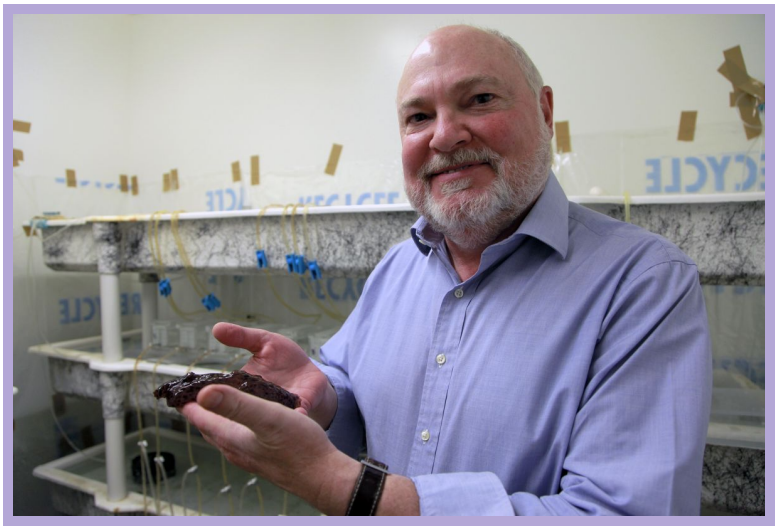
Written by: Lorena Gonzalez
Edited by: Diana Castro

UCLA InterAxon's Media Committee

Are You Thinking What I'm Thinking?

How UCLA's David Glanzman Ph.D. transferred long-term memory between sea slugs (Summary)



David Glanzman Ph.D. holding an *Aplysia*, Image Courtesy of UCLA Newsroom

INTRODUCTION:

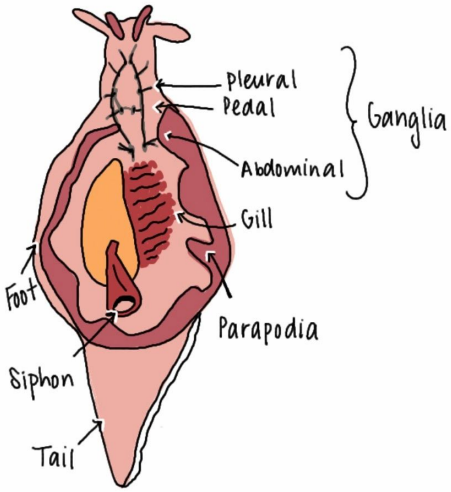
Long-Term Memory (LTM) is the type of memory responsible for information storage over an extended period of time. In this study, researchers assessed **long-term sensitization (LTS)** in *Aplysia*, a type of marine slug, through repeated electric shocks to the tail. **Sensitization** is the learning process that occurs when repeated exposure to a stimulus causes a stronger response to that stimulus. In other words, the organism becomes more sensitive to stimulation over time.

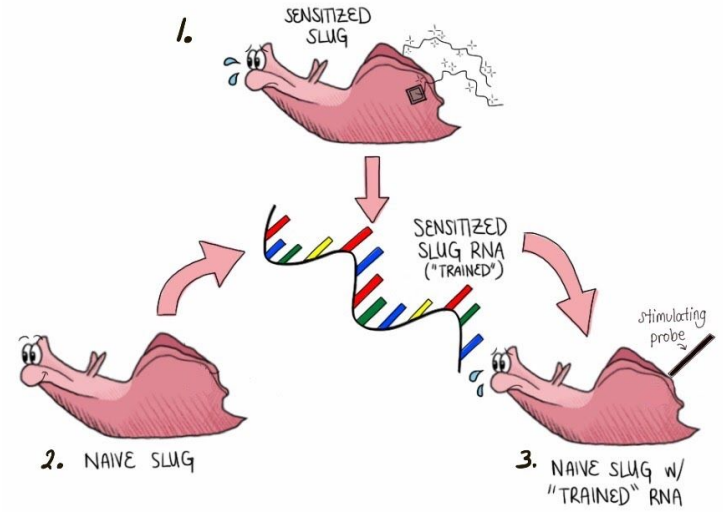
Written by: Lorena Gonzalez
Edited by: Diana Castro

Noncoding RNAs (ncRNAs) do not translate into proteins and can affect long-term memory formation. Therefore, the researchers in this study hypothesized that an RNA injection from a sensitized slug to a non-sensitized slug might result in memory transfer indicated by significant behavioral changes.

