

發酵時間對猴頭菌固態發酵 燕麥之活性成分影響

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Health foods – oat

(台灣的燕麥健康食品有十四種)

- 調節血脂功能產品:

(1)桂格原片原味大燕麥片、(2)桂格三寶燕麥、(3)桂格黃金麩片燕麥片、(4)機能燕麥麵、(5)桂格養生燕麥麵、(6)桂格美味大燕麥片-楓糖口味。

(7)統一陽光高纖燕麥穀奶

(8)愛之味純濃燕麥(天然原味)、(9)高野家燕麥片

- 調節血脂功能，不易形成體脂肪功能:

(1)桂格即沖即食大燕麥片 (2)桂格 100 % 喝的燕麥

- 調節血糖功能:

(1)桂格機能燕麥片

- 調節血脂功能，免疫調節功能:

(1)桂格美味大燕麥片(水果優格口味)

高齡化社會

- 65歲的老年人口只要超過全國總人口的7%即為高齡化社會。
- 台灣自1993年起邁入高齡化社會以來，65歲以上老人所占比率持續攀升，2012年底已達11.2%。
- 2012年神經退化性疾病:阿滋海默症(失智症)和巴金森氏症分別佔台灣65歲以上老年人口的0.6%和1-2%。
- 健康食品延緩衰老評估功能(2013年11月新修正草案)已增加神經退化性疾病的評估方法，如:誘導腦部組織退化的阿滋海默症(失智症)和巴金森氏症的動物模式。

Neurodegenerative disease



- ◆ Endoplasmic reticulum stress (ER stress)
- ◆ Parkinson's disease
- ◆ Alzheimer's disease

Hericium erinaceum (猴頭菇) classification

Fungi (真菌界)

Eumycota (真菌門)

Basidiomycotina (擔子菌亞門)

Hymenomycetes (層菌綱)

Aphylophorales (非褶菌目)

Hydnaceae (齒菌科)

Hericioideae (猴頭菌亞科)

Hericieae (猴頭菌)

Hericium (猴頭菌屬)



Fresh
fruiting body



Dried
fruiting body

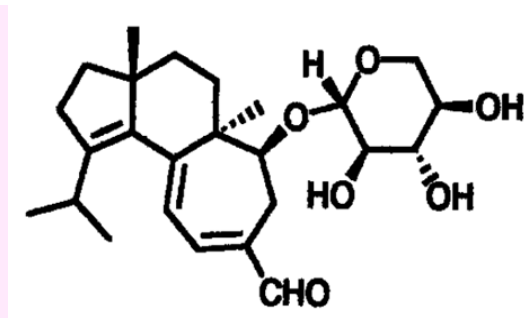
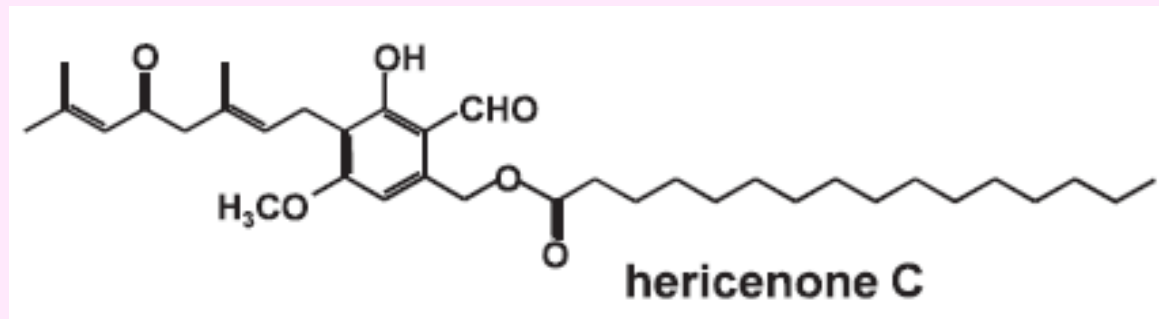
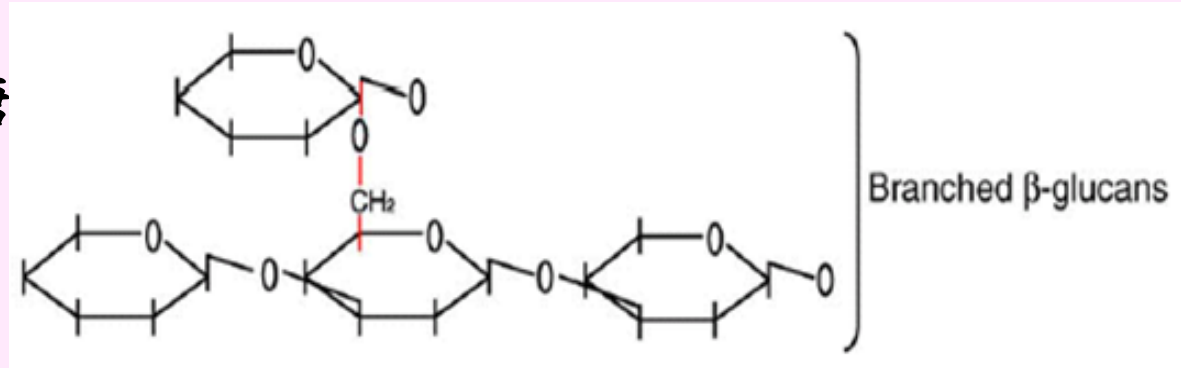
Hericium sp. alternate name

- **China name** : 刺蝟菇、白髮菇、花頭菌、花菜菌
- **Japan name** : 獅子茸、獅子菇
yamabushitake (山伏茸)
- **English name** : tree hedgehog, lion's mane (Pegler, 2003)
- 中國四大名菜: 海參、猴頭菇、燕窩、熊掌



Bioactive components of *H. erinaceum*

- Polysaccharides 多醣
- Proteins 蛋白質
- Terpenoids 三萜
- Hericenone 猴頭酮
- Erinacine 猴頭素



Immunological stimulation of *H. erinaceus* polysaccharide

- Mushroom's polysaccharide could increase IL-1 and IL-2 secretion, increase T-cells content. (Wang *et al.*, 2001; 吳等, 2005)
- *H. erinaceus* and *H. laciniatum* polysaccharide could increase total T-cells、CD4⁺ cells、CD8⁺ cells and macrophages content. (Wang *et al.*, 2001)
- *H. erinaceus* hot water extracts induced the IFN- γ and IL-12, NO expression, by the activation of NK cell. (Yim *et al.*, 2007)
- *H. erinaceus* hot water extracts induced the NO production and IL-1- β expression. (Son *et al.*, 2006)

