

## **MSc Neuroscience at the Institute of Psychiatry**

### **2004 Essay titles**

#### *Section 1*

1. Motor cortex and somatosensory cortex – different or similar? Describe how the structure and function of these two regions are interrelated, yet distinct, and how you would investigate these properties. (Nadeem Khan/Jon Cooper)
2. Describe the role of the cytoskeleton in the post-natal development of neurons (Jean-Marc Gallo)
3. Discuss the mechanisms responsible for the timing and patterning of neural crest migration (Brenda Williams)
4. What have twin and family studies of schizophrenia told us about the disease (John Powell)
5. Cytokines can be considered to have pro-inflammatory or anti-inflammatory actions. Discuss this statement in the context of the development and resolution of an immune response within the CNS (Payam Rezaie/David Male)
6. Discuss the evidence for defective axonal transport as a mechanism involved in the pathogenesis of Alzheimer's disease (Diane Hanger)
7. Review and discuss the postulated neurotoxic mechanisms of protein aggregates in neurodegenerative disease (Jean-Marc Gallo)
8. Compare and contrast the different roles of ligand-gated ion channels (incl. Those controlled via metabotropic receptors) and voltage-gated ion channels in synaptic transmission (John Stephenson)
9. Describe (using diagrams) the main types of binding assays used in receptor studies. What are they used for and what parameters do they provide? What are the practical problems that can arise and how can they be resolved? (Iain Campbell)
10. How would you use current knowledge of the neurobiology of relapse to drug-seeking behaviour in laboratory studies aimed at identifying new medication to help people to stay off cocaine? (Ian Stolerman)

## *Section II*

1. Therapeutic options for fatal pediatric disorders are severely limited. Using the example of infantile neuronal ceroid lipofuscinosis, describe potential therapeutic approaches and the stages that are necessary to develop effective agents for clinical use. (Jon Cooper/Nadeem Khan)
2. For which CNS neurodegenerative condition would you advocate the development of stem cell therapy, and why? (Helen Hodges)
3. Compare what can be learnt from labeling a cohort of cells using thymidine labeling, and from labeling a clone of cells using a retroviral vector. (Jack Price)
4. Discuss the major findings from behavioural genetic research into anxiety and depression and consider how these can inform molecular genetic studies. (Thalia Eley)
5. Microglia have been described as 'a double-edged sword'. Discuss. (Payam Rezaie)
6. Describe and discuss the differences in the neurochemical abnormalities of Parkinson's disease and Alzheimer's disease (Brian Anderton)
7. Discuss the evidence underlying a causal relationship between bovine spongiform encephalopathy (BSE) in cattle, and variant Creutzfeldt-Jakob disease (vCJD) in man. (Payam Rezaie)
8. Describe how dysfunction of a cortico-striatal thalamo-cortical circuit might give rise to the movement disorders characterising Parkinson's disease and Huntington's chorea. Describe how dysfunction of a parallel circuit might give rise to schizophrenic symptoms. (John Stephenson)
9. A particularly perceptive animal house technician notices that a mouse in the breeding colony of C57BL/6 mice has a peculiar gait. On closer examination the animal's mother displays a similar ataxic phenotype. How might you begin to investigate these intriguing mice? (Leo Schwalkwyk)
10. When fMRI was first introduced in the early 1990's, it was believed that its greatest impact would be in Neurology. However, it has been much more widely used in Psychology and Psychiatry. Discuss the reasons why you think this may have been the case. (Mick Brammer)
11. Discuss the role of glutamatergic transmission in psychiatric disorders. (Mike Travis)

### *Section III*

1. Review the evidence linking  $\beta 1$  integrins and the reelin signalling pathway. (Brenda Williams)
2. Explain how cell fate is determined in the developing spinal cord. (Jack Price)
3. Microglia are tissue-resident macrophages. Discuss the evidence for and against this concept. (Payam Rezaie)
4. 25. What are human prion diseases? How can vCJD be distinguished clinically, pathologically and experimentally from other forms of human prion disease? (Payam Rezaie)
5. Anticipation is observed in Huntingdon's disease. Define the term and explain the molecular basis of anticipation in Huntington's disease and one other neurodegenerative disorders (John Powell)
6. Describe (giving an example in each case), the molecular structure of an ionotropic receptor, a metabotropic receptor, a tyrosine kinase linked receptor and a steroid receptor. How are these structures linked to their functions? (Iain Campbell)
7. Discuss the advantages and limitations of transgenic mice for behavioural neuroscience investigations into the neurobiology of drug dependence, using studies on nicotine and cocaine as examples. (Ian Stolerman)
8. Describe the molecular regulation of the transition from short term to long term memory. (John Stephenson)
9. Why is it important to monitor neural transplants by neuroimaging? (Mike Modo)
10. "Schizophrenia and Bipolar Affective Disorder have a common aetiology and biological basis" Please discuss this statement with reference to current biological and epidemiological research. (Mike Travis)