Immunomodulatory Activity of 3b,6b-Dihydroxyolean-12-en-27-oic Acid in Tumor-Bearing Mice

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) b A &
A , C A , , 310029, . . C
(: 86-571-869-71091; : 86-571-869-71091; - : @ . .)
[b]) , A , 310013, . . C
) C , C , 310053, . . C

3β,6β- -12- -27- (**1**) *Astilbe chinensis.* *in vivo* b **1** - b -b' . **1** 40, 60, 80 10 . **1** - b 180 22 , (C) , ( ), , -2 (-2) , 180-b , . , **1** 2,4- b b (B)- b - ( ) C **1** (BC)- b b 180 22 , C , -2 b - b , b - BC b **1** b , .

Introduction. . b , , . b , ' . b b 1 . , b 2 . b b . , b b b . 3 . b b 4 . b b ,

5 . b
b b
6 . , b
, b b 7 12 .
Astilbe chinensis (AXIM.) RANCH. AVAT. ( ) b
, , , C
, , 13 . b
(A) *A. chinensis* ,
(C)- -b 14 15 . 3*β*,6*β*-
-12- -27- (**1**)
A. chinensis, b b -
- 16 17 . C **1** b
-8910 ,
, 60 18 .
1 b
C 205 , C 205 0/ 1 ,
- *Bcl-2* , - *Bax* ,
Δ*ψ* , -3 19 . ,
1 -b , b
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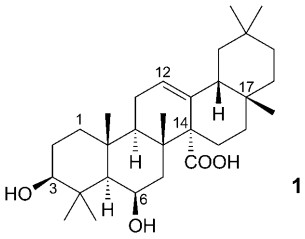

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Results. 1. *Inhibition of* **1** *on the Growth of Transplantable Tumors in Mice.*
b **1** - b *Tables 1*
2. - b 180 b b
1 -b (*P* < 0.001), b b 35.77,
51.11, 47.94% 40, 60, 80 ⅓ , b . C **1**
b - b 22 (*P* < 0.001).
b **1** 22 35.57, 48.84, 41.10%
b b , b b **1**-
(*Tables 1* *2*)
.

2. *Effects of* **1** *on Splenocyte Proliferation in S180-Bearing Mice.* **1**
- 180- b *Fig. 1.*
C A (C A)- -b

b 1. *Inhibitory Effect of* **1** *on the Growth of Transplantable S180 Sarcoma in Mice*)

	‰				%
		B	A		
C		18.96±1.58	31.19±1.87	3.03±0.54	
C	50	19.34±1.73	28.63±1.36	1.08±0.46***	64.43
1	40	18.90±1.55	31.20±2.79	1.95±0.28***	35.77
	60	19.24±1.92	31.30±2.78	1.48±0.49***	51.11
	80	19.15±1.63	31.49±2.84	1.58±0.40***	47.97

) ± . . (*n* 10). ***P<0.001. C :

b 2. *Inhibitory Effect of* **1** *on the Growth of Transplantable H22 Hepatoma in Mice*)

	‰				%
		B	A		
C		18.34±1.11	29.59±3.74	3.25±0.76	
C	50	18.55±0.99	25.78±2.77	0.84±0.16***	74.23
1	40	18.86±1.20	29.34±1.48	2.10±0.25***	35.57
	60	18.85±0.78	29.06±2.19	1.66±0.46***	48.84
	80	19.13±1.21	30.04±2.27	1.92±0.33***	41.10

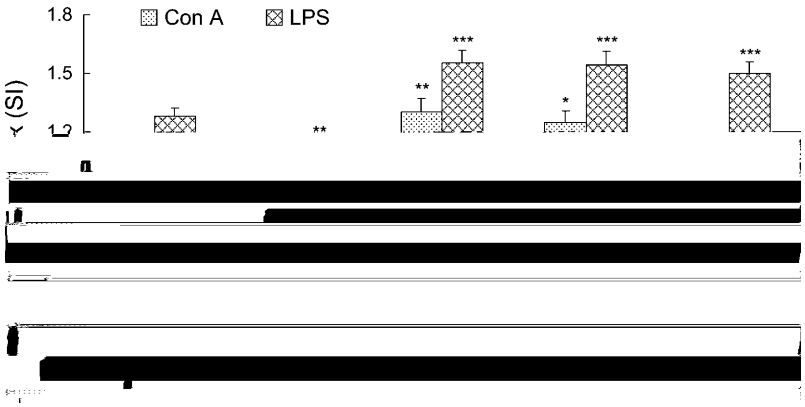
) ± . . (*n* 10). ***P<0.001. C :

b **1** 40 60 ‰ (*P*<0.05 *P*<0.01). b B ( ) **1** (*P*<0.001). , C A- - (C)- (*P*<0.05 *P*<0.01).