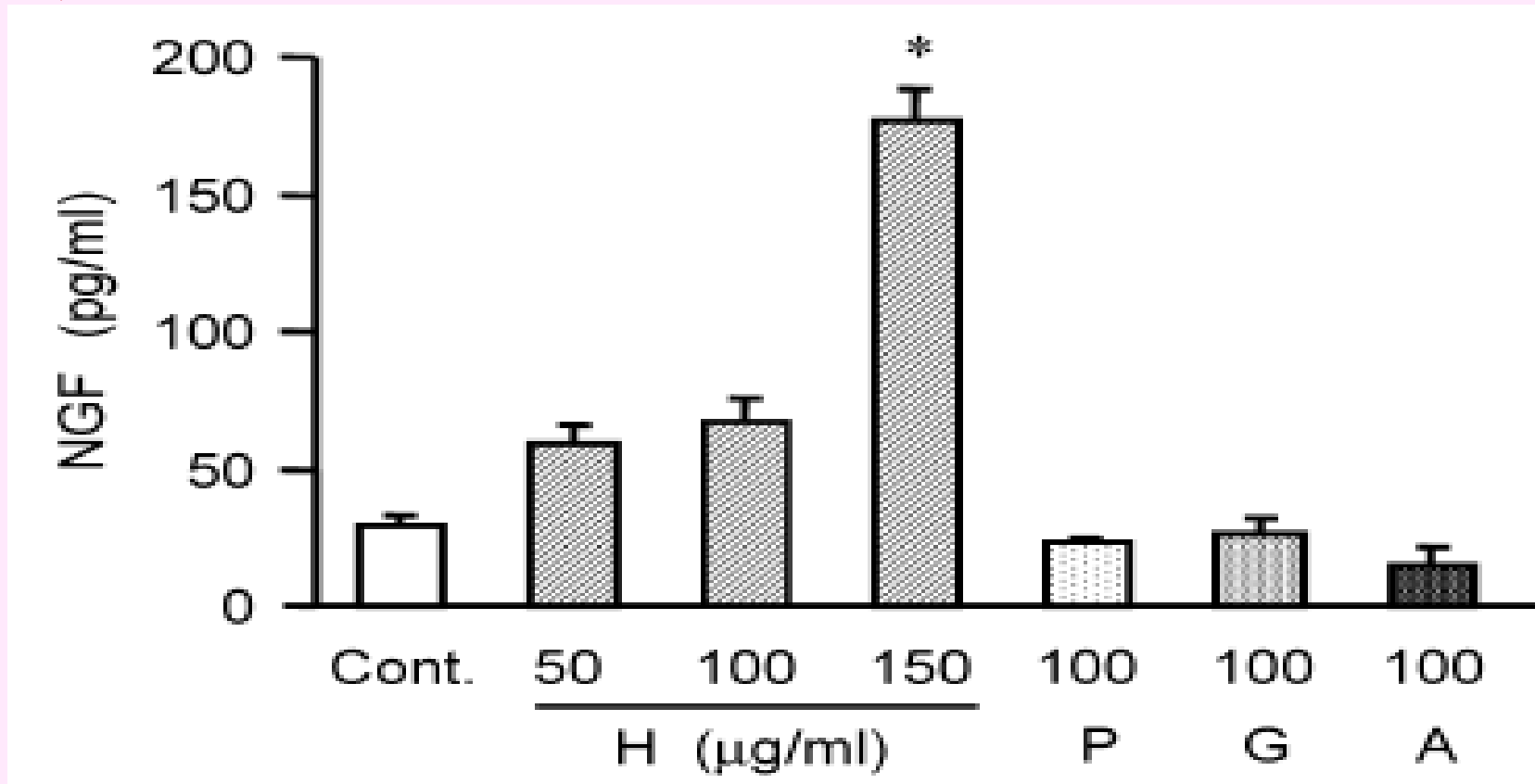
Bio-functions of hericenone and erinacines

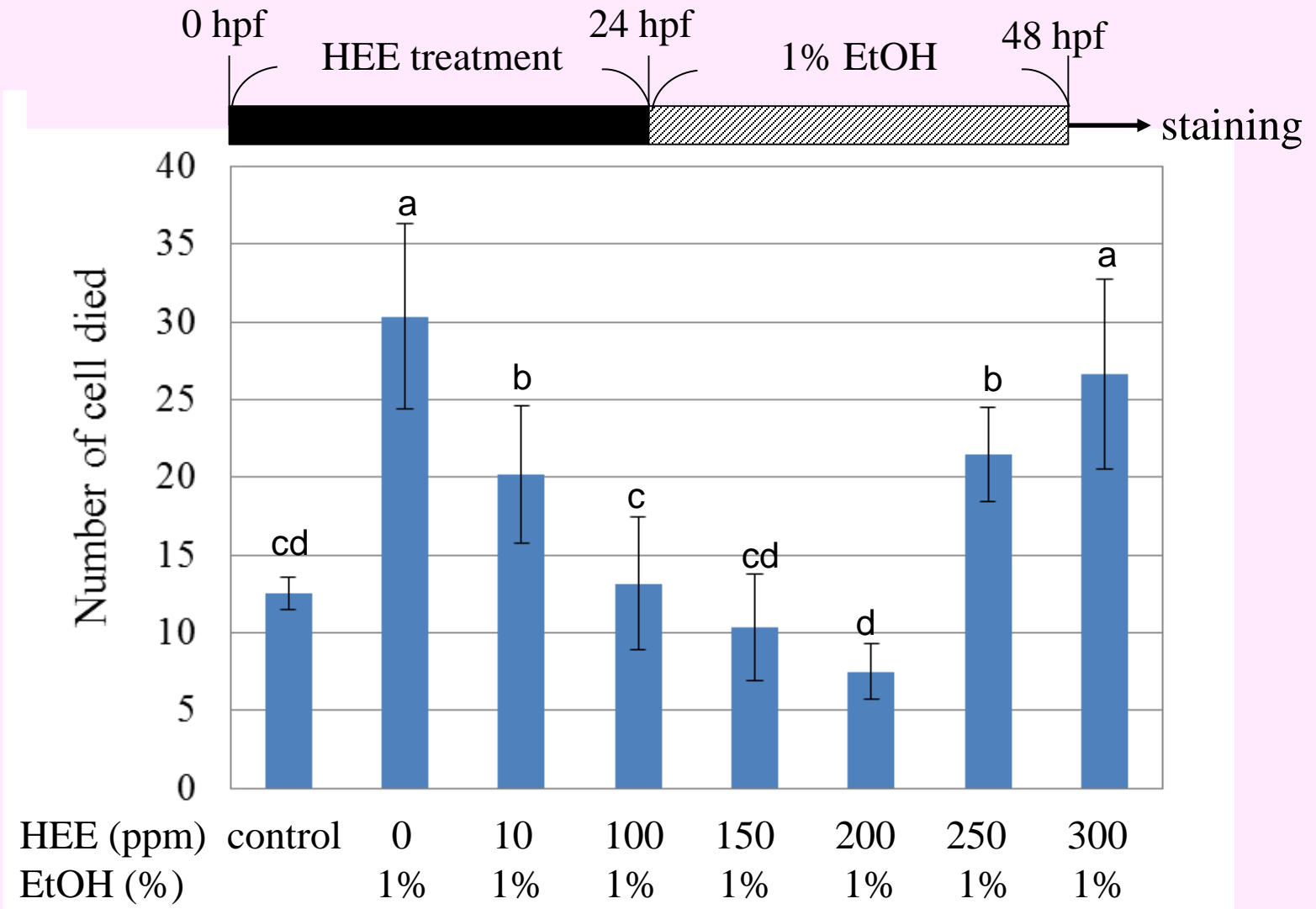
- **Promoting nerve growth factor (NGF) synthesis.**
- **Treatment and prevention of dementia.** (Mori *et al.*, 2008)
- **Neuroprotective effects.** (Hazekawa *et al.*, 2010)
- **Erinacine can stimulate mouse astroglial cells to secrete NGF more than hericenone.** (Kawagishia *et al.*, 1991, 1994)

