPG-modified liposomes induced significantly less cytotoxicity. Data from the inhibition of tumour growth revealed MGluPG-modified liposomal DOX was both safe and inhibited tumor growth efficiently.

35 TRADITIONAL CHINESE MEDICINE (TCM) THERAPEUTIC EFFECTS ASSESSMENT IN BREAST CANCER PATIENTS

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Objectives In China, the incidence of breast cancer is relatively high, and the peak incidence later in life. Traditional Chinese medicine (TCM) has become well known worldwide for its significant role in preventing and treating cancer. In the present study, we investigated the efficacy of TCM Xiaozhengshugan recipe as an adjunctive therapy in breast cancer.

Methods This was a prospective, randomized, controlled trial. A total of 72 breast cancer patients were randomized into an observation group (Western medicine treatment combined with TCM Xiaozhengshugan recipe, n = 38) and a control group (Western medicine only with no TCM therapy, n = 34). The effectiveness of therapy for breast cancer was evaluated.

Results The study demonstrated that the Xiaozhengshugan recipe could relieve clinical symptoms and improve quality of life (QoL). QoL scores in both groups were higher than before treatment ($p < 0.01$). The improvement in Chinese medical symptoms in the observation group was significantly better than in the control group ($p < 0.05$). CA153, CEA and CA125 levels were decreased in both groups after therapy compared to before ($p < 0.05$, respectively). None of the patients died during the follow-