

**Results** The inflammatory score, cardiac interstitial fibrosis score, cardiac apoptotic index, protein expression levels of caspase-3, caspase-8 and caspase-9, HW/BW, level of NO and activity of iNOS, expression levels of iNOS mRNA, and caspase-3, caspase-8 and caspase-9 protein were all significantly higher in the model control group and experimental group than in the normal control group ( $p < 0.01$ ), and the levels in the model control group were higher than in the experimental group. HW/BW was only slightly elevated in the model control group compared with the experimental group.

**Conclusions** The development of EAM is related to the NO catalyzed by iNOS. L-NAME protected cardiac myocytes through suppressing the activity of iNOS and further decreased production of NO in EAM. The mechanism may be related to inhibiting the apoptosis of cardiac myocytes mediated by the caspase family and protecting mitochondrial function.

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### 52 EFFECT OF EXTERNAL APPLICATION OF SPIKENARD WATER DECOCTION ON THE MOUSE PAIN MODEL

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**Objectives** To investigate the effects of external application of a spikenard water decoction on pain model mice.

**Methods** We investigated the effects of spikenard water decoction on the pain threshold in mice using the hot plate method. After injection of formaldehyde, the effects of spikenard water decoction on the formalin-induced pain incubation period and biting times were observed.

**Results** Each dose of spikenard water decoction obviously or significantly improved the pain threshold of pain model mice ( $p < 0.01$ ,  $p < 0.05$ ), significantly prolonged the pain licking incubation period ( $p < 0.01$ ) and obviously or significantly reduced the number of instep licks in 5 min and 10 min ( $p < 0.01$ ,  $p < 0.05$ ).

**Conclusions** External application of spikenard water decoction has a good analgesic effect in the mouse pain model.

### 53 SYNTHESIS OF A NOVEL PROTEIN-FRIENDLY AMPHIPHILIC MATERIAL AND ITS APPLICATION IN PROTEIN DRUG DELIVERY

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**Objectives** We synthesized an environmentally friendly amphiphilic material PK3-PEI with good mechanical properties, pH sensitivity and biocompatibility, aiming at improving the acidic microenvironment produced by the degradation of polyester compounds and poor mechanical properties of PK3. PK3-PEI spontaneously forms micelles in pH 7.4 PBS and rapidly degrades into non-toxic small molecules in acidic conditions. Surface PEI with large positive charges effectively promotes cell targeting and accelerates the release of drug after entering the cells.

**Methods** PK3 and PEI were linked using a connection molecule. Activation of -OH groups on PK3 (0.46 g) was accomplished using HMDI (50-fold) in chloroform at 80°C for 4 hours. The

intermediate was precipitated with diethyl ether and incubated with PEI (Mw 2000 kDa, linear, 0.46 g) in chloroform at 80°C for 4 hours. PK3-PEI was collected through repeated precipitation in diethyl ether. For the preparation of PK3-PEI micelles, 100  $\mu$ L of BSA solution (40 mg/mL) and 40 mg of PK3-PEI were dispersed in chloroform in dialysis bags. The PK3-PEI micelles were obtained by dialysis against pH 7.4 PBS.

**Results** The connection ratio of PK3 and PEI was 1:1. The particle size and  $\zeta$  potential of micelles were 50.3 nm and 25.7 mV, respectively. The *in vitro* release profile showed PK3-PEI had a shorter hydrolysis cycle and higher pH sensitivity than PK3. The MTT assay showed blank PK3-PEI micelles had lower cytotoxicity (4.6%) than free PEI (18.7%). Cellular uptake indicated PK3-PEI micelles had higher uptake efficiency than PK3 ( $p < 0.01$ ).

**Conclusions** PK3-PEI micelles have a better degradation curve and targeting effect for the delivery of antitumor drugs and can be used as a promising carrier in cancer treatment.

### 54 ANTI-GLIOMA ACTIVITY OF RANA TEMPORARIA CHENSINENSIS EGG PROTEIN HYDROLYSATE

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**Objectives** *Rana temporaria chensinensis* only live in the Changbai mountain area in the northeast of China. The eggs of *R. temporaria chensinensis* contain many special ingredients that modulate incretion. This study aimed to investigate the effects of *R. temporaria chensinensis* egg protein hydrolysate on human glioma C<sub>6</sub> cell proliferation and apoptosis.

**Methods** We extracted *R. temporaria chensinensis* egg protein (500 mg/mL) and investigated its effects on human glioma C<sub>6</sub> cell cultures, and subjected it to an MTT assay, colony forming assay, Western blot assay and flow cytometry analysis of apoptosis. We further investigated the effects of *R. temporaria chensinensis* egg protein hydrolysate (1.5 g/kg) on glioma development and progression *in vivo* using a mouse model of glioma.

**Results** *R. temporaria chensinensis* egg protein hydrolysate inhibited the proliferation of glioma cells; these effects were mediated by the phosphoinositide 3-kinase (PI3K)/AKT signalling pathway.

