Results Glucosamine hydrochloride has a significant inhibitory antitumour effect on MKN-45 cells in vitro. The cell viability of MKN-45 cells treated with different concentrations of glucosamine hydrochloride rose continuously from 24 to 72 hours compared with the untreated control. MKN-45 cells were inhibited by 54% by 500 μ g/mL glucosamine hydrochloride and by 85% by 1000 μ g/mL glucosamine hydrochloride. Administration of 500 μ g/mL glucosamine hydrochloride resulted in a significant decrease in MMP-2 and MMP-3 expression of about 79% and 70%, respectively, in MKN-45 cells.

Conclusions In this study, we showed that the antitumour activity of glucosamine hydrochloride significantly suppresses MKN-45 cells in vitro. This effect was shown by inhibitory gene expression of MMP-2 and -3.

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16 DISCRIMINATION OF BRAZILIAN GREEN PROPOLIS AND CHINESE PROPOLIS BASED ON HIGH-PERFORMANCE LIQUID CHROMATOGRAPHIC FINGERPRINTS AND MULTIVARIATE STATISTICAL ANALYSIS

Lulu Geng*, Fanxin Meng, Mingzhi Zhao, Liying Wang, Yumeng Liu, Liang Wang. Department of Chemistry and Pharmacy, Zhuhai College of Jilin University, Zhuhai, China

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Objectives The determination of chemical components is usually used in the quality control of propolis. However, chemical components from different types of propolis are similar. The objective of this investigation was to establish a method based on a specific chemical fingerprint profile and a multivariate mixed model statistical analysis which could easily distinguish propolis of different origins and promote the quality control of propolis.

Methods A novel approach using high performance liquid chromatography (HPLC) coupled with multivariate statistical analysis was established for profiling and distinguishing Chinese and Brazilian green propolis. A batch of 22 propolis samples was analyzed, and the datasets on retention time, peak area and sample codes were subjected to mixed multivariate statistical analysis consisting of principal component analysis (PCA) and a selforganization mapping net (SOM).

Results The fingerprints were profiled. PCA score plots showed Chinese and Brazilian green propolis clearly classified into two groups. The visualized SOM results showed data from the two groups projected to the adjacent neurons clearly separated from each other. Artepillin C, which contributed greatly to the differentiation, was screened out and identified as the reference compound. Artepillin C is the characteristic component in Brazilian propolis which can be used as chemical marker to distinguish propolis of different origins.

Conclusions In this study, fingerprints coupled with multivariate statistical analysis have been successfully applied to distinguish Chinese from Brazilian green propolis. The research identified a chemical marker, and thus helps to investigate and promote the quality control of propolis.

17 DELIVERY OF BETULINIC ACID LIPID NANOPARTICLES ASSEMBLED BY A MICROFLUIDIC DEVICE

Xueqin Huang, Xi Zhao, Liang Wang, Mingzhi Zhao, Peng Xie, Dongsheng Yang*. Department of Chemistry and Pharmacy, Zhuhai College of Jilin University, Zhuhai, China

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Background Microfluidics chip-based approaches (MF) can achieve unique transport properties through laminar flows and vastly increased surface-to-volume ratios, which have been extensively utilized to prepare smaller and homogeneous lipid nanoparticles (LNPs). LNPs have shown potential to carry highly insoluble medicines, especially betulinic acid (BA) which has significant antitumour activity but is difficult to administer for cancer therapy due to its poor water solubility. In this study, we investigated the parameters involved in the continuous production of LNPs encapsulating BA (BA-LNPs) by MF, and the possibility of improving antitumour efficacy and reducing toxicities was described.

Methods Briefly, a three-inlet MF system was developed and used to produce the LNPs. EggPC, cholesterol and BA (45:37:18% molar) were dissolved in ethanol. The lipid solution was then loaded into a 1 mL glass syringe and injected into the centre inlet channel, while phosphate-buffered saline (PBS; pH 6.5) was loaded into two 5 mL glass syringes and introduced into the two side inlet channels to establish hydrodynamic focusing. To investigate the physicochemical and biological properties of fabricated liposome at different shear forces, the total flow rate (TFR) is varied from 0.3 to 0.8 mL/min.

Results The TFR has a very small effect on particle size distribution, but an increase in TFR causes a progressive decrease in liposome size. The percentage of encapsulating efficiency (EE) was 77–92% and there were no significant changes when BA-LNPs were stored at 4° C. The inhibitory rate of BA-LNPs was significantly higher compared to free BA in vitro. Immunohistochemical analysis showed many damaged tumor cells after BA-LNPs were injected for 15 days. The survival of mice treated with BA-LNPs was apparently prolonged compared to mice treated with free BA.

Conclusions This result indicates that much stronger antitumour effects were induced by BA-LNP administration, which is most likely due to the relatively small particle sizes produced by MF and which are suitable for intracellular transportation.

Pharmaceutical Analysis

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NATURAL MEDICINES TO TREAT LIVER PROBLEMS

Fei Xiong, Yongsong Guan*, Ningning Yang, Qing He. Department of Oncology, West China Hospital of Sichuan University, Chengdu, China

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Objectives Liver disease, especially the chronic diseases, is a serious health problem worldwide. Natural medicines have been used for thousands of years to treat liver problems. Patients with liver problems sometimes try natural medicines, especially medicinal herbs, and some natural agents. This study aims to discuss several aspects of natural medicines for treating liver problems.

Methods Electronic databases including Web of Science and PubMed were searched for in vitro, in vivo and clinical studies on the effects of natural medicines on liver problems.