NGF (神經生長因子) synthesis by erinacine

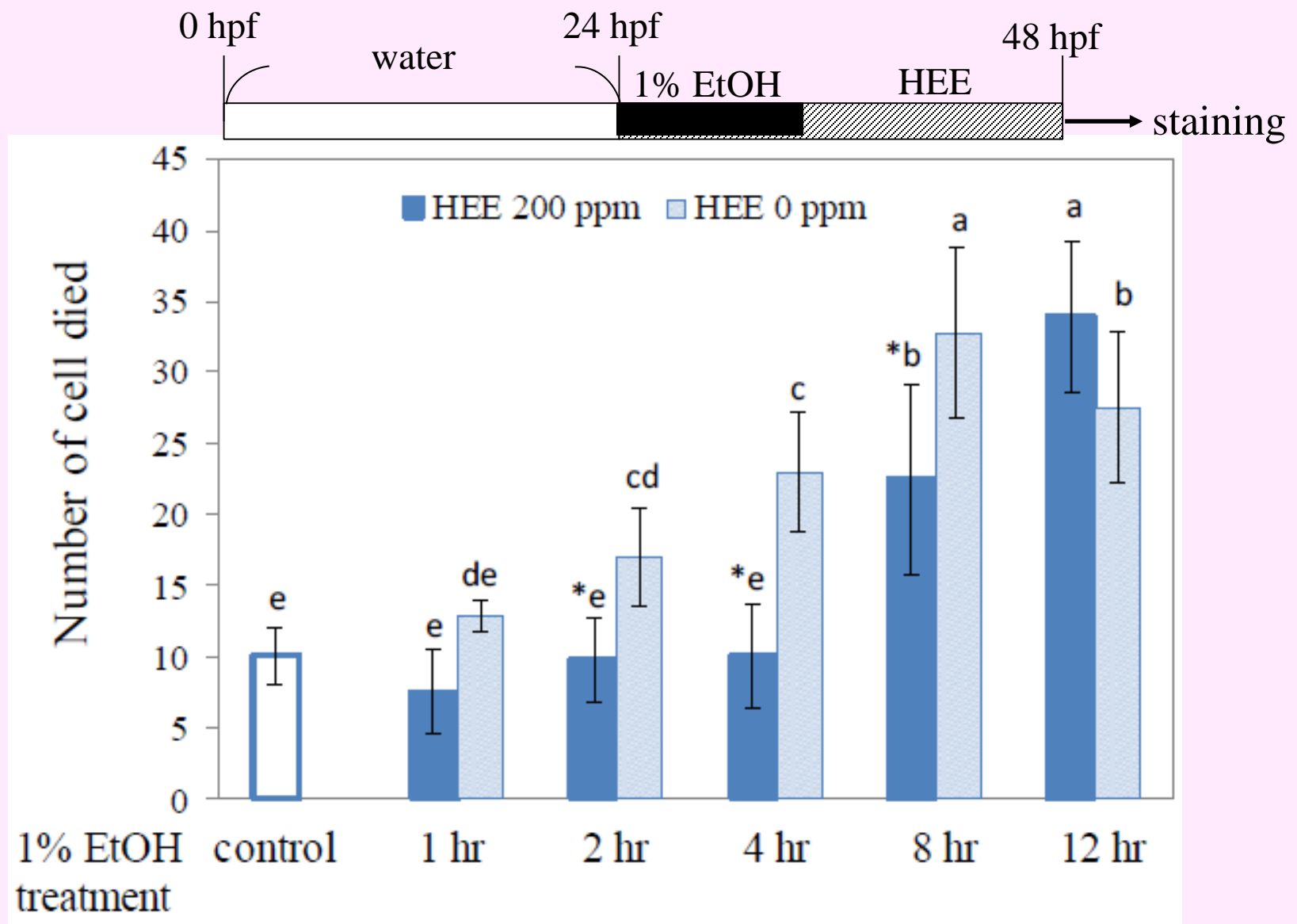
	Concentration	NGF (pg/mL)	
Erinacine A	1.0 mM	250.1 ± 36.2	(Kawagishi <i>et al.</i> , 1994)
Erinacine B	1.0 mM	129.7 ± 6.5	
Erinacine C	1.0 mM	299.1 ± 59.6	
Epinephrine (Control)	1.0 mM	69.2 ± 17.2	
Erinacine E	5.0 mM	105 ± 5.2	(Kawagishi <i>et al.</i> , 1996)
Erinacine F	5.0 mM	175 ± 5.2	
Epinephrine (Control)	5.0 mM	70.2 ± 5.4	
Erinacine H	33.3 µg/mL	31.5 ± 1.7	(Lee <i>et al.</i> , 2000)

