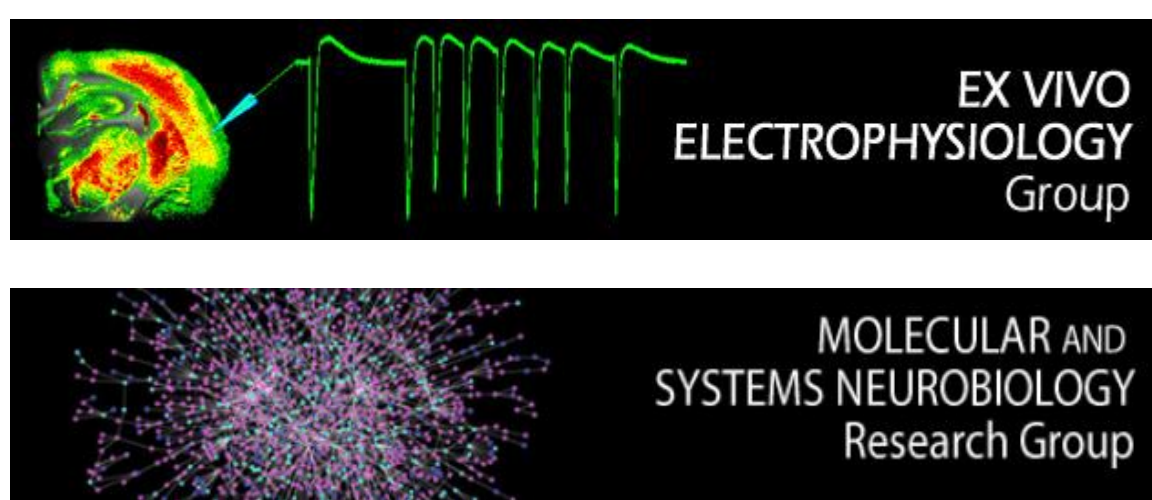




Background

Mycotoxins are toxic secondary metabolites produced by microscopic fungi often infecting agricultural crops. The most common *Fusarium* toxins – **fumonisin B1 (FB1)**, **deoxynivalenol (DON)** and **zearalenone (ZEA)** – are structurally stable and able to enter the food chain. Consumption of grain containing toxin above tolerable daily intake (TDI) level may cause adverse health effects. FB1 is known as a de novo sphingolipid biosynthesis depressor, DON is a powerful protein synthesis inhibitor, while ZEA can interact with estrogen receptors. Recent data suggest that these toxins may also have acute effects on neural cell cultures as well. Thus, we decided to examine with electrophysiological techniques whether they alter neuronal network activities after acute treatment.