MATERIALS AND METHODS

Aplysia were first anesthetized before having platinum wires implanted in their tails for electric shock delivery. Slugs were then placed into the experimental chamber for 24 hours to acclimate (or adjust) to the environment before the shock tests. After shock administration, trained/sensitized snails had RNA extracted for further processing. After being injected with this RNA, naive/untrained/non-sensitized slugs had their siphon lightly stimulated with a soft, flexible probe. Researchers noted the duration of the subsequent **siphon withdrawal reflex (SWR)**, or inward retraction of the siphon, in response to probe stimulation. The siphon is a tube-like structure that lets water flow through it. The slug will draw its siphon inwards (SWR) as a defense mechanism in response to nearby disturbances or predators.

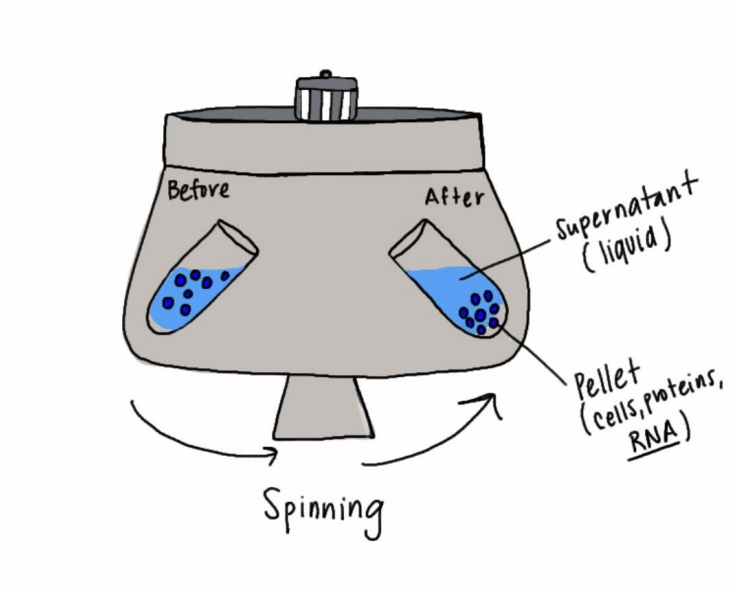


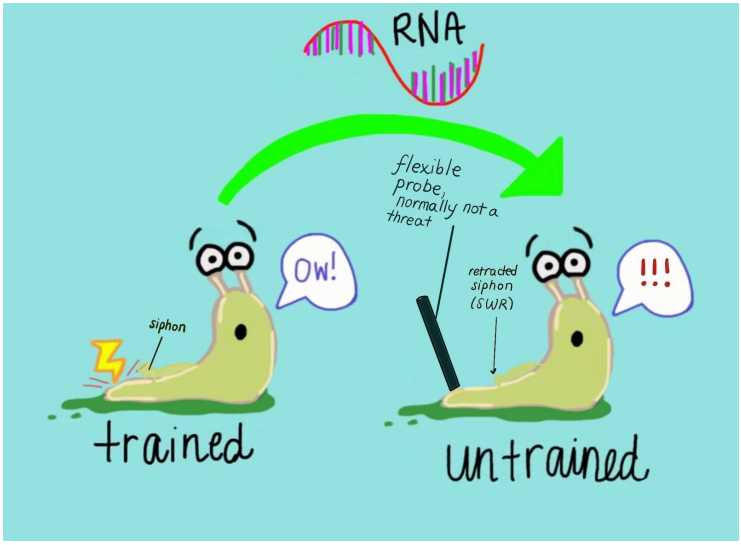


Written by: Lorena Gonzalez
Edited by: Diana Castro

RNA PREPARATION AND INJECTION:

RNA was extracted from pleural-pedal and abdominal ganglia (collections of nerve cells) following homogenization (chemical mixing for uniformity) and centrifugation (vigorous spinning to separate RNA pellets from aqueous components). After further chemical refinement, RNA from trained animals were combined and RNA from untrained animals were combined into separate tubes respectively. RNA concentrations were subsequently measured and injected into the hemocoel (invertebrate body cavity which circulates fluid throughout the animal's body) of the slug's neck.





Results:

After receiving an injection of RNA from sensitized/trained slugs and being lightly tapped with a flexible probe, untrained slugs showed an enhanced siphon withdrawal reflex (SWR) despite never having been shocked themselves. This behavioral response indicated a successful memory transfer between the slugs! Future research may counter memory loss or lessen the trauma of painful memories in patients.

Written by: Lorena Gonzalez
Edited by: Diana Castro

WORKS CITED:

Bédécarrats, Alexis, et al. “RNA from Trained Aplysia Can Induce an Epigenetic Engram for Long-Term Sensitization in Untrained Aplysia.” ENeuro, Society for Neuroscience, 1 May 2018, www.eneuro.org/content/5/3/ENEURO.0038-18.2018.

Wolpert, Stuart. “UCLA Biologists 'Transfer' a Memory.” UCLA, UCLA, 14 May 2018, newsroom.ucla.edu/releases/ucla-biologists-transfer-a-memory.