Effects of mushroom extracts on the secretion of NGF from 1321N1 cells. *H. erinaceus* (H) (猴頭菇), *P. eryngii* (P)(杏鮑菇), *G. frondosa* (G) (舞茸), *A. blazei* (A)(巴西蘑菇)





Effect of pretreatment with different concentrations of ethanol extracts from *H. erinaceum* solid-state fermented product (HEE) on the number of died brain neuron cells in zebrafish embryos. (mean ± S. D., n = 6)



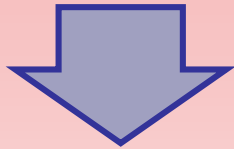
Effect of post-treatment with 200 ppm *H. erinaceum* fermented product ethanol extracts (HEE) on the number of died brain neuron cells in zebrafish embryos. (mean ± S. D., n = 6)



Cultivation of *H. erinaceum*



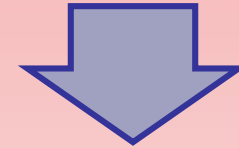
**Solid-state
cultivation**



Fruiting body Mycelium



**Submerged
fermentation**

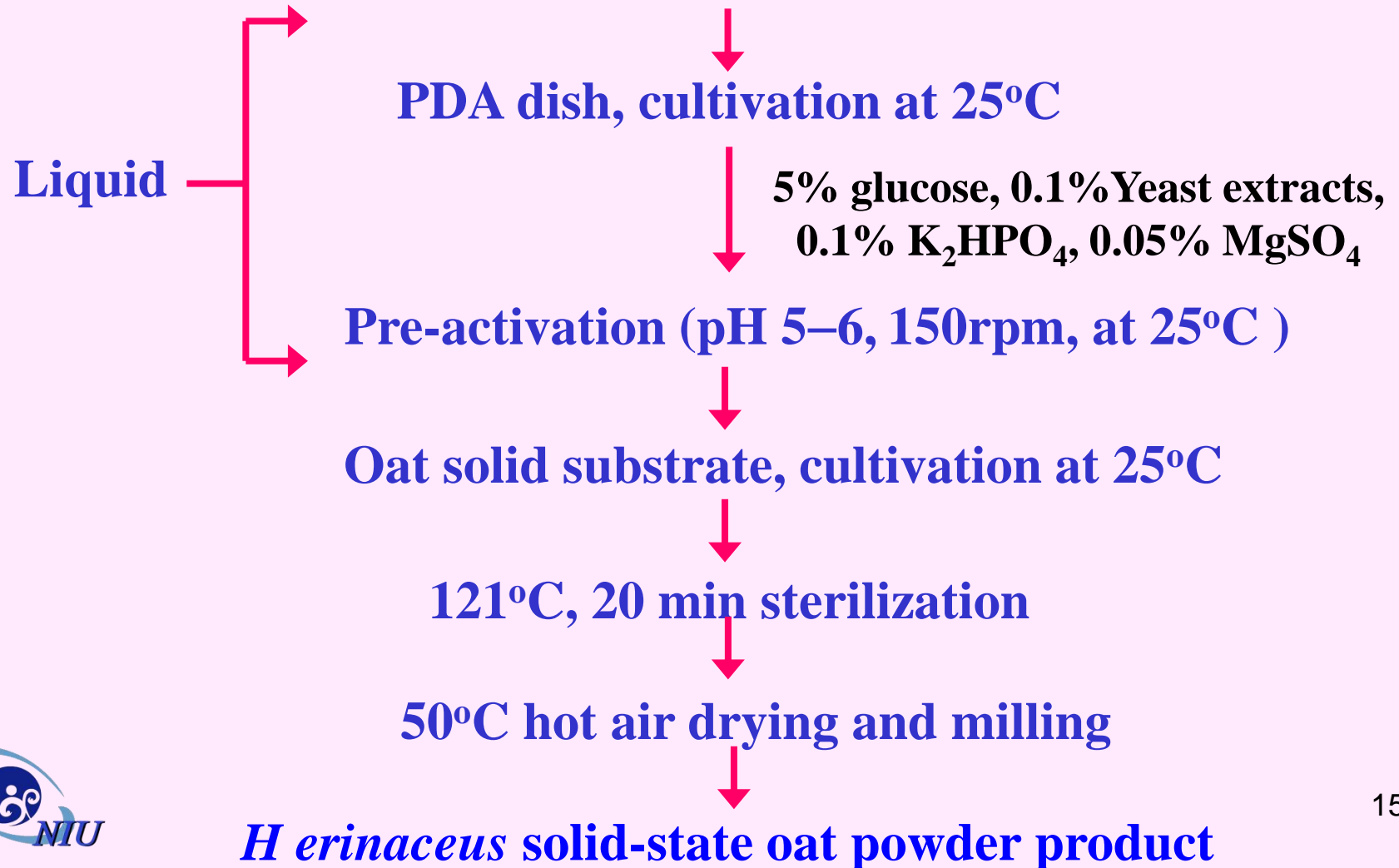


Mycelium



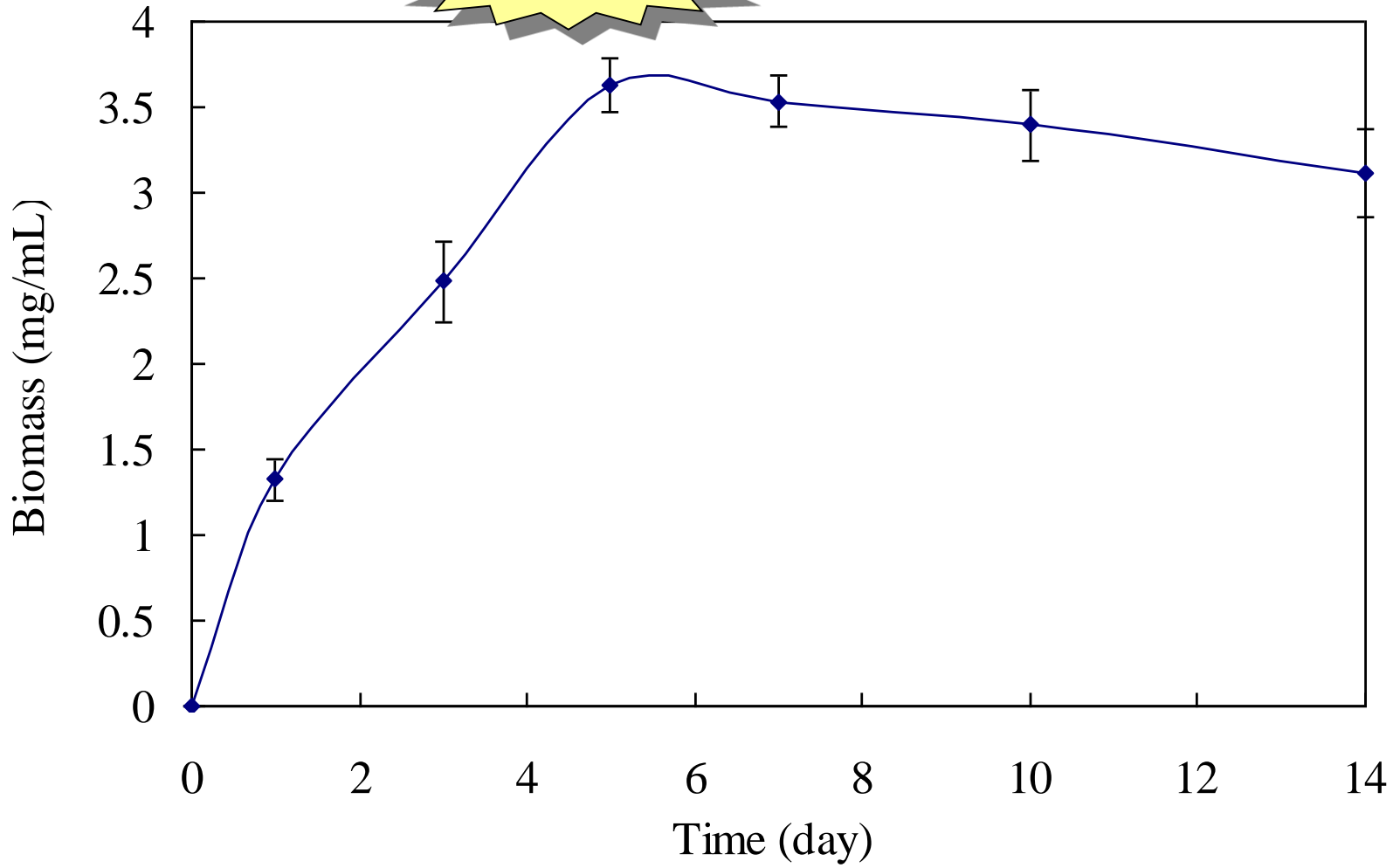
Preparation of the *Hericium erinaceus* liquid and solid-state fermented product

Hericium erinaceus BCRC 36470

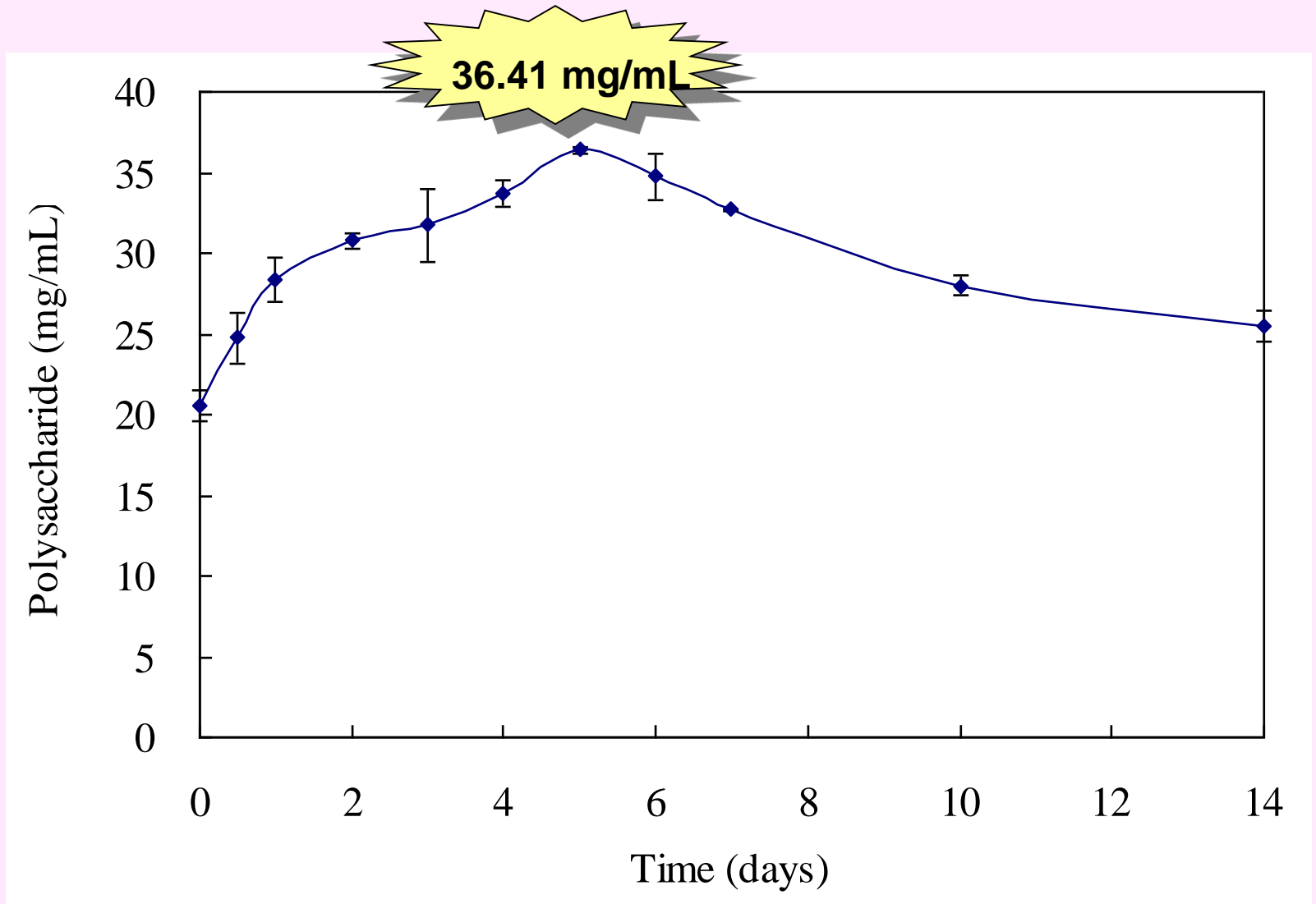


Change of mycelia dry weight during 14 days *H. erinaceus* submerged fermentation (pre-activation)

