

大葉大學 95 學年度 研究所博士班 招生考試試題紙

系 所 別	組 別	考 試 科 目 (中 文 名 稱)	考 試 日 期	節 次	備 註
生物產業科技學系		專業英文論文閱讀能力測驗	6 月 26 日	第 一 節	共 3 頁 第 1 頁

註：考生可否攜帶計算機或其他資料作答，請在備註欄註明（如未註明，一律不准攜帶） 8:30 ~ 11:00

考生注意事項

1. 筆試題目共計十題，任選五題作答。每題 20 分，合計 100 分。
2. 作答方式：將英文摘要改寫成中文（不必抄題）。
3. 無適當中文翻譯之特殊專有名詞，如微生物學名、化合物、化學成分等，可依原文寫出。
4. 作答題數超過五題者，將依作答順序取前五題計分，其餘答案不予計分。
5. 一律橫式作答。
6. 作答時請註明「選答試題之題號」，以便閱卷老師之評分。

試題

第一題

Genera, families, and possibly orders of basidiomycetous yeasts can be defined by 25S rRNA homology and correlated phenotypic characters. The teleomorphic genera *Filobasidium*, *Leucosporidium*, and *Rhodosporidium* have greater than 96 relative binding percent (rb %) intrageneric 25S rRNA homology and significant intergeneric separation from each other and from *Filobasidiella*. The anamorphic genus *Cryptococcus* can be defined by morphology (monopolar budding), colony color, and greater than 75 rb% intrageneric homology; *Vanrija* is heterogeneous. *Agaricostilbum* (Phragmobasidiomycetes, Auriculariales), *Hansenula* (Ascomycotera, Endomycota), *Tremella* (Phragmobasidiomycetes, Tremellales), and *Ustilago* (Ustomycota, Ustilaginales) appear equally unrelated to the *Cryptococcus*, *Filobasidiella*, and *Rhodosporidium* spp. used as probes. The Filobasidiaceae and Sporidiaceae, Filobasidiales and Sporidiales, form coherent homology groups which appear to have undergone convergent 25S rRNA evolution, since their relatedness is much greater than that indicated by 5S rRNA homology. Ribosomal RNA homologies do not appear to measure evolutionary distance.

第二題

The aim of this work was to determine the effect of temperature and water content on the mechanical properties of convection dried apples. Apples v. Idared were cut into slices and then air-dried at temperature in the range from 50 to 80°C. Mechanical properties were measured by compression-relaxation test. Samples were investigated after drying and also after 5 weeks of storage over anhydrous calcium chloride at constant temperature. Analysis showed that the observed differences between compression-relaxation curves of apples dried at 50, 60 and 70°C were not significant. Decreasing of water content caused an increase of force needed to compress dried apples. Drying at 80°C affected the texture of dried apples much more in comparison to those obtained at lower hot air temperature. The use of suitable temperature and drying of apples to definite water content could be used to design the mechanical properties of the final product.

第三題

Stroke is a major cause of mortality worldwide and bone marrow stem cell transplantation has been demonstrated to be a potential strategy for the treatment of stroke. Under ischemic conditions, circulating stem cells appear to migrate selectively to ischemic regions to support plasticity and functional recovery of damaged tissue. However, the signals that guide stem cells to ischemic lesions are unknown. Stromal cell-derived factor-1 α (SDF-1 α) is a CXC chemokine produced by bone marrow stromal cells, and acts as a potent chemo-attractant for hematopoietic stem cells (HSCs) that are constitutively expressed by all tissues. Recent reports have indicated that SDF-1 α is a strong chemo-attractant for CD34⁺ cells which express CXCR4, the receptor for SDF-1 α , and play an important role in HSCs trafficking between peripheral circulation and bone marrow. Studies of mice lacking SDF-1 α or CXCR-4 have confirmed that SDF-1 α is necessary for the migration of HSCs from fetal liver to bone marrow. In addition, SDF-1 α expression found in the brains of HIV-positive patients suggests that SDF-1 α may play a role in neuroprotection in response to HIV infection. Therefore, the SDF-1 α /CXCR4 signal may also play an important neuroprotective/neuroplastic role in the repair of neural tissue injury.