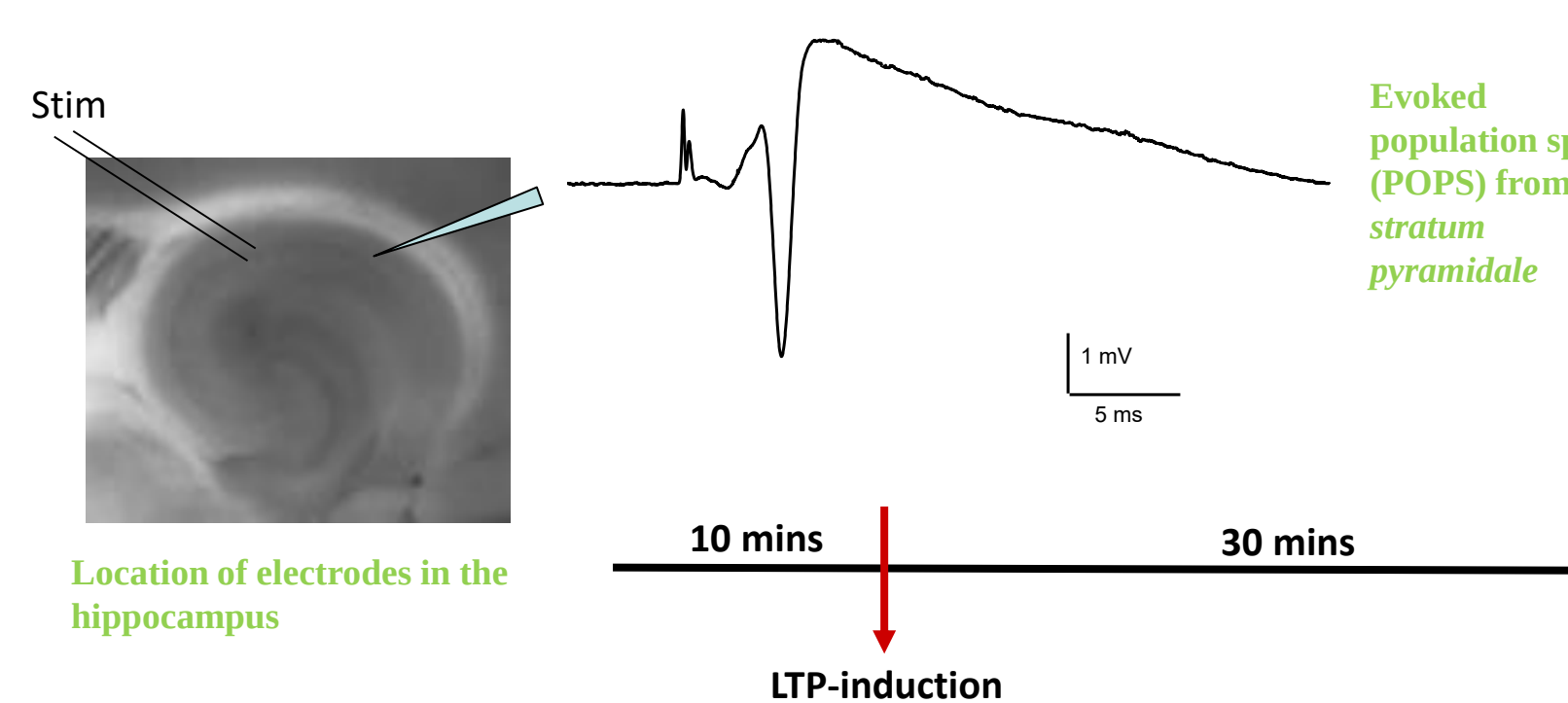
Materials & Methods



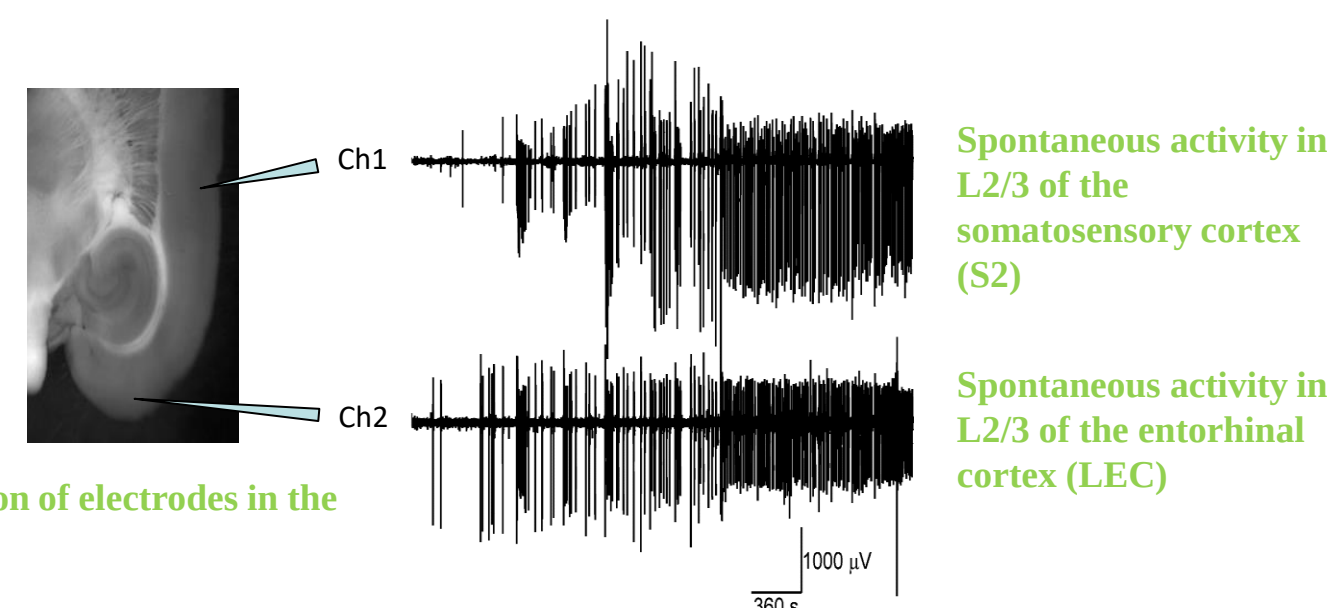
Extracellular recordings

- 400 μm thick brain slices of male Wistar rats (150-250g)
- FB1, DON or ZEA treatment *in vitro* for 30 mins
- 3 concentrations: 10, 50 and 100 μM
- Recording of electrically evoked and spontaneous field potentials

Registration of toxic effects on long-term potentiation in the hippocampus (LTP, induced with a special theta-burst stimulus train)



Registration of toxic effects on epileptiform activity in the entorhinal and somatosensory cortices (induced with magnesium-free ACSF – MFR)