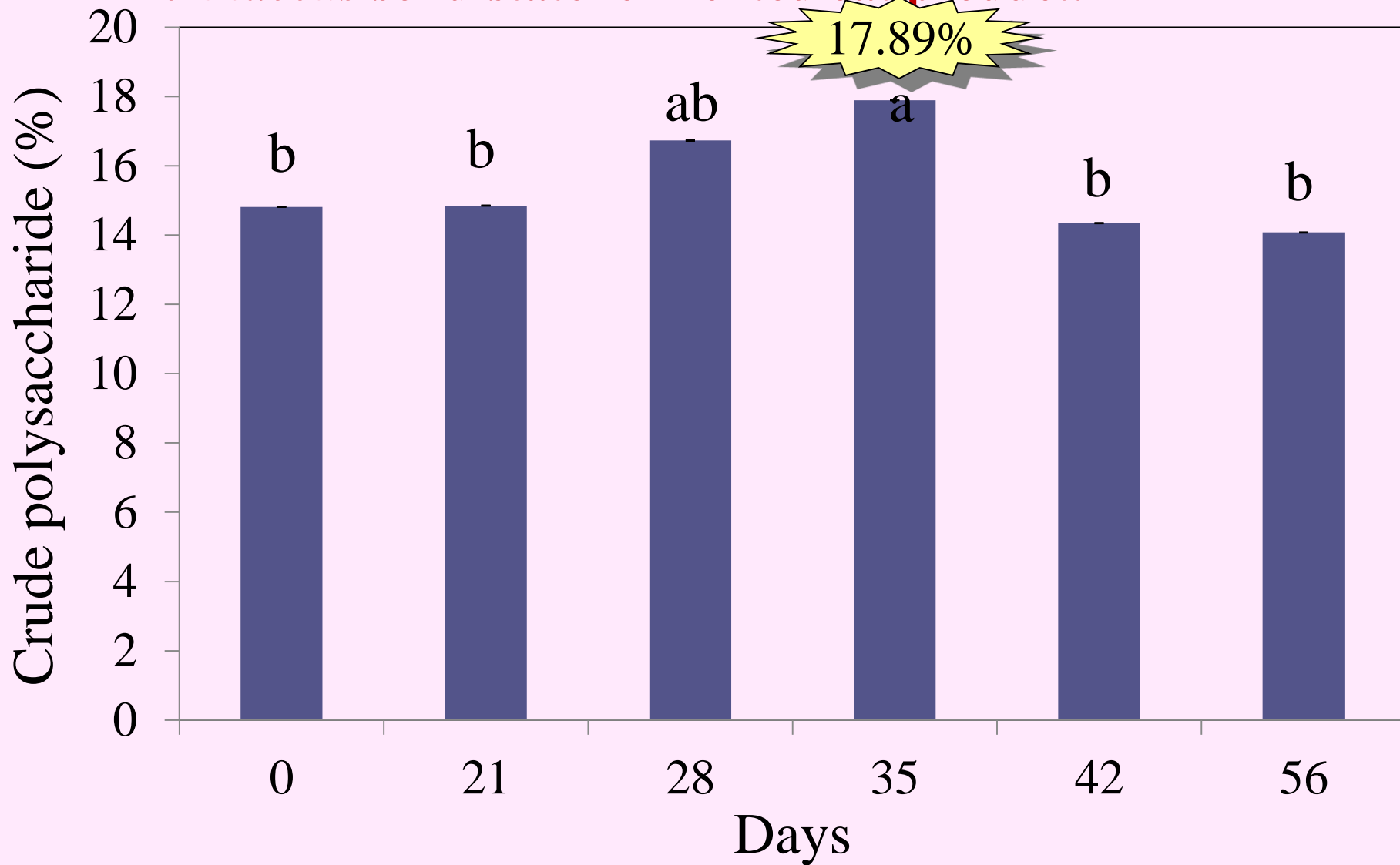
3.63 mg/mL



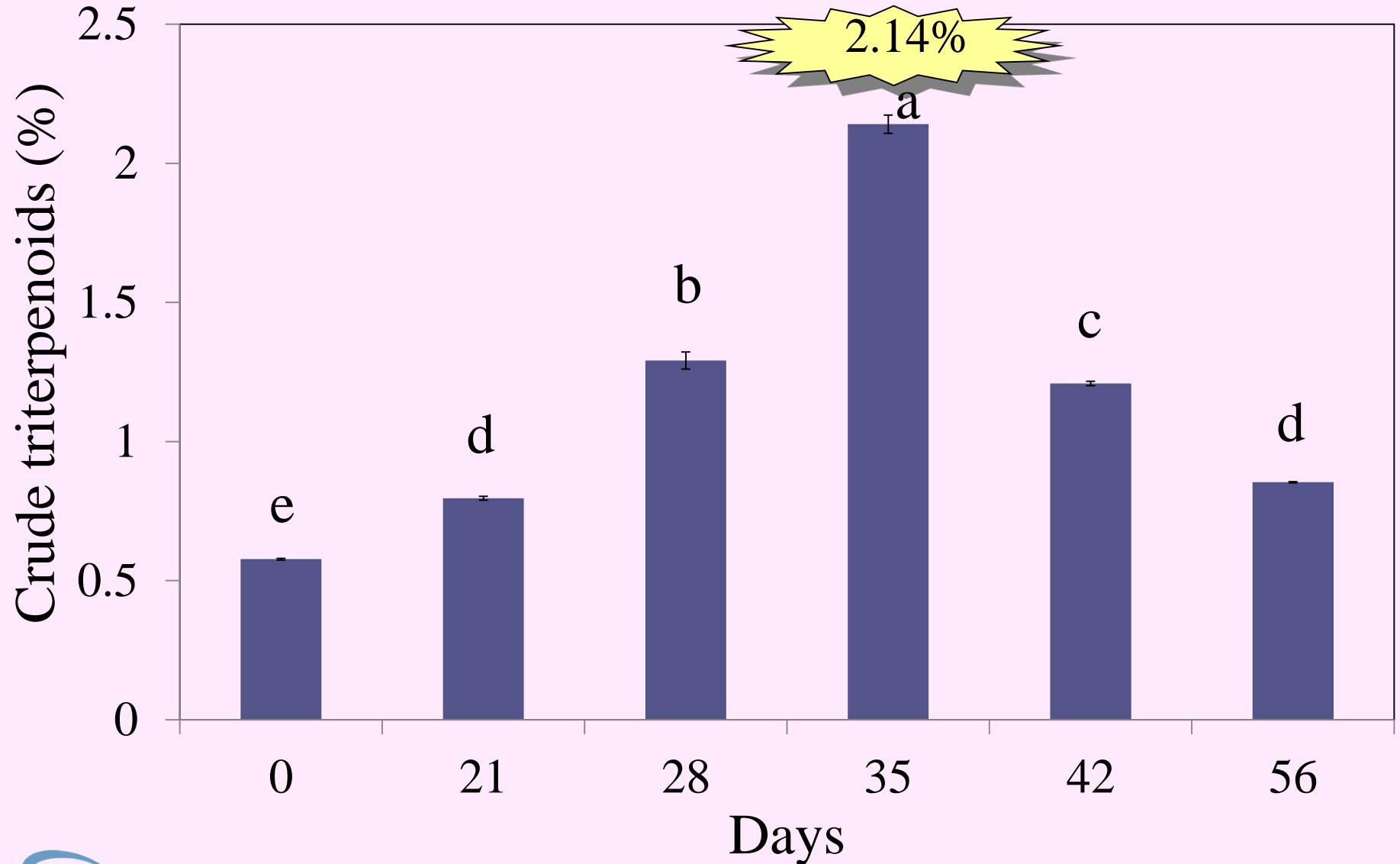
Change of polysaccharide content during 14-days *H. erinaceus* submerged