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第四題

In a small study of patients with back, neck or joint pain, researchers found that regularly listening to music provided pain relief beyond that brought on by standard pain management techniques. The scientists randomly divided 60 patients ages 26 to 64, all of them receiving traditional pain treatment, into three groups. Over seven days, the first listened for one hour a day to one of five tapes chosen by the researchers, the second to music of their own choosing, and the third received only standard care. All patients kept diaries recording their level of pain, depression and disability. The music groups experienced a 20 percent decrease in pain compared with a 2 percent increase in pain in the control group over the week of the study. Pain was measured using two standardized pain questionnaires. The authors did not suggest any specific mechanism that would explain the finding.

第五題

The valuable pharmaceutical polymer, hyaluronic acid, is produced industrially using the gram-positive bacterium *Streptococcus zooepidemicus*. Synthesis of this polymer is a significant energetic burden upon the microorganism hence the native NADH oxidase gene was cloned and overexpressed to increase the energy yield of catabolism during aerobic cultivation on glucose. Elevated NADH oxidase levels led to a decline in lactic acid generation and prevented ethanol formation, leaving acetate as the main fermentation product. Biomass yield increased due to the energy gained from the formation of acetate. Evaluation of the acetate flux control coefficient over a range of NADH oxidase expression levels revealed that acetate production was sensitive to the NADH oxidase level. However, at high NADH oxidase levels, the acetate flux was mainly influenced by another factor. The concomitant excretion of pyruvate at high NADH oxidase levels suggested that the flux through the pyruvate dehydrogenase enzyme complex was limiting the conversion of pyruvate to acetate.

第六題

A thermophilic and actinic bacterium strain, MH-1, which produced three different endochitinases in its culture fluid was isolated from chitin-containing compost. The microorganism did not grow in any of the usual media for actinomycetes but only in colloidal chitin supplemented with yeast extract and (2,6-*O*-dimethyl)- β -cyclodextrin. Compost extract enhanced its growth. In spite of the formation of branched mycelia, other properties of the strain, such as the formation of endospores, the presence of meso-diaminopimelic acid in the cell wall, the percent G1C of DNA (55%), and the partial 16S ribosomal DNA sequence, indicated that strain MH-1 should belong to the genus *Bacillus*. Three isoforms of endochitinase (L, M, and S) were purified to homogeneity and characterized from *Bacillus* sp. strain MH-1. They had different molecular masses (71, 62, and 53 kDa), pIs (5.3, 4.8, and 4.7), and N-terminal amino acid sequences. Chitinases L, M, and S showed relatively high temperature optima (75, 65, and 75°C) and stabilities and showed pH optima in an acidic range (pH 6.5, 5.5, and 5.5, respectively). When reacted with acetylchitohexaose [(GlcNAc)₆], chitinases L and S produced (GlcNAc)₂ at the highest rate while chitinase M produced (GlcNAc)₃ at the highest rate. None of the three chitinases hydrolyzed (GlcNAc)₂. Chitinase L produced (GlcNAc)₂ and (GlcNAc)₃ in most abundance from 66 and 11% partially acetylated chitosan. The *p*-nitrophenol (pNP)-releasing activity of chitinase L was highest toward pNP-(GlcNAc)₂, and those of chitinases M and S were highest toward pNP-(GlcNAc)₃. All three enzymes were inert to pNP-GlcNAc. AgCl, HgCl₂, and (GlcNAc)₂ inhibited the activities of all three enzymes, while MnCl₂ and CaCl₂ slightly activated all of the enzymes.