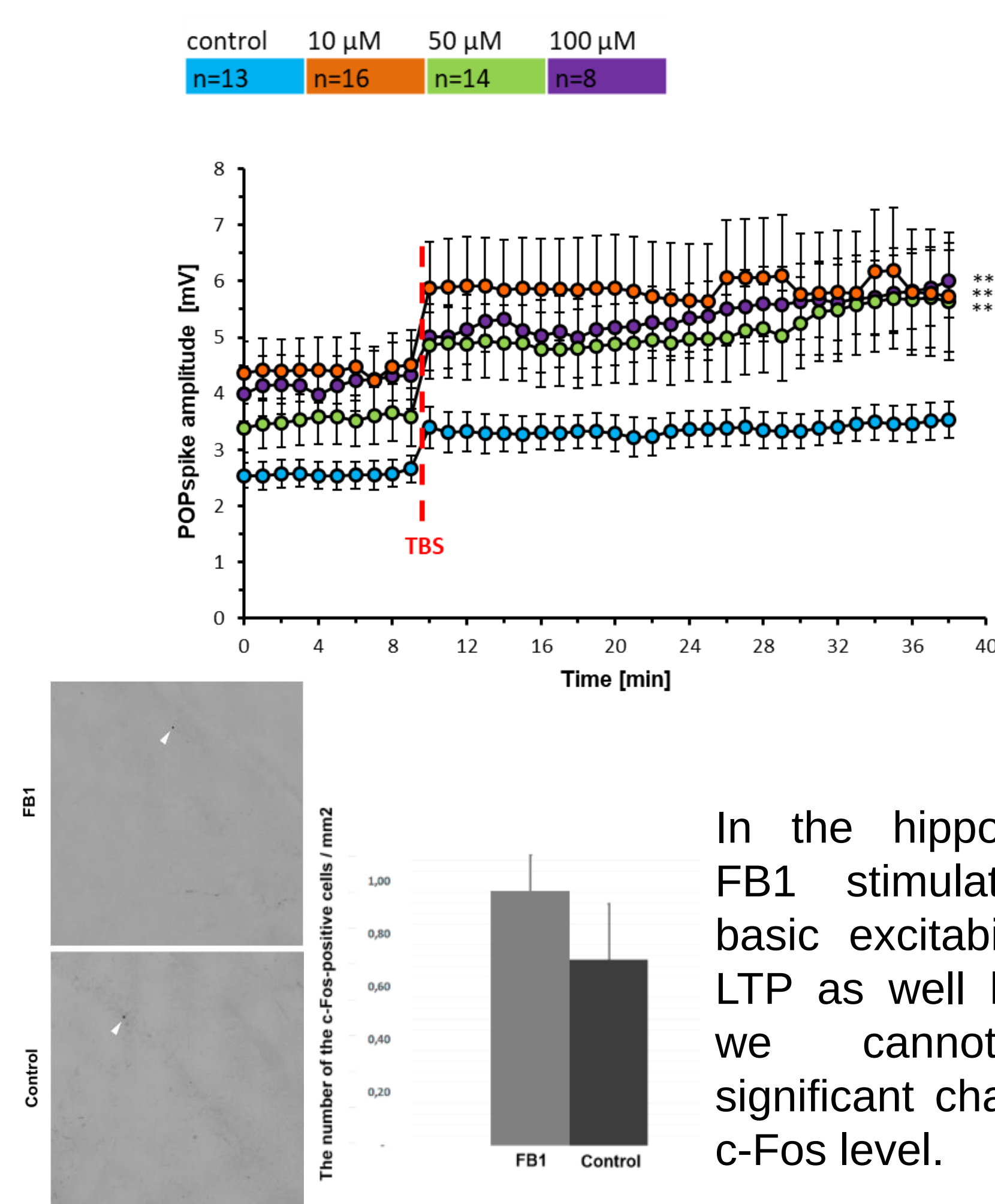
Immunohistochemistry

- Male rats (310-340g)
- FB1, DON or ZEA injected intraperitoneally (1mg/kgbw)
- Transcardial perfusion 2 hours later
- 50 μm thick brain slices
- Immunohistochemical staining with rabbit anti-c-Fos antibody with nickel-DAB peroxidase technique
- Microphotographs of 2.12 mm²-sized areas
- Counting c-Fos positive cells with ImageJ program

- Statistical analysis: repeated-measures or one-way ANOVA with Tukey post hoc test
 - $p < 0.05$ *
 - $p < 0.01$ **
 - $p < 0.001$ ***
 - (compared to control)

