

## **Raging Hormones on the Reef?**

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Many people have seen dramatic images of coral spawning: cued by environmental signals, like the phase of the moon, coral colonies will at specific times on specific days release eggs and sperm or larvae into the water column. Some of the larvae will eventually settle back onto the reef to form a new generation of reef-builders. Coral reproduction is beautiful, ecologically important and scientifically mysterious—it is still unknown how corals respond biologically to environmental signals. How do corals detect the environmental cues and translate them into biological signals to produce eggs and spawn?

Steroids, such as estrogen and testosterone, are essential to reproduction in vertebrate animals. Estrogens and other steroids have been measured in coral tissues and in the water during coral spawning, but it is not clear what role steroids play in coral reproduction. The Caribbean Marine Research Center, a NOAA/NURP facility is currently sponsoring research aimed at understanding how steroids function in reef-building corals. In this project, researchers Ann Tarrant and Mark Hahn (Woods Hole Oceanographic Institution) are investigating whether corals contain specific proteins that can bind to steroids and act as receptors.

**How do steroid hormones “work” in vertebrate animals like fishes and humans?** Basically steroids can work in two different ways. First, they can cross the cell membrane inside the cell to bind receptor proteins inside the cell. These receptors can then interact with DNA to turn specific genes on or off. Secondly, in some cases, steroids can interact with receptor proteins within the cell membrane. These membrane-bound proteins communicate with the inside of the cells through small mobile signal molecules, such as calcium ions or cAMP. Many environmental chemicals can also bind to steroid receptors and disrupt natural hormonal signaling.

### **How are steroid receptors being studied in corals?**

Researchers have collected small fragments of *Montastrea cavernosa*, the great star coral, from reefs around Lee Stocking Island, Bahamas. This is a common gonochoric (separate male and female colonies) reef-building coral that spawns gametes into the water column. Some of these fragments have been exposed to steroids in the laboratory in order to allow researchers to measure changes in intracellular signaling molecules. Laboratory studies will also use small amounts of radiolabeled steroids to determine whether steroids bind specifically to proteins inside coral cells or on the cell membranes. Additional experiments are being conducted with *Astrangia danae*, a coral species that forms small colonies in temperate waters and can be collected in Woods Hole. These experiments will provide insight into which steroid compounds are most likely to act as coral hormones, what time in the reproductive cycle they might be most active, and whether environmental contaminants can disrupt natural signaling processes in corals.

### **Why is research on coral hormones important to NOAA?**

This research is supported by the NOAA Coral Reef Conservation Program and helps to address the NURP goal to promote healthy coasts and effective management with new scientific

knowledge. Improved understanding of natural bioregulation of coral reproduction will (1) help managers to assess whether coral reproduction is vulnerable to disruption by environmental contaminants, and (2) potentially facilitate efforts to reseed and restore damaged reefs.

**More information:** <http://www.whoi.edu/people/atarrant>

**Photos (all photos taken by Ms. Kristen Whalen, WHOI)**

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