Results Nearly half of the natural medicines used in treatment of liver diseasestoday are natural products and their derivatives. Sho-saiko-to is effective on hepatitis, liver fibrosis, and HCC. But long-term consumption of this herb drug may lead to interstitial pneumonia and even acute respiratory failure. Silybum marianum is a hepatoprotective agent and long-term use of this herb was considered to be safe. Some other natural medication, such as long pepper, holy basil, coffee, apple, and citrus, for example, have hepatoprotective effect, but more in-depth studies are required to confirm the dosages of each agent to avoid side effects when using them to treat liver problems.

Conclusions Naturopathy is becoming more popular worldwide and provides benefits to many patients with liver diseases such as hepatitis, liver cirrhosis and liver cancer. The integration of conventional and naturopathic medicine will produce a practice style that provides excellent medical care for the liver.

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19 DELIVERY OF 1,2-DIHYDROQUINOLINES VIA TRANSFERRIN-TARGETED LIPOSOMES

¹Yan Liu, ^{1,2}Robert J Lee, ¹Lesheng Teng, ¹Lirong Teng*. ¹School of Life Sciences, Jilin University, Changchun, China; ²Division of Pharmaceutics, College of Pharmacy, The Ohio State University, Columbus, OH, USA

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Objectives Quinolines have been shown to have anticancer activities. This study investigates delivery of a novel quinolone using liposomes targeted to cancer cells.

Methods A 1, 2-dihydroquinoline was loaded into transferrin-targeted liposomes. Lipids (6.0 μ mol), HSPC, cholesterol and PEG-DSPE in the ratio 63:36:1, and 0.5 μ mol 1, 2-dihydroquinoline were dissolved in ethanol. An ethanol injection method was used to prepare transferrin-targeted liposomes. Mean particle size and ζ potential measurements, cytotoxicity assay, flow cytometry and confocal microscopy were performed.

Results The mean particle size of transferrin liposomes was 124 \pm 2.7 nm. The ζ potential was -6 ± 1.2 mV. Transferrin-targeted liposomes showed high cytotoxicity for tumour cells. In competitive binding assays, the uptake from transferrin-targeted liposomes was inhibited 78% by 10 nM holo human transferrin. Flow cytometry and confocal microscopy analyses indicated that association of transferrin-targeted liposomes to tumour cells was much greater than that of non-targeted liposomes.

Conclusions We have identified a 1, 2-dihydroquinoline as a potential anticancer agent. Furthermore, this compound can be efficiently loaded into transferrin-targeted liposomes for targeted delivery to tumour cells. These data suggest that transferrin-targeted liposomes carrying 1, 2-dihydroquinoline are a potential anticancer agent for clinical application.

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20 THE HYPOLIPIDEMIC EFFECT OF SOPHORA JAPONICA POWDER ON A MOUSE MODEL OF HYPERLIPIDAEMIA

Yan Li, Peng Xi, Tan Wang, Mingsan Miao*. Department of Pharmacology, Henan University of Traditional Chinese Medicine, Zhengzhou, China

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Objectives To investigate the hypolipidemic effect of *Sophora japonica* powder on a mouse model of hyperlipidaemia.

Methods A hyperlipidaemic mouse model was established by feeding mice with a high fat diet and a fat emulsion complex, factors which produce hyperlipidaemia. At the same time, large, medium and small doses of *S. japonica* powder were administered for 10 days and serum total cholesterol (TC), triglycerides (TG), HDL-C and LDL-C were measured.

Results A hyperlipidaemia mouse model was successfully established. High, medium and low doses of *S. japonica* powder significantly decreased serum TC and TG levels (p < 0.01), significantly increased HDL-C levels (p < 0.01) and significantly reduced serum LDL-C levels (p < 0.01). Low doses of *S. japonica* powder significantly reduced serum LDL-C levels (p < 0.05). **Conclusions** *S. japonica* powder has an obvious hypolipidemic

effect on mice with hyperlipidaemia, can effectively regulate lipid metabolism and has a therapeutic effect on hyperlipidaemia. Acknowledgements The study was financially supported by the

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21 ANALYSIS OF THE CHARACTERISTICS OF HEMORRHOIDS MODELS

Mengfei Zhang, Mingsan Miao*, Peng Xi, Liling Xiang. Department of Pharmacology, Henan University of Traditional Chinese Medicine, Zhengzhou, China

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Objectives Based on the characteristics of the clinical symptoms of hemorrhoids and analysis of the corresponding animal model, treatment methods are proposed.

Methods The clinical diagnosis of hemorrhoids and the therapeutic effects of Chinese medicine and Western medicine were analyzed and the establishment and characteristics of the current animal model were summarized. The current animal model and clinical symptoms of anastomosis were analyzed and discussed in relation to clinical symptoms and standards.

Results In Western medicine, hemorrhoids are divided into external, internal and mixed hemorrhoids. There are three research models of inflamed external hemorrhoids: the croton oil and carrageenan anal edema model, the acetic acid bacteria and ulcer model, and the anal skin trauma model. The blood stasis type model is used for thrombotic external hemorrhoids. The esophageal varices model is mainly used for internal hemorrhoids. Mixed hemorrhoid models include the inferior rectal vein occlusion model and the ligation of hemorrhoids model. The above models are only approximate models of hemorrhoids as there are large differences in clinical incidence and the degree of anastomosis. More effective models of hemorrhoids must be produced, combining clinical pharmacology and related research. In addition, our laboratory has long been engaged in the study of