Unit Assessment – Module 9 Case Study: Neurodegeneration (II)

Methods in Neurobiology

Overview

In this assignment you are asked to write a detailed paragraph describing the experiments illustrated in the two figures below like authors do when writing the result paragraph of a scientific paper. You should consider those figures your experiments and write a detailed description of the work behind it. Such experiments involve techniques discussed in previous modules and focus on neurodegenerative diseases. This a 20-point assignment.

Instructions

- Please provide 1-2 paragraphs (1 page max) describing the experiments illustrated in the figures below. Your work can include a discussion about the method, the model used, and the results obtained. Both figures can be discussed together since they are taken from the same paper and belong to the same experiment.
- Include citations, if needed in the usual format.
- Please refrain from reading the full article online.
- Examples on how to formulate your work may include "In this paper the authors describe a way…They used this model because…In this experiment, the authors introduced…This technique allows to.."

Figure 1

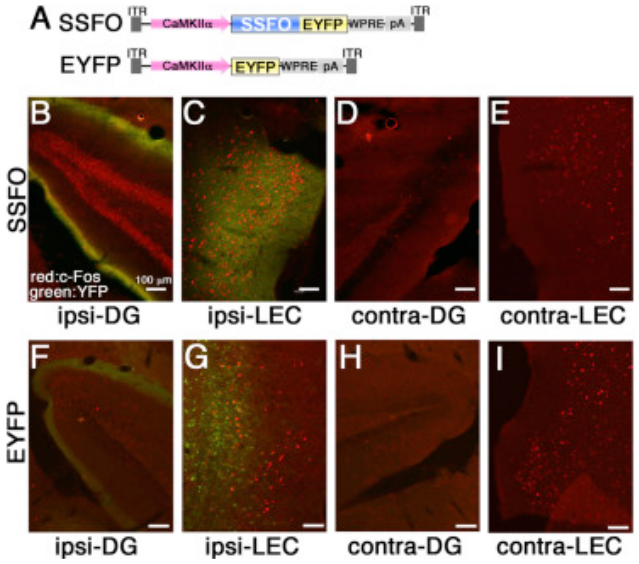

Figure 1. Optogenetic Stimulation Activated Perforant Pathway Neurons
(A) Schematic structures of SSFO-EYFP (SSFO) and EYFP (EYFP) driven under the control of CaMKIIα promoter in an AAV vector are shown. ITR, the inverted terminal repeat sequences; CaMKIIα, Ca^{2+}/calmodulin-dependent protein kinase II alpha (promoter); WPRE, woodchuck hepatitis virus posttranscriptional regulatory element; pA, polyadenylation signal.
(B–I) Immunofluorescence labeling for c-Fos (neuronal activation marker, red) and YFP (virus expression marker, green) of the coronal sections of mice infected with AAV-SSFO (B–E) or AAV-EYFP (F–I). Expression of SSFO

or EYFP (green) was observed in perforant pathway neurons of the ipsilateral side of infection, i.e., LEC (ipsi-LEC, C and G) and OML of the DG (ipsi-DG, B and F), but not in those of the contralateral side (contra-DG, D and H, and contra-LEC, E and I). Unilateral optogenetic stimulation increased the levels of c-Fos at ipsilateral DG (B) and LEC (C) (red), specifically in the SSFO-infected mice. Note that non-stimulated LEC neurons show modest levels of basal c-Fos activities (E, G, and I).

Figure 2

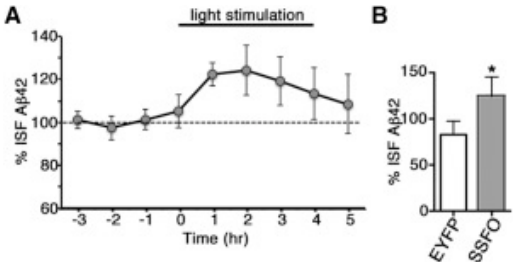

Figure 2. Acute Optogenetic Stimulation of the LEC Increased Aβ42 Levels in the Hippocampus
(A) Average levels of ISF Aβ42 in the hippocampus of APP Tg mice infected with SSFO detected by an in vivo microdialysis technique. Light stimulation (1×/min for 4 hr) increased the ISF level of Aβ42. Mean relative levels of ISF Aβ42 ± SEM (mean of those 1, 2, and 3 hr prior to stimulation as 100%) are indicated (n = 5).
(B) Quantitative analysis of ISF Aβ42 levels at 1 hr of stimulation. ISF level of Aβ42 in the hippocampus of SSFO-infected APP Tg mice was significantly higher than that for mice infected with EYFP (n = 4 [EYFP] and 5 [SSFO], respectively; Student's t test, mean ± SD, $^{*}p < 0.05$).