3. Effects of **1** *on Natural Killer (‰) Cell and Cytotoxic T Lymphocyte* (C) *Activity in S180-Bearing Mice.* - b ‰ C . , , 180 ‰ - AC-1 . A *Figs. 2* *3*, **1** ‰ C 180- b 60 80 ‰ (*P*<0.01 *P*<0.001).

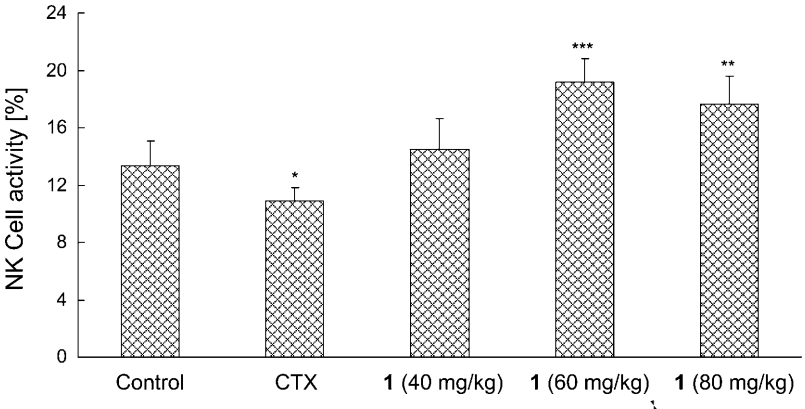
4. Effects of **1** *on Secretion of IL-2 from Splenocytes in S180-Bearing Mice.* ‰ , **1** -2 180- b b [1]) . A *Fig. 4*, **1** ‰ -2 180- b 40 60 ‰ (*P*< 0.01 *P*<0.001). , -2 C - (*P*<0.01).

[1]) 3-(4,5- -2-)-2,5- -2*H*- b .



. 1. *Effects of* **1** *on mitogen-stimulated splenocyte proliferation in S180-bearing mice.*

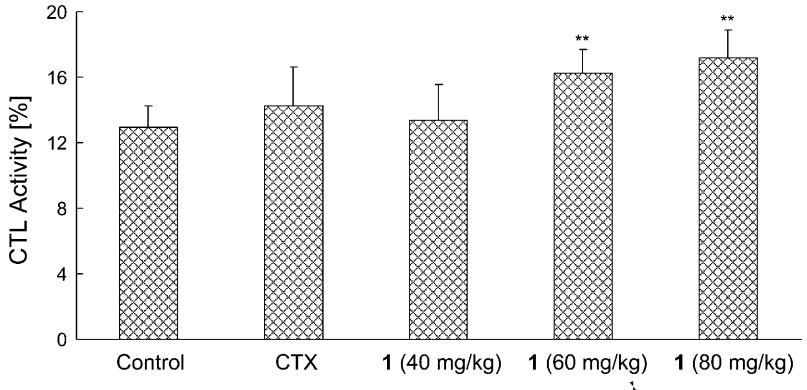
180 , **1** 40, 60, 80 % 10 , C 50 % 2 . . 11, C A, , *RPMI-1640* 48 . b b . . ± . . (*n* 5). *$P < 0.05$, **$P < 0.01$, ***$P < 0.001$.



. 2. *Effects of* **1** *on NK cell activity in S180-bearing mice.*

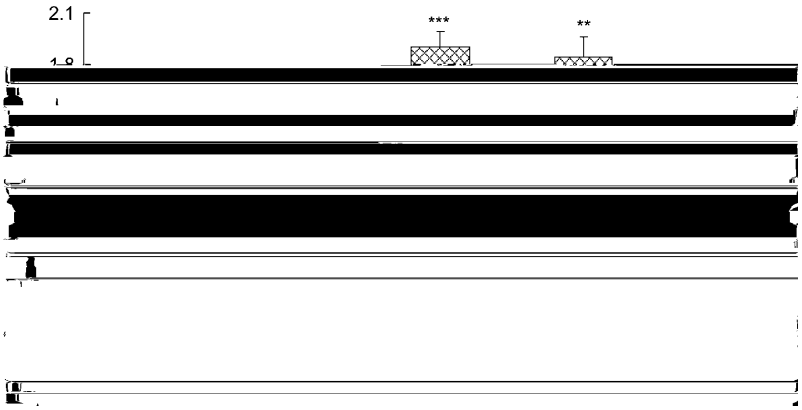
180 , **1** 40, 60, 80 % 10 , C 50 % 2 . . 11, b b . . ± . . (*n* 5). *$P < 0.05$, **$P < 0.01$, ***$P < 0.001$.

