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三七环二肽成分和人参内酰胺成分*

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Cyclodipeptides of *Panax notoginseng* and Lactams of *Panax ginseng**

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Abstract: From the roots of *Panax notoginseng* fourteen cyclodipeptides **1 – 14** were isolated including one new compound (**1**), seven new natural compounds (**4 – 10**) and six known compounds (**2 – 3**, **11 – 14**) together with one known other compound **15**. The chemical structure of **1** was elucidated as cyclo-(Leu-Thr) based on spectral methods. From the roots of *Panax ginseng* five known lactams (**16 – 20**) including pyroglutamic acid were isolated together with butyric diacid, daucosterol and sucrose. The primary bioactivity test showed that pyroglutamic acid and its n-butyl derivative have weak Ca^{2+} antagonistic activity.

Key words: *Panax notoginseng*; *Panax ginseng*; Araliaceae; cyclodipeptides; lactams
关键词: 三七; 人参; 五加科; 环二肽; 内酰胺
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Panax notoginseng (Bur.) F. H. Chen and *Panax ginseng* C. A. Meyer (Araliaceae) are two famous Traditional Chinese Medicines. There are a lot of chemical studies on them, especially saponins. As one part of our investigation on cyclopeptides from higher plants with the TLC chemical detection method for cyclopeptides (Zhou and Tan, 2000) some cyclopeptides and lactams were detected in the EtOAc fractions of *P. notoginseng* and *P. ginseng* respectively, leading to isolate fifteen compounds including fourteen cyclodipeptides **1 – 14** from the roots of *P. notoginseng* and five known lactams including pyroglutamic acid (**16**), methyl pyroglutamate (**17**), ethyl pyroglutamate (**18**), isobutyl pyroglutamate (**19**), n-butyl pyroglutamate (**20**) from the roots of *P. ginseng*. Among them

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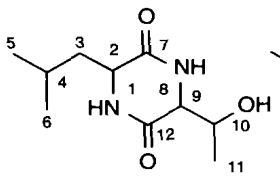
compound **1** is one new compound, compounds **4 – 10** are new natural compounds, compounds **2 – 3** and **11 – 15** are known compounds. Compounds **2** and **11**, **3** and **4**, **10** and **15**, **12** and **13** are mixtures with 2:1, 1:1, 1:1, 2:1 ratios, respectively. Compounds **17 – 20** may be artifacts of compound **16** during isolation. The primary bioactivity test showed that pyroglutamic acid and its n-butyl derivative have weak Ca^{2+} antagonistic activity. Herein we report the structure elucidation of compound **1**.



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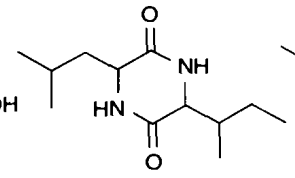

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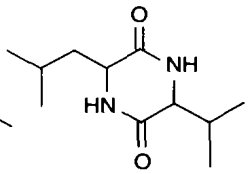

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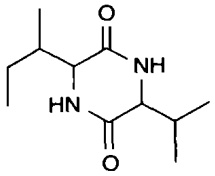

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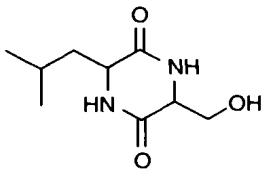

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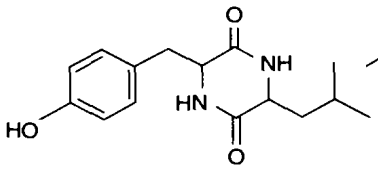

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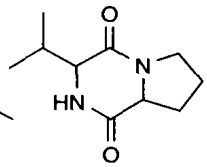

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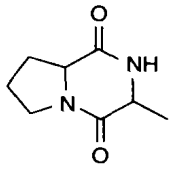

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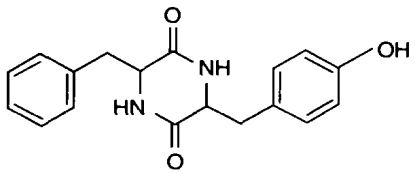

