

Neuronal activity in an amphibian brain during a spatial navigation task



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1 – Introduction

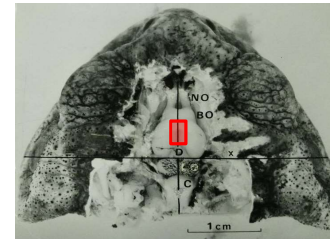
Spatial navigation is a skill conserved between vertebrates, suggesting that it is important for survival. We are interested in the **evolution of neural mechanisms** that rule this ability, looking for learning patterns potentially present in a common ancestor.



We use the terrestrial toad, *Rhinella arenarum*, as a model of ancient vertebrate.

Amphibians have a homologous area to the hippocampal formation (mammal brain structure involved in spatial learning) called **medial pallium**, which functions are not yet fully described.

Expression of **c-fos** can be used as an indirect marker of neuronal activity. c-Fos staining in a neuron indicates recent activity and it is believed that its expression is induced by a novel experience, such as learning spatial task in a maze.



Dorsal view of the amphibian brain, the structure under study (medial pallium) is highlighted. .

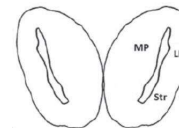


Diagram of mid-telencephalic Section of the telencephalon.
LP = lateral pallium
MP = medial pallium
Str= Striatum

2 – Methods & Results

We trained toads in a water finding orientation task using a transparent open field (with access to extra maze cues). After 12 training sessions (3 trials per session) experimental animals learned to solve the task.

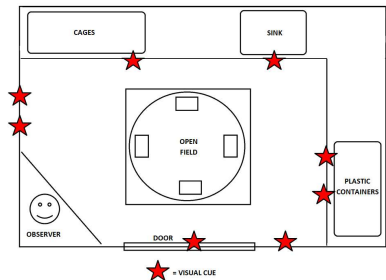
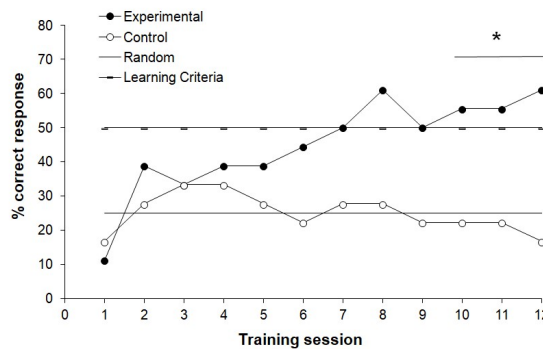


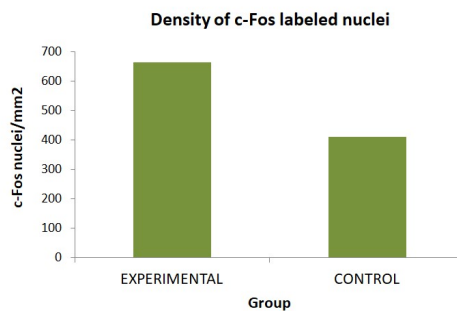
Diagram of the training room including visual cues location.

3 – Results

After acquisition, brains were analyzed using c-Fos immunohistochemistry technique. Our results revealed **increased c-Fos + neurons in the medial pallium region**, suggesting that this structure is involved in spatial navigation strategies in amphibians. .



c-Fos + neurons (40x) from medial pallium area in experimental animals.



4 – Discussion

Our results indicate that medial pallium is involved in the use of extra maze visual cues for spatial orientation in amphibians. Hippocampus and medial pallium seems to be functional equivalents for this task, telling us that this ability is evolutionary conserved