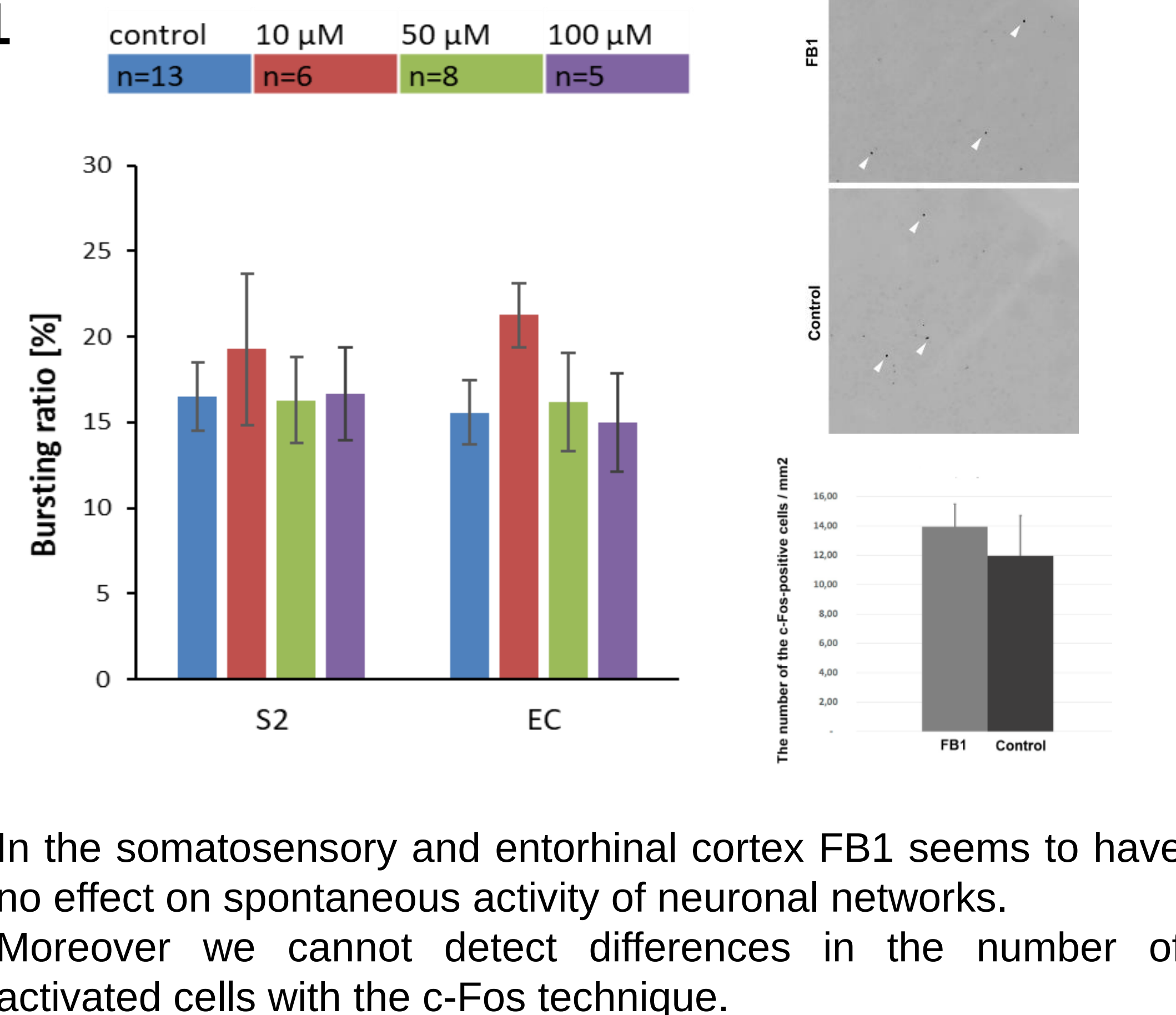
Results