5. *Effects of* **1** *on 2,4-Dinitrofluorobenzene (* B*)-Induced Delayed-Type Hypersensitivity (* *) reactions in Mice.* **1** B- *Fig. 5.* C **1** , B- -



. 3. *Effects of* **1** *on CTL activity in S180-bearing mice.*

, **1** 40, 60, 80 ⁄ 10 , C 50 ⁄ 2 C b b 11, . ± . . (*n* 5). **$P<0.01$.

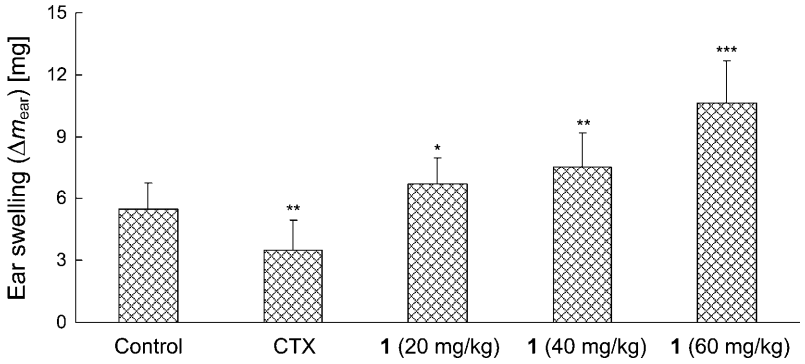


. 4. *Effects of* **1** *on secretion of IL-2 from splenocytes in S180-bearing mice.*

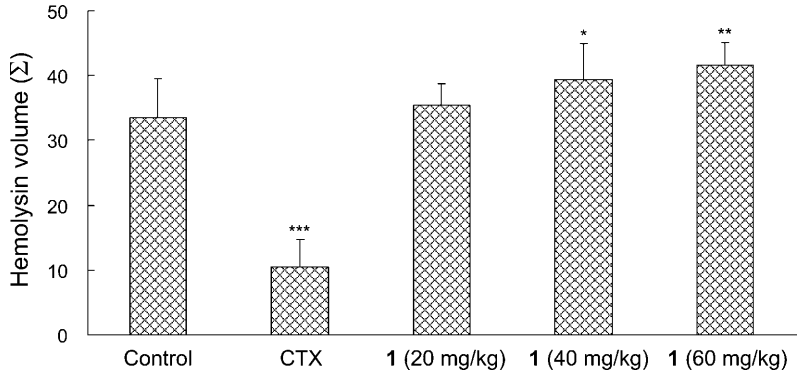
180 , **1** 40, 60, 80 ⁄ 10 , C 50 ⁄ 2 . 11, , -2 b . ± . . (*n* 5). **$P<0.01$ ***$P<0.001$.

($P<0.05$, $P<0.01$ $P<0.001$), C ($P<0.01$), .

6. *Effects of* **1** *on the Sheep Red Blood Cell* (BC)*-Induced Antibody Production in Mice.* C **1** BC- b . A *Fig. 6*, b **1** - BC b -



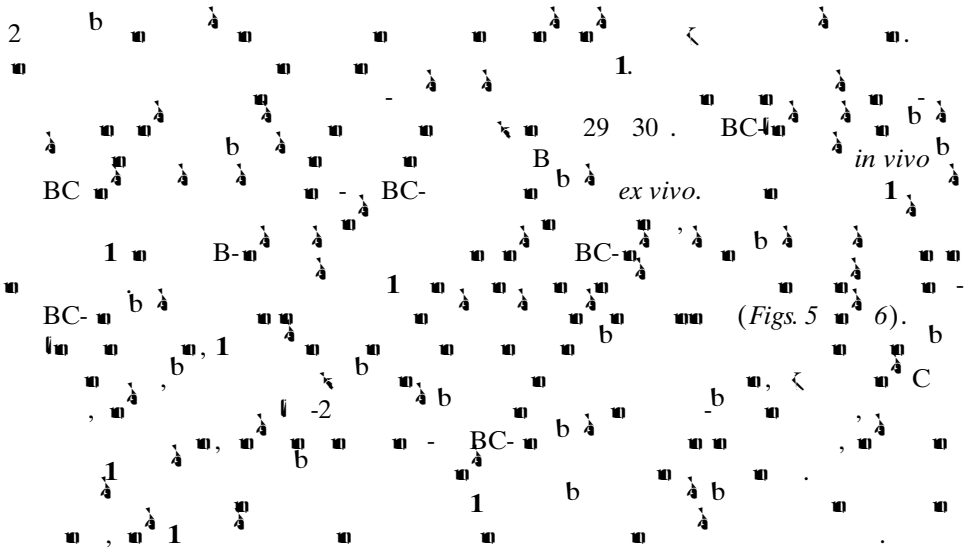
. 5. *Effect of* **1** *on 2,4-dinitrofluorobenzene* (B)*-induced delayed-type hypersensitivity* ( ) *reaction in mice.* B 0, **1** 20, 40, 60 ½ 5 , C 100 ½ 1 . b . , b B. (Δm) B- 24 . ± . . (n 10). $^{*}P<0.05$, $^{**}P<0.01$, $^{***}P<0.001$.