fermentation (pre-activation)



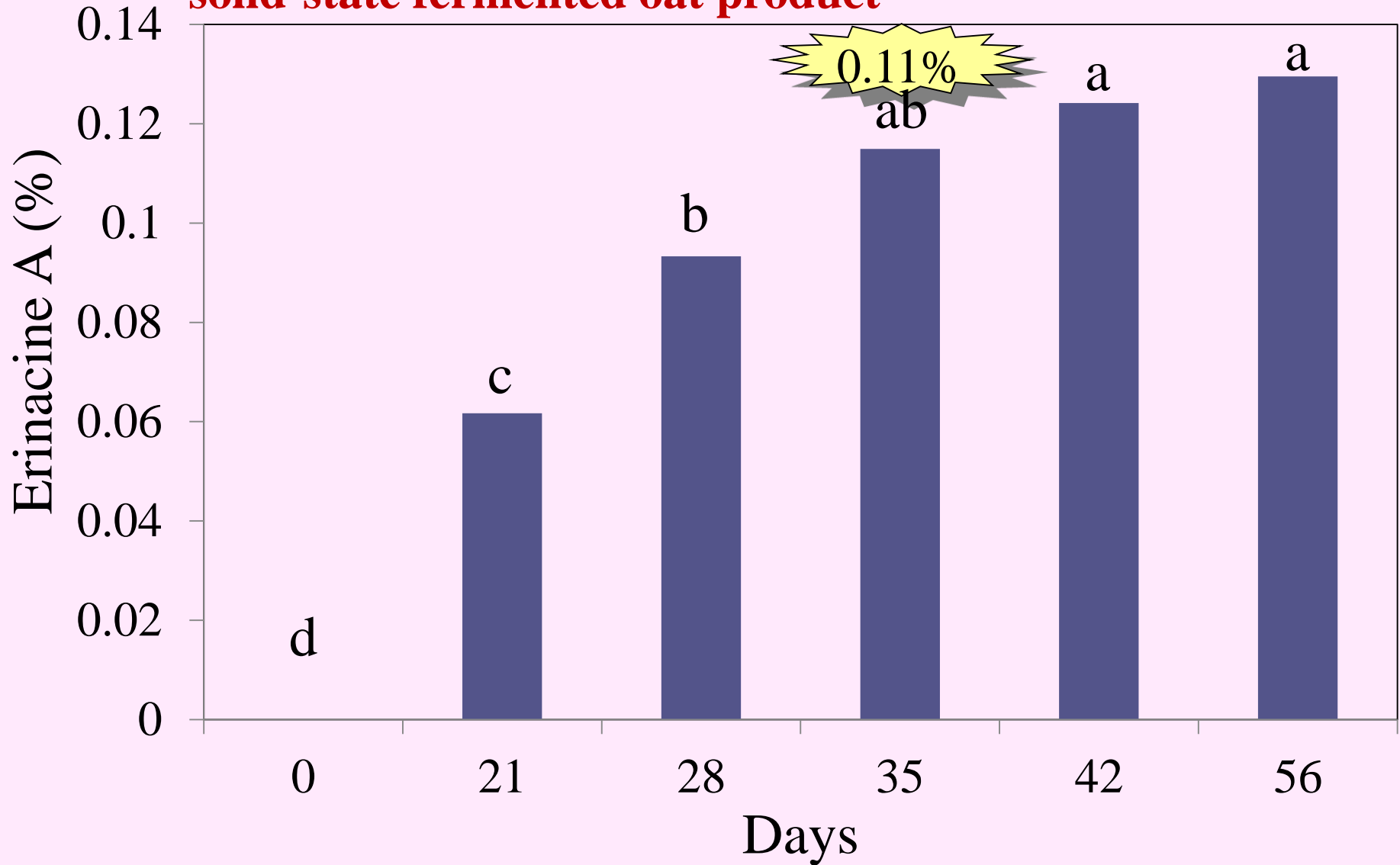
Effects of cultivation time on crude polysaccharide of *H. erinaceus* solid-state fermented oat product.



