Camphoratins A–J, Potent Cytotoxic and Anti-inflammatory Triterpenoids from the Fruiting Body of *Taiwanofungus camphoratus*

Shwu-Jen Wu,[†] Yann-Lii Leu,[‡] Chou-Hsiung Chen,[§] Chih-Hua Chao,[§] De-Yang Shen,[§] Hsiu-Hui Chan,[§] E-Jian Lee,[⊥] Tian-Shung Wu,*[,§,▽,+] Yea-Hwey Wang,[∥] Yuh-Chiang Shen,[∥,+] Keduo Qian,[○] Kenneth F. Bastow,[○] and Kuo-Hsiung Lee*[,▽,○]

Department of Medical Technology, Chung Hua University of Medical Technology, Tainan 717, Taiwan, Republic of China, Natural Products Laboratory, Graduate Institute of Natural Products, Chang Gung University, Kweishan, Taoyuan 333, Taiwan, Republic of China, Department of Chemistry, National Cheng Kung University, Tainan 701, Taiwan, Republic of China, Neurophysiology Laboratory, Neurosurgical Service, Department of Surgery, National Cheng Kung University Medical Center and Medical School, Tainan, Taiwan, Republic of China, College of Pharmacy, China Medical University, Taichung, Taiwan 401, Republic of China, National Research Institute of Chinese Medicine, Taipei 112, Taiwan, Republic of China, Chinese Medicine Research and Development Center, China Medical University and Hospital, Taichung, Taiwan, Republic of China, and Natural Products Research Laboratories, Division of Medicinal Chemistry and Natural Products, UNC Eshelman School of Pharmacy, University of North Carolina, Chapel Hill, North Carolina 27599-7568, United States

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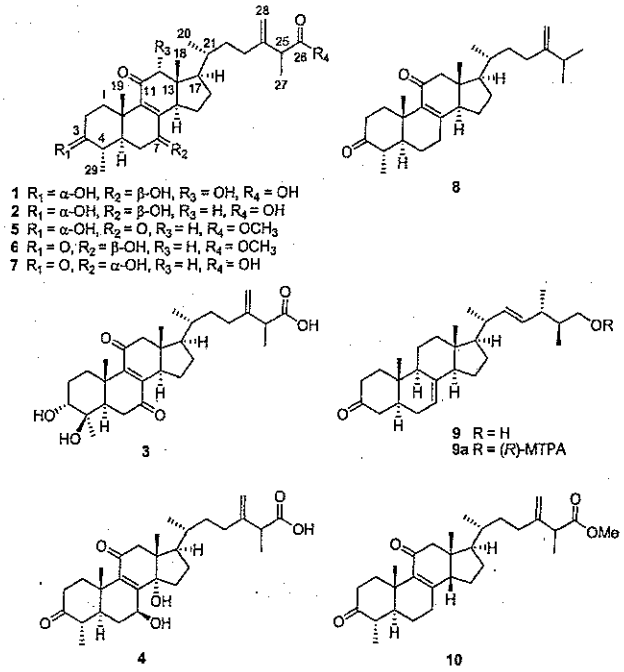
Ten new triterpenoids, camphoratins A–J (**1**–**10**), along with 12 known compounds were isolated from the fruiting body of *Taiwanofungus camphoratus*. Their structures were established by spectroscopic analysis and chemical methods. Compound **10** is the first example of a naturally occurring ergosteroid with an unusual *cis*-C/D ring junction. Compounds **2**–**6** and **11** showed moderate to potent cytotoxicity, with EC_{50} values ranging from 0.3 to 3 μM against KB and KB-VIN human cancer cell lines. Compounds **6**, **10**, **11**, **14**–**16**, **18**, and **21** exhibited anti-inflammatory NO-production inhibition activity with IC_{50} values of less than 5 μM, and were more potent than the nonspecific NOS inhibitor N^{ω}-nitro-L-arginine methyl ester.

Taiwanofungus camphoratus (synonyms: *Ganoderma camphoratum*; *Antrodia cinnamomea*; *Antrodia camphorata*) (Polyporaceae, Aphyllophorales) is a rare and precious medical fungus in Taiwan and is called a "national treasure of Taiwan".[1] Its Chinese name is Zhan-Ku or Niu-Chang-Chih. The microorganism is parasitic to the inner heartwood wall of old hollow trunks of *Cinnamomum kanehirai* Hay. (Lauraceae). The growth rate of natural *T. camphoratus* in the wild is very slow, and it is difficult to cultivate in a greenhouse, making fruiting bodies expensive to obtain. In traditional Taiwanese folk medicine *T. camphoratus* has been used as an important health food for treating food, alcohol, and drug intoxication, diarrhea, abdominal pain, hypertension, itching, and liver cancer.[2] Previous studies on the chemical constituents of the fruiting body of *T. camphoratus* showed that it is a rich source of triterpenoidic acids, some of which have shown anti-inflammatory,[3] anticholinergic,[4] and antiserotonergic activities.[4] Furthermore, zhankuic acids A and C exhibited significant cytotoxicity against P-388 murine leukemia cells in vitro.[4] The present study on the chemical constituents of an EtOH extract of the fruiting body of *T. camphoratus* has led to the isolation of 10 new triterpenoids, namely, camphoratins A–J (**1**–**10**), and 12 known compounds, zhankuic acids A–C (**11**–**13**),[4,5] zhankuic acid A methyl ester (**14**),[4] antcin A (**15**),[5] antcin C (**16**),[5] antcin K (**17**),[6] methyl antcinate H (**18**),[7] eburicol (**19**),[8] ergosterol D (**20**),[9] methyl 4α-methylergost-8,24(28)-diene-3,11-dion-26-oate (**21**),[10] and ergosterol peroxide (**22**).[11] Cytotoxic activity, inhibition of nitric oxide (NO) or reactive oxygen species (ROS) production, and free radical-scavenging activity of the isolates were evaluated in our study.



Results and Discussion

Camphoratin A (**1**) was obtained as a colorless powder. The HRESIMS of **1** showed a pseudomolecular ion peak at *m/z* 511.3038, consistent with a molecular formula of $C_{29}H_{44}O_6Na$ and eight degrees of unsaturation. The UV and IR absorption bands at 255 nm and 1709, 1660, and 3408 cm^{-1}, respectively, suggested the presence of α,β-unsaturated carbonyl and carboxylic acid functionalities. The former was corroborated by carbon resonances at δ 202.8 (qC), 154.3 (qC), and 141.2 (qC), and the latter was evidenced by the resonance at δ 176.9 (qC). An exocyclic double bond was also identified from the NMR signals at δ_C 150.7 (qC), 110.5 (CH_2) and δ_H 5.07, 5.23 (each 1H, s). The above data, coupled with the characteristic methyl signals at δ_H 0.90 (3H, s), 1.11 (3H, d, J = 7.6 Hz), 1.18 (3H, d, J = 6.8 Hz), 1.48 (3H, d, J = 7.2 Hz),

* Corresponding authors. Tel: 919-962-0066. Fax: 919-966-3893. E-mail: khlee@unc.edu; tswu@mail.ncku.edu.tw.
[†] Chung Hua University of Medical Technology.
[‡] Chang Gung University.
[§] Department of Chemistry, National Cheng Kung University.
[⊥] Neurophysiology Laboratory, National Cheng Kung University Medical Center and Medical School.
[∥] National Research Institute of Chinese Medicine.
[▽] China Medical University and Hospital.
[○] University of North Carolina.
[+] These authors contributed equally to this work.

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