第七題

Raspberry ketone (4-(4-hydroxyphenyl) butan-2-one; RK) is a major aromatic compound of red raspberry (*Rubus idaeus*). The structure of RK is similar to the structures of capsaicin and synephrine, compounds known to exert anti-obese actions and alter the lipid metabolism. The present study was performed to clarify whether RK helps prevent obesity and activate lipid metabolism in rodents. To test the effect on obesity, our group designed the following in vivo experiments: 1) mice were fed a

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high-fat diet including 0.5, 1, or 2% of RK for 10 weeks; 2) mice were given a high-fat diet for 6 weeks and subsequently fed the same high-fat diet containing 1% RK for the next 5 weeks. RK prevented the high-fat-diet-induced elevations in body weight and the weights of the liver and visceral adipose tissues (epididymal, retroperitoneal, and mesenteric). RK also decreased these weights and hepatic triacylglycerol content after they had been increased by a high-fat diet. RK significantly increased norepinephrine-induced lipolysis associated with the translocation of hormone-sensitive lipase from the cytosol to lipid droplets in rat epididymal fat cells. In conclusion, RK prevents and improves obesity and fatty liver. These effects appear to stem from the action of RK in altering the lipid metabolism, or more specifically, in increasing norepinephrine-induced lipolysis in white adipocytes.

第八題

A fish sauce (CSS) was prepared from gutted chum salmon (*Oncorhynchus keta*) using barley koji and halo-tolerant microorganisms (HTM) *Zygosaccharomyces rouxii*, *Candida versatilis* and *Tetragenococcus halophilus*. During fermentation, chemical analysis was performed to determine the pH of the fish sauce mash (*moromi*). After fermentation, the optical density at 550 nm and the chemical and extractable components of CSS were compared with those of Thai fish sauce (*nampla*) and soy sauce. The pH of CSS *moromi* fell rapidly early in the fermentation process, and the color of CSS was lighter than that of fish sauce prepared without using HTM. The ethanol content of CSS was higher than that of *nampla*, but lower than that of soy sauce. According to free amino acid analysis, contents of aspartic acid, glycine, lysine, and leucine were higher in CSS than in *nampla* and soy sauce; however, its lactic acid, acetic acid and pyroglutamic acid contents were lower. Sensory evaluation showed that CSS had a soy-sauce-like flavor and a less fishy odor than *nampla*.

第九題

The phytohormone abscisic acid (ABA) regulates stress-responsive gene expression during vegetative growth. The ABA regulation of many genes is mediated by a subfamily of basic leucine zipper class transcription factors referred to as ABFs (i.e. ABF1-ABF4), whose transcriptional activity is induced by ABA. Here we show that a calcium-dependent protein kinase is involved in the ABA-dependent activation process. We carried out yeast two-hybrid screens to identify regulatory components of ABF4 function and isolated AtCPK32 as an ABF4-interacting protein. AtCPK32 has autophosphorylation activity and can phosphorylate ABF4 in vitro. Mutational analysis indicated that serine-110 of ABF4, which is highly conserved among ABF family members, may be phosphorylated by AtCPK32. The serine-110 residue is essential for ABF4-AtCPK32 interaction, and transient expression assay revealed that it is also required for the normal transcriptional function of ABF4. The expression patterns and subcellular localization of AtCPK32 are similar to those of ABF4. Furthermore, its overexpression affects both ABA sensitivity and the expression of a number of ABF4-regulated genes. Together, our data demonstrate that AtCPK32 is an ABA signaling component that regulates the ABA-responsive gene expression via ABF4.

第十題

The lack of industrially suitable microorganisms for converting biomass into fuel ethanol has traditionally been cited as a major technical roadblock to developing a bioethanol industry. In the last two decades, numerous microorganisms have been engineered to selectively produce ethanol. Lignocellulosic biomass contains complex carbohydrates that necessitate utilizing microorganisms capable of fermenting sugars not fermentable by brewers' yeast. The most significant of these is xylose. The greatest successes have been in the engineering of Gram-negative bacteria: *Escherichia coli*, *Klebsiella oxytoca*, and *Zymomonas mobilis*. *E. coli* and *K. oxytoca* are naturally able to use a wide spectrum of sugars, and work has concentrated on engineering these strains to selectively produce ethanol. *Z. mobilis* produces ethanol at high yields, but ferments only glucose and fructose. Work on this organism has concentrated on introducing pathways for the fermentation of arabinose and xylose. The history of constructing these strains and current progress in refining them are detailed in this review.