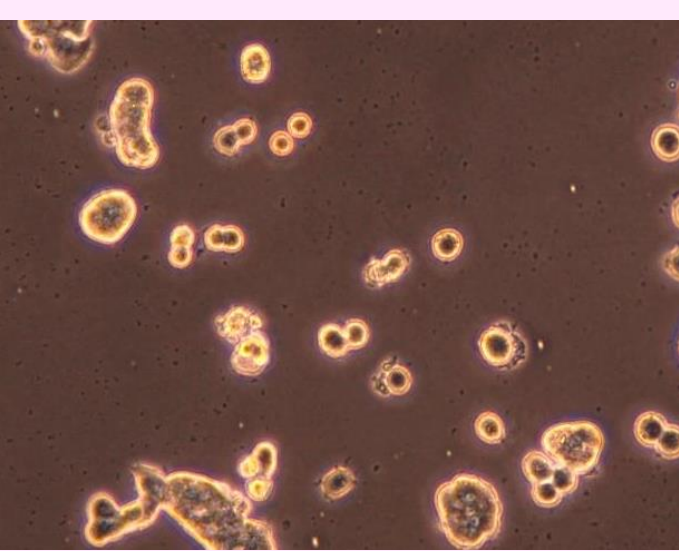
Effects of cultivation time on crude triterpenoids of *H. erinaceus* solid-state fermented oat product.



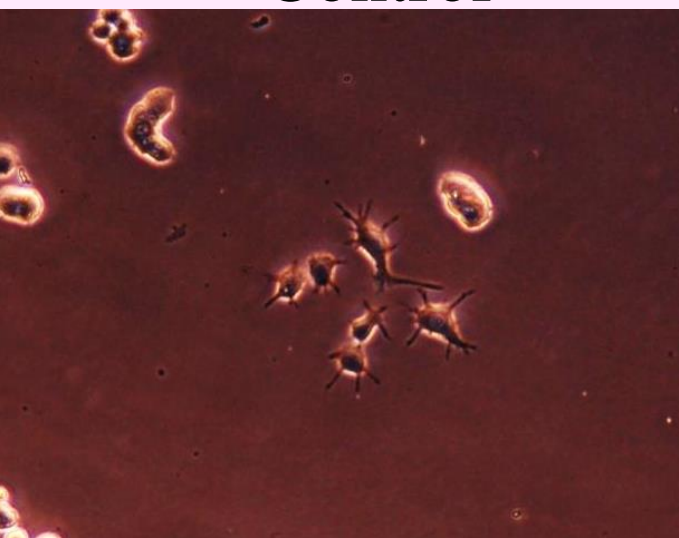
Effect of cultivation time on erinacine A of *H. erinaceus* solid-state fermented oat product



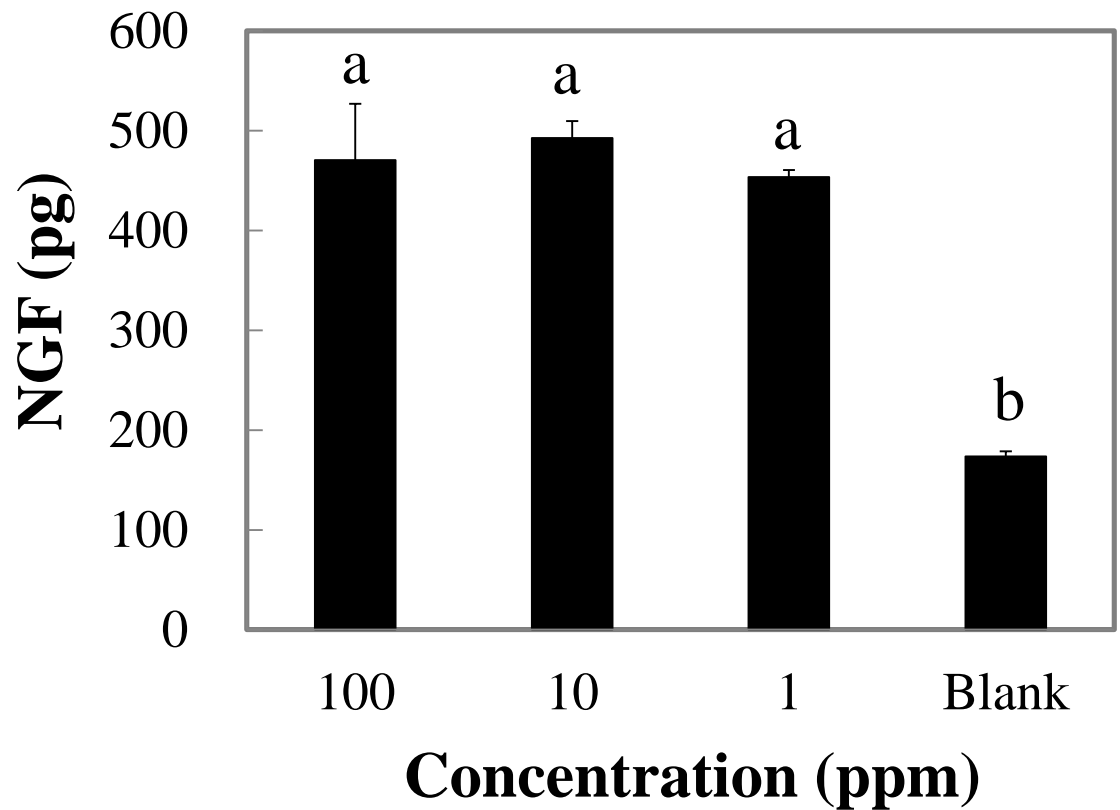
Effect of adding different concentration *H. erinaceum* fermentation product ethanol extracts on PC12 cells producing NGF after 72 h cultivation.



Control



H. erinaceum 10 ppm



Conclusions

- ◆ **Pre-activated *H. erinaceus* conditions: 5% glucose medium, pH 6.0 and 5-days fermentation**
- ◆ **The optimal crude polysaccharides, triterpenoids, and erinacine A contents were in *Hericium erinaceus* 35-days solid-state fermented oat product.**
- ◆ **The addition ethanol extracts from *Hericium erinaceus* fermented products significantly improved secretion of NGF and neurite outgrowth of PC12 cells.**

誌謝

- 農糧署的2008~2010的「猴頭菌子實體和發酵產物萃取液化學組成和生理功能之探討」科技計畫經費支助。
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Thanks !
歡迎聆聽
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