ported in the world, but the authentic one is found only in mountain ranges at elevations of 3000-5000 m in Qinghai, Yunnan, Sichuan and Tibet in China.

The composition of *C. sinensis* is very complicated with many important compounds.[1-3] In general, it includes cordycepic acids, polysaccharides, adenosine, cordycepin, ergosterol, vitamins (B_1, B_{12}, E), various minerals (such as Zn, Cu, Se, K, Ca, and Mg), and several essential amino acids, etc. It has recently been found to have the biological functions of promoting the immune system[4,5] and increasing coronary blood flow.[6,7] Antitumor and antiviral effects of *C. sinensis* have also been reported recently.[8-10]

The outstanding medical merits of *C. sinensis* have attracted much attention from around the world. As it requires a specific host and a strictly conditioned environment in which to grow, sources of natural *C. sinensis* are very limited. The increase of demand, along with a tapering of natural *C. sinensis*, have encouraged the high-tech and commercialized cultivation of *C. sinensis*. However, the food safety and physiological effects of the new products of cultured mycelium of *Cordyceps sinensis* (*C. sinensis my*) remain unknown. The present study is intended to elucidate the food safety and physiological effects of *C. sinensis my* in the human.

MATERIALS AND METHODS

Material

The *Cordyceps* sample was manufactured by a submerged culture technique conducted by Taiwan Sugar Research Institute. The fungus, *Cordyceps sinensis*, was isolated from naturally occurring cordyceps, and the culture conditions were optimized and scaled-up to a 6-kL fermentor using Taguchi's method.[11] The cultivated mycelia was spray-dried to obtain a powder. The contents of soluble proteins, sugar, and adenosine derivatives were calculated from their concentrations in a hot water extract of the powder. The fungus-bearing ergosterol content was determined from its concentration in an ethylacetate extract. Various components of cultivated *Cordyceps* were analyzed and the composition is shown in Table 1. Amounts of soluble proteins and sugars were analyzed by Bradford's method[12] and Phenol-sulfuric acid method,[13] respectively. Adenosine derivatives were determined by the enzymatic method.[14] Both cordycepin and ergosterol were analyzed by capillary electrophoresis.[15,16] ICP-MS was used to analyze the total amount of heavy metals.

Table 1. Chemical Composition of the Powder of Cultured Mycelium of *Cordyceps sinensis*

Component	Content
Soluble protein	0.33% (wt/wt)
Sugars	5.81% (wt/wt)
Adenosine derivatives	5.92 μmol/g
Cordycepin	1.23 μmol/g
Ergosterol	3.51 mg/g
Heavy metals (total amount)	< 2 ppm

Assessment of Food Safety[17]

Weaning (3-week) and larger (8-week) ICR mice were purchased from the National Laboratory Animal Breeding and Research Center, National Science Council. They were housed individually in stainless steel wire cages in a room maintained at 23 ± 2 °C with a controlled 12-h light : dark cycle. All of them were fed with a nonpurified diet (Laboratory Rodent Chow, Ralston Purina, St. Louis, MO) for 1 week as the adaptive period. Then, both weaning and larger ICR mice were randomly assigned to 4 groups. Each age group mice were administered with 50, 100, 200 or 400 mg *C. sinensis my*·mouse^{-1}·day^{-1} by intragastric route once per day for 3 days. The mortality of mice was recorded through the subsequent 5 days. Food and water were fed ad libitum during the study period.

Physiological Effects

Human subjects

The study was conducted at the Taipei Medical College. Fifteen males and 5 females were recruited into the study. They were healthy non-smokers and had no chronic illnesses, including malabsorption, liver, or cardiovascular diseases. No nutritional supplements were given 1 month before and during the study period. Subjects were free living, consumed their usual diets, and were asked not to change their usual food intake or physical activity throughout the study period. The study was fully explained to each subject, and informed consent was obtained. Every subject was supple-