Hippocampus

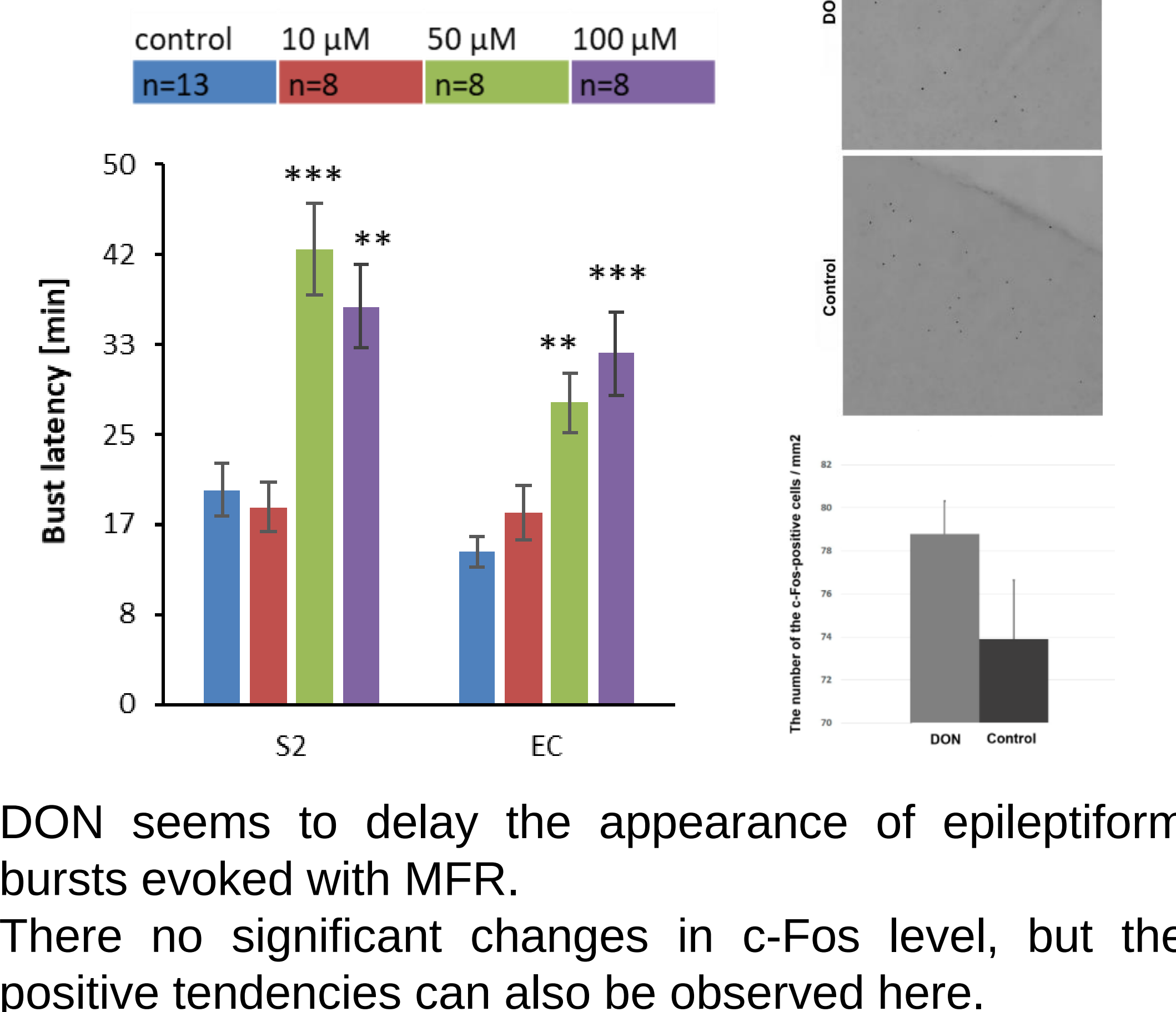