**Conclusions** This study suggested that *R. temporaria chensinensis* egg protein hydrolysate promotes apoptosis of glioma cells both *in vitro* and *in vivo*.

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## Healthcare Informatics

### 55 RESEARCH ON LAST MILE DISTRIBUTION OF EMERGENCY MEDICAL SUPPLIES IN EARTHQUAKE DISASTERS

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**Objectives** A model based on time and cost is proposed in order to quantitatively study last mile distribution of emergency medical supplies. Because cost is not particularly important in the

distribution of emergency medical supplies in earthquake disasters, but time should be considered, the MAGTD (multi-attribute grey target decision) strategy was proposed. The novel method of cloud computing is proposed to solve the problem of minimizing delivery time while maximizing loading rate in the distribution of emergency medical supplies.

**Methods** The distribution model for an earthquake disaster region is divided into direct and indirect parts, and the characteristics of emergency medical supplies are summarized and analyzed. Secondly, the AHP-OWA operator based on cloud computing is constructed to evaluate the importance of the emergency medical supplies. Finally, the last mile delivery risk assessment model is established.

**Results** The use of the experimental examples and comparison with the existing algorithm shows that the proposed cloud computing method can deliver the optimal solution in a shorter period for emergency medical supplies distribution in earthquake disasters.

**Conclusions** The proposed method needs less time and the loading rate is higher for last mile distribution than other existing algorithms to help minimize further problems following destructive earthquakes.

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#### A HOSPITAL MANAGEMENT SYSTEM BASED ON WORKFLOW

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**Objectives** Hospital management systems, currently under the network environment, are an emerging category of information systems. The decomposition of hospital management systems into the workflow of mobile agents' architectures does not seem an appropriate solution, since mobile agents can allow servers to be made more flexible, with components being added and removed at runtime. Mobile agents can reduce network load and permit disconnected operation during which a client can also 'launch' a mobile agent into the network.

**Methods** In this paper, we study a hospital management system based on workflow. It can cope with the rapidly evolving business environment better than most other systems as they are more flexible and open. We describe a possible architecture of such a hospital management system. Mobile agents enable a flexible and adaptive system with the possibility of simulation, analysis and monitoring of process execution in order to identify potential inconsistencies and to provide appropriate information to the administrator for the purpose of process improvement. Then we discuss the functionalities and the collaborations of mobile agents, followed by process state transitions and the executing process of the hospital management system.

**Results** We implemented the described architecture and proposed solutions to the problems arising while the hospital management system was being implemented. The prototype design could provide a more flexible and adaptive infrastructure for incorporating dynamic changes into the currently executing process model. Due to a mobile agent system, its modular design both reduces the

complexity of the system and is also easy to expand, as well as having good robustness and reliability.

**Conclusions** We have constructed a hospital management system based on workflow which provides more flexibility, adaptability and expansibility, and is more robust and reliable than existing systems.

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#### A PREDICTABLE SMART HOME INTEGRATED WITH CLOUD COMPUTING AND LONG-TERM CARE

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**Objectives** This paper introduces a predictable smart home which was integrated with cloud computing. A Hakka pinyin input method for Android mobile/cell phones has been provided. Our system achieved the goals of energy saving and carbon reduction, and can be employed in medical care applications, such as long-term care.

**Methods** This system provides a diversified smart home interface. By mining power consumption data, we can predict people's future behavior for controlling home appliances. In this paper, we use an  $n$ -gram language model for training an  $(n-1)$ th-order Markov model. Based on statistical models, we can predict the behavior of residents and patients, and achieve energy saving and carbon reduction. In our system, mobile/cell phone and smart watch apps were developed to provide residents or patients with a convenient interface to control IR appliances, ZigBee appliances and appliances with a WiFi smart plug. The power consumption data must first be obtained by calling the WiFi smart plug's open API. The open API's power consumption data is presented in JSON format, as show below:

```
{"result":true,"data":[{"outletid":"PT020020F85EAA766A01",
"attridval":"2_0,5_0,7_4517,8_0,12_0"}]}
```

The attribute of the result is present calling status. The outlet id is the WiFi smart plug's id. Data is the power consumption string which is shown as 2\_Current A,  $1/100 = 0.01$  A for this case. This should be divided by 100. The home appliance condition should then be determined based on the current information, and the following rule used to generate one string for the present condition at different times. In the rule, the string consists of two parts: the prefix and the time index. In this system, the Hakka pinyin input method for Android mobile/cell phones that enable users to input Hakka words quickly and conveniently has been provided. It is toneless while the user inputs the pinyin, and several response messages for typing errors are included. The smart home apps on mobile/cell phones employ a socket client connecting to the cloud server, allowing residents to use their smart devices and web applications anywhere with an internet connection to control appliances.

**Results** The experimental data were generated from six appliances generating 4320 sequential states over 1 month. Several experiments were conducted using three  $n$ -gram models on six home appliances. A prediction precision of 95.7% on average