. 6. *Effect of* **1** *on the sheep red blood cell* (BC)*-induced antibody production in mice.* 10^8 BC 0.5 B 0, **1** 20, 40, 60 ½ 5 , C 50 ½ 2 . . A 5 , BC - BC b . ± . . (n 10). $^{*}P<0.05$, $^{**}P<0.01$, $^{***}P<0.001$.

($P<0.05$ $P<0.01$), C - BC b ($P<0.001$), .

Discussion. C b b , , b



Experimental Part

General. 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl-2*H*-tetrazolium bromide (MTT) was purchased from *Sigma Chemical Co.* (St. Louis, MO, USA). *RPMI-1640* medium was purchased from *Gibco* (Grand Island, NY, USA). 2,4-Dichlorophenoxyacetic acid (2,4-D) was purchased from *BD Biosciences Pharmingen* (San Diego, CA, USA). Cisplatin (CDDP) was purchased from *Jiangsu Hengrui Company*

1 40, 60, 80 % 10 ( ) C 50 % 2 . b . 0.2 /10 b . 11 . b . b % (*C. T*)/*C* × 100, *C* ; *T*

Splenocyte-Proliferation Assay. b 32 , 4 96- b 5 × 10^6 / 100 µ ; , C A (5 µ /), (b 10 µ /), *RPMI-1640* 200 µ . 37° 5% C 2. A 44 , 50 µ . (2 /) , b 4 . b (1400*g*, 5), . , 150 µ . (180 µ 20 µ 1N C) , b b A (*Bio-Rad*, A) 570 15 . (*SI*) U b b : *SI* b b -

Assay of Natural Killer ( )-Cell Activity. - b 33 . B , AC-1 96- b ( ) , 4 × 10^4 / *RPMI-1640*. U . , 2 × 10^6 / / 50 : 1. 250*g* 1 . A 4 b 37° 5% C 2, 250*g* 4 . (100 µ) , 96 b . b ( ) , b b b 490 . : - , , . -C : % (*A . A . An*)/(*Am. An*) × 100, *A* , b b ; *A*, b b - ; *An*, b b ; *Am*, b b 1% -40.

Assays of Cytotoxic T-Lymphocyte (C) *Activity.* C b b . 180 C , . 50 : 1. , : % (*A . A . An*)/(*Am. An*) × 100, *A*, b b ; *A* , b b ; *An* *Am*, b .

Cytokine Levels in the Cultured Supernatants of Splenocytes. 1 b 180- b , (5 × 10^6 /) b b C A (5 µ /) 48 , -2 (-2) . (*SI*) -2 34 . C , *RPMI-1640* 37° 48 5% C 2, . *RPMI-1640* , , , 5 × 10^6/ . -2 96 - b . . A 20 b , 50 µ (2 /) b . 4 , . b C A -1640 b b : *SI* b b -2 b b .

2,4-Dinitrofluorobenzene (B)*-Induced Delayed-Type Hypersensitivity* ( ) *Response.* - C , . A 50 µ 1% B / 1 : 1 ba

. B **1** 20, 40, 60 5 C 100 / 1 . . A 5 , 10 µ 1% B . 24 , B . 35 .

Sheep Red Blood Cell (BC)-*Induced Antibody Production.* **1** BC- 36 . - C , . 10^8 BC 0.5 B . B **1** 20, 40, 60 5 C 50 2 . . A 5 , BC - BC . B , . (100 µ) 5×10^6 BC 100 µ B . 3 37°.

Statistical Analysis. ± (. .), *t*- .

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