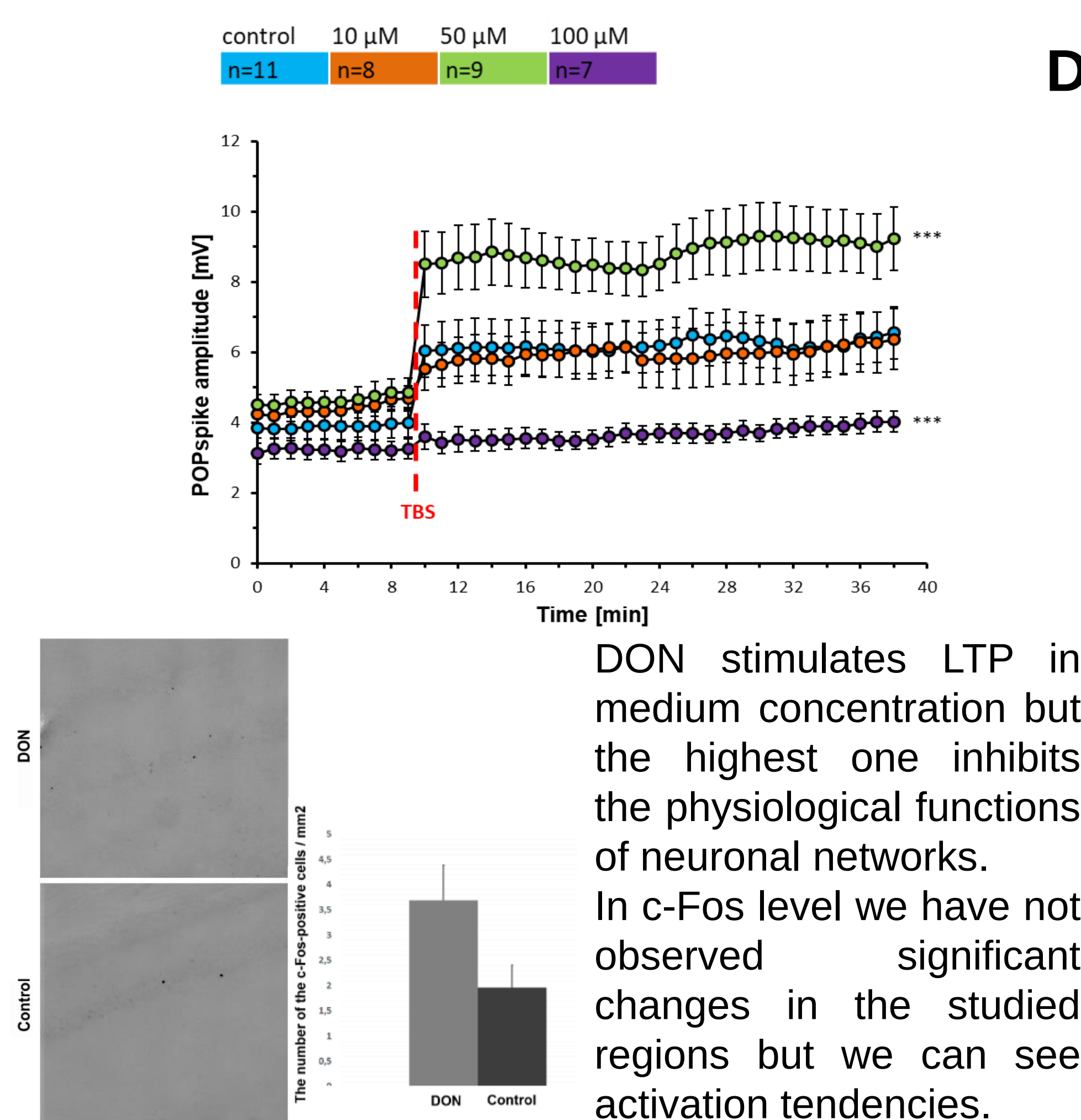


