

靜宜大學 103 學年度博士班招生考試試題

學系:食品營養學系

科目:營養科學(含生物化學)

- 一、高血壓為臺灣十大死亡原因之一，也是心臟冠狀動脈疾病與腦血管病變最重要的危險因素，研究指出天然食物(食材)中含有某些成分可能具有調節血壓之效用；請閱讀下方摘要並回答下列相關問題。50%
- (1) 請依據下方摘要至多以 200 個中文字寫出此篇文獻之目的、結果與結論；並以個人論點說明此篇文獻實際應用之可能性。(10%)
 - (2) 請說明高血壓之診斷準則及飲食上應注意之事項。(10%)
 - (3) 請簡介人體血壓調控系統，並說明「angiotensin I-converting enzyme」所扮演之角色。(10%)
 - (4) 此篇文獻利用 ultrafiltration、gel filtration 與 reversed phase high-performance liquid chromatography 進行蛋白質分離純化，請簡介此三種分析方法之原理。(15%)
 - (5) 請說明下列名詞：「IC₅₀ value」、「peptide」(5%)

Purification, Identification, and *In Vivo* Activity of Angiotensin I-Converting Enzyme Inhibitory Peptide, from Ribbonfish (*Trichiurus haumela*) Backbone

Ribbonfish (*Trichiurus haumela*) backbone is normally discarded as an industrial waste from fish processing. A method of developing angiotensin I-converting enzyme inhibitory (ACEI) peptides from ribbonfish backbone was previously optimized. The purposes of the study were to characterize the active peptides in the hydrolysate and to evaluate its *in vivo* activity. Ribbonfish backbone protein hydrolysate prepared by acid protease was fractionated into 4 fractions (I, MW < 1 kDa; II, MW = 1 to 5 kDa; III, MW = 5 to 10 kDa; and IV, MW > 10 kDa) through ultrafiltration membranes. Fraction I, showing the highest ACEI activity, was further purified using consecutive chromatographic techniques including gel filtration and reversed phase high-performance liquid chromatography. The purified ACE inhibitory peptide was determined to have a molecular weight of 317.25 Da, with a sequence of Leu-Trp and an IC₅₀ value of 5.6 μM. Systolic blood pressure of spontaneously hypertensive rats was significantly decreased from 181 ± 2.0 to 161.3 ± 2.3 mm Hg after 4 h of oral administration of Leu-Trp at a dose of 10 mg/kg of body weight. These results indicated that ribbonfish backbone protein could be used for development of antihypertensive agent.

(source: Zou, P., et al. (2014) Journal of Food Science, 79: C1-C7.)

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二、現代人晚婚與生活壓力造成不孕症的增加，同時也使試管嬰兒技術被廣泛應用，由於母親處於不利懷孕的狀態，造成早產兒的發生率隨之增加。消化道的健康是食物營養能被吸收的關鍵，對早產兒更形重要，研究指出不同配方對早產兒的腸道免疫有不同的影響；請閱讀下方摘要並回答下列相關問題。50%

- (1) 請依據下方摘要至多以 200 個中文字寫出此篇文獻之目的、結果與結論；並以個人論點說明此篇文獻實際應用之可能性。(10%)
- (2) 請說明初乳的營養價值。(10%)
- (3) 請簡介人體乳汁分泌的調控系統，並說明下視丘、腦下腺在回饋機轉中所扮演的角色。(15%)
- (4) 此篇文獻利用 hexose absorption、tissue IL concentration、histomorphology、histopathology 與 fluorescence in situ hybridization 來評估腸道的健康與免疫，請說明原理為何。(15%)

Similar efficacy of human banked milk and bovine colostrum to decrease incidence of necrotizing enterocolitis in preterm piglets

Preterm birth and formula feeding predispose to necrotizing enterocolitis (NEC) in infants. As mother's milk is often absent following preterm delivery, infant formula (IF) and human donor milk (HM) are frequently used as alternatives. We have previously shown that porcine and bovine colostrum (BC) provide similar NEC protection in preterm piglets relative to IF. We hypothesized that HM exerts similar effects and that this effect is partly species-independent. Preterm piglets ($n = 40$) received 2 days of total parenteral nutrition, followed by a rapid transition to full enteral feeding ($15 \text{ ml} \cdot \text{kg}^{-1} \cdot 2 \text{ h}^{-1}$) for 2 days using BC ($n = 13$), HM ($n = 13$), or IF ($n = 14$). Intestinal passage time and hexose absorption were tested in vivo. Body and organ weights were recorded on *day 5*, and macroscopic NEC lesions in the gastrointestinal tract were assessed. Intestinal samples were collected for determination of histomorphology, histopathology, tissue IL-6 and IL-8, organic acids, bacterial adherence by fluorescence in situ hybridization score, and digestive enzyme activities. Relative to IF, pigs from BC and HM showed longer intestinal passage time; higher weight gain, hexose absorptive capacity, mucosal proportion, and enzyme activities; lower NEC incidence, organic acid concentration, and IL-8 concentration; and reduced histopathology lesions. Tissue IL-6 concentration and bacterial adherence score were lower for HM, relative to both BC and IF groups. We conclude that BC and HM are both superior to IF in stimulating gut structure, function, and NEC resistance in preterm piglets. BC may be a relevant alternative to HM when mother's milk is unavailable during the first week after preterm birth. (source: Jensen, M. L. et al. (2013) *Am. J. Physiol. Regul. Integr. Comp. Physiol.*, 305:1 R4-R12.)