

Male seahorses develop placentas to support their growing babies

September 20 2021, by Jessica Suzanne Dudley, Camilla Whittington



Credit: Kindel Media from Pexels

Supplying oxygen to their growing offspring and removing carbon dioxide is a major challenge for every pregnant animal. Humans deal with this problem by developing a placenta, but in seahorses—where the male, not the female, gestates and gives birth to the young—exactly how it worked hasn't always been so clear.

Male seahorses incubate their [embryos](#) inside a [pouch](#), and until now it was unclear how the embryos "breathe" inside this closed structure. Our new study, published in the journal [Placenta](#), examines how pregnant male seahorses (*Hippocampus abdominalis*) provide [oxygen supply](#) and [carbon dioxide](#) removal to their embryos.

We examined male seahorse pouches under the microscope at different stages of [pregnancy](#), and found they develop complex placental structures over time—in similar ways to human pregnancy.

A pregnant dad gestating up to 1,000 babies

Male pregnancy is rare, only occurring in a group of fish that includes seahorses, seadragons, pipehorses and pipefishes.

Pot-bellied seahorse males have a specialized enclosed structure on their tail. This organ is called the [brood pouch](#), in which the embryos develop.

The female deposits eggs into the male's pouch after a [mating dance](#) and pregnancy lasts about [30 days](#).

While inside the pouch, the male [supplies nutrients](#) to his developing embryos, before [giving birth](#) to up to 1,000 [babies](#).

Embryonic development requires [oxygen](#), and the oxygen demand increases as the embryo grows. So too does the need to get rid of the resulting carbon dioxide efficiently. This presents a problem for the pregnant male seahorse.



Male pot-bellied seahorses have large fleshy pouches where embryos develop during pregnancy. Credit: Aaron Gustafson

Enter the placenta

In egg-laying animals—such as birds, [monotremes](#), certain reptiles and fishes—the growing embryo accesses oxygen and gets rid of carbon dioxide through pores in the egg shell.

For animals that give birth to live young, a different solution is required. Pregnant humans develop a [placenta](#), a complex organ connecting the mother to her developing baby, which allows an efficient exchange of oxygen and carbon dioxide (it also gets nutrients to the baby, and

removes waste, via the bloodstream).

Placentae are filled with many small blood vessels and often there is a thinning of the tissue layers that separate the parent's and baby's blood circulations. This improves the efficiency of oxygen and nutrient delivery to the fetus.

Surprisingly, the placenta is not unique to mammals.

Some sharks, like the Australian sharpnose shark (*Rhizoprionodon taylori*) [develop a placenta](#) with an umbilical cord joining the mother to her babies during pregnancy. Many [live-bearing lizards form a placenta](#) (including very complex [ones](#)) to provide respiratory gases and some nutrients to their developing embryos.



Male pot-bellied seahorse filling his pouch with water in a mating display.
Credit: Kymberlie R. McGuire

Our previous [research](#) identified genes that allow the seahorse father to provide for the developing embryos while inside his pouch.

Our new [study](#) shows that during pregnancy the pouch undergoes many changes similar to those seen in mammalian pregnancy. We focused on examining the brood pouch of male seahorses during pregnancy to

determine exactly how they provide oxygen to their developing embryos.

What we found

By viewing the seahorse pouch under the microscope at various stages of pregnancy, we found that [small blood vessels](#) grow within the pouch, particularly toward the end of pregnancy. This is when the baby seahorses (called fry) require the most oxygen.

The distance between the father's blood supply and the embryos also decreases dramatically as the pregnancy goes on. These changes improve the efficiency of transport between the father and the embryos.

Interestingly, many of the changes that occur in the seahorse pouch during pregnancy are similar to those that occur in the uterus during mammalian pregnancy.



Credit: Kindel Media from Pexels

We have only scratched the surface of understanding the function of the seahorse placenta during pregnancy.

There is still much to learn about how these fathers protect and nourish their babies during pregnancy—but our work shows the morphological changes to [seahorse](#) brood pouches have a lot in common with the development of mammalian placentae.

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