Somatosensory and entorhinal cortices

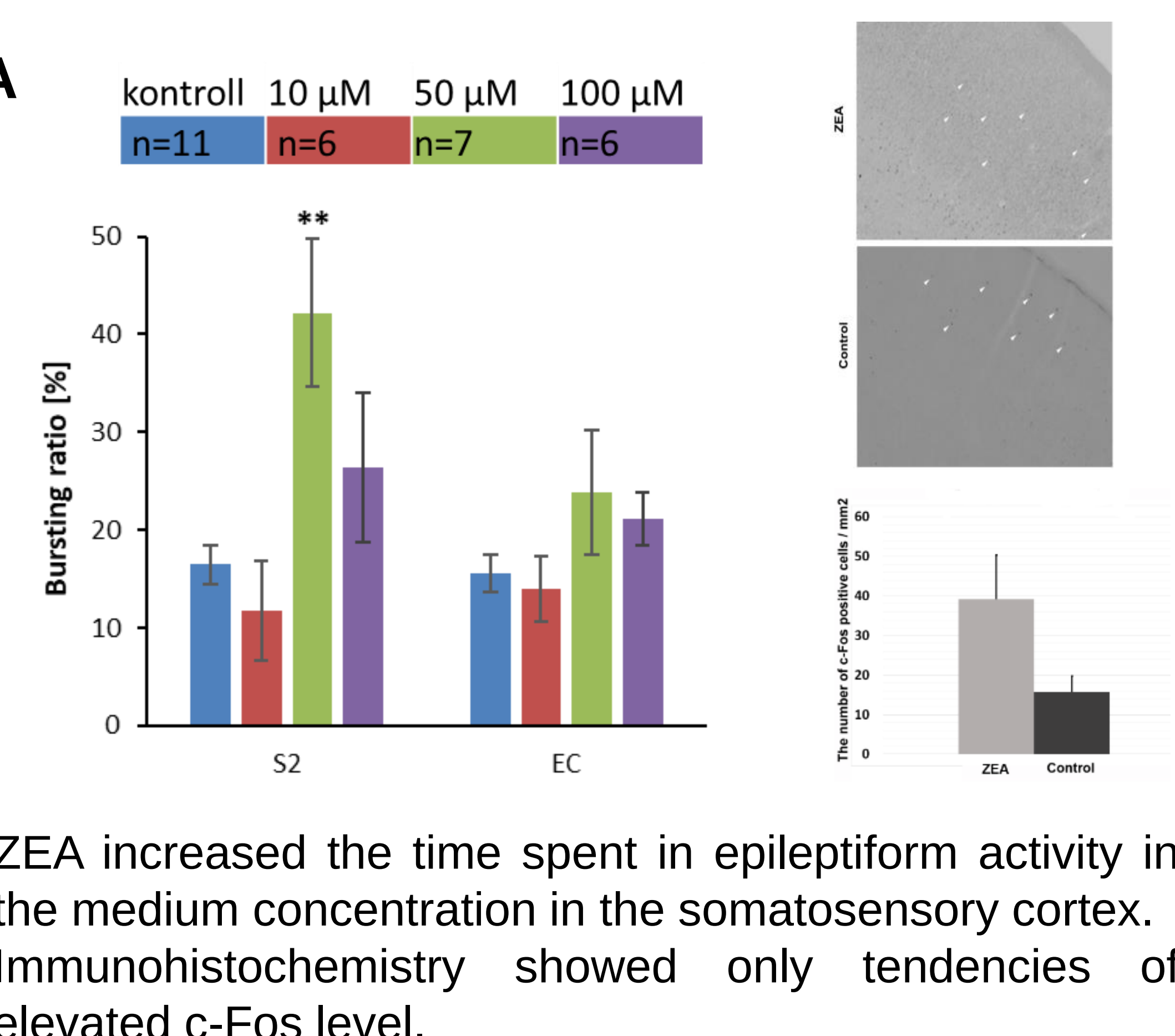
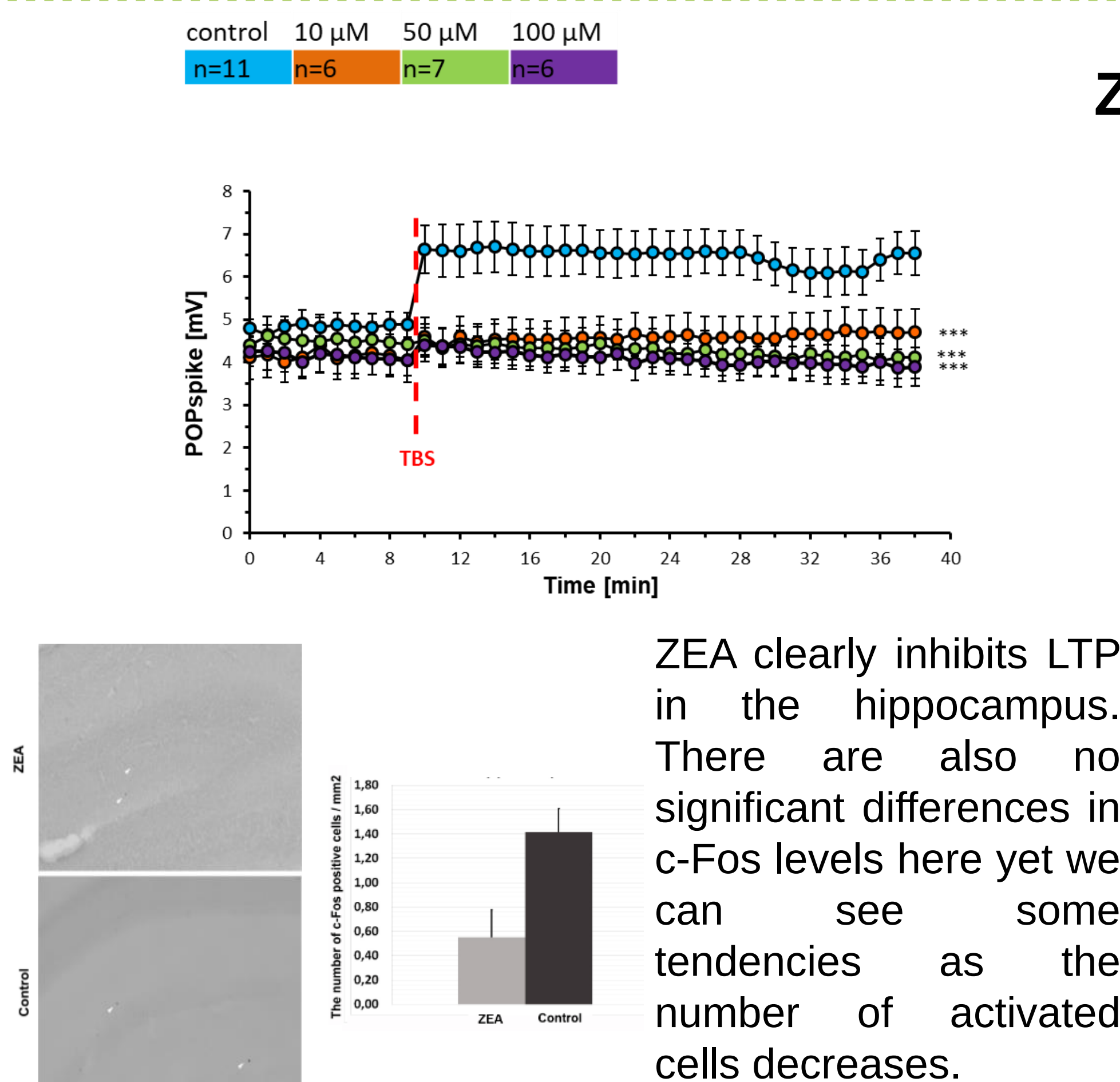
FB1



DON



ZEA



Discussion

Based on our results, each *Fusarium* toxin has different acute effects on neuronal networks following direct exposure of rat brain slices to toxin-containing ACSF. However, after intraperitoneal injection, the toxins may not penetrate the blood-brain barrier sufficiently to yield effective concentration required for significantly increased neuronal activation. Therefore, activation was detected only in a few brain regions, like the nucleus accumbens or the ventral tegmental area.

Although the current experiments do not provide information concerning the exact mechanisms, our results may be explained by that FB1 can increase intracellular Ca²⁺ levels, DON disturbs the synthesis of several proteins and ZEA can activate estrogenic receptors.