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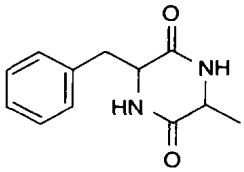

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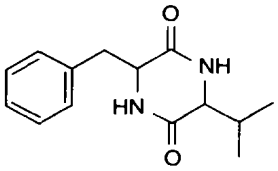

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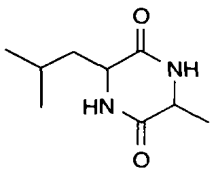

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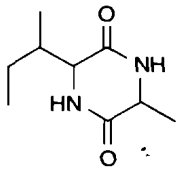

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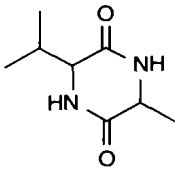

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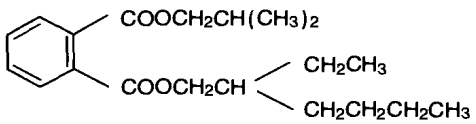

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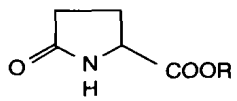

16 R=H
17 R=CH_3
18 R=CH_2CH_3
19 R=$CH_2CH(CH_3)_2$
20 R=$CH_2CH_2CH_2CH_3$

Table 1 NMR data of **1** (in DMSO, 400 MHz for δ_H, 100 MHz for δ_C)

No.	δ_H	δ_C
1	8.21 (1H, s)[a]	
2	4.00 (1H, m)[b]	52.8 (d)[c]
3	1.68 (1H, m), 1.55 (1H, m)	45.0 (t)
4	1.80 (1H, m)	23.3 (d)
5	0.84 (3H, d, 6.6)	23.1 (q)
6	0.82 (3H, d, 6.5)	21.5 (q)
7		168.6 (s)[d]
8	8.02 (1H, s)[a]	
9	5.02 (1H, d, 5.4)[b]	60.5 (d)[c]
10	4.00 (1H, m)	66.9 (d)
11	1.06 (3H, d, 6.5)	20.1 (q)
12		166.8 (s)[d]

[a-d] Assignments may be reversed.

Compound 1 Colorless needles (CH_3OH), gave a negative ninhydrin reaction but positive after hydrolysis with 6 mol/L HCl (Zhou and Tan, 2000). Its moleclular formular was determined as $C_{10}H_{18}O_3N_2$ by means of DEPT spectrum and FAB-MS in which its quasimolecular ion peak at m/z 215 $(M+1)^+$. The ^{13}C NMR spectrum showed the presence of two amides CO at δ 166.8, 168.6, four methines CH at δ 66.9, 60.5, 52.8, 23.3, one methene CH_2 at δ 45.0, three methyls CH_3 at δ 23.1, 21.5, 20.1, respectively. The ^1H NMR spectrum showed the presence of two amides NH at δ 8.02, 8.21, three methines CH at δ 4.00 – 5.02, one methine CH and one methene CH_2 at δ 1.55 – 1.80, three methyls CH_3 at δ 0.82 – 1.06, respectively. These facts indicated that **1** is a cyclodipeptide and composed of Leu (1eq) and Thr (1eq). The NMR data are shown in the Table 1. Therefore, the structure of **1**, a new cyclodipeptide, was elucidated as cyclo-(Leu-Thr).

With the same method as **1**, other thirteen cyclodipeptides were determined by spectral methods as following: **2** [cyclo-(Leu-Ile)], **3** [cyclo-(Leu-Val)], **4** [cyclo-(Ile-Val)], **5** [cyclo-(Leu-Ser)], **6** [cyclo-(Leu-Tyr)], **7** [cyclo-(Val-Pro)], **8** [cyclo-(Ala-Pro)], **9** [cyclo-(Phe-Tyr)], **10** [cyclo-(Phe-Ala)], **11** [cyclo-(Phe-Val)], **12** [cyclo-(Leu-Ala)], **13** [cyclo-(Ile-Ala)], **14** [cyclo-(Val-Ala)].

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