**The Scientist: NewsBlog:**
Growing a backbone
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Researchers have discovered a conserved mechanism among vertebrates that determines body segment number, according to a study published online in *Nature* today (June 18).

The number of body segments an organism has varies greatly between species: our vertebrae, a measly thirty-three in number, hardly stack up to the 300-plus in our slithering co-vertebrates. But anatomists and embryologists have puzzled over a mechanism to explain the difference.

"If you were to ask most biologists why snakes have more vertebrae than others, they might say it's likely stem cells at the posterior of the embryo proliferate longer," said Scott Holley, a professor of developmental biology at Yale University who was not involved in the study. "What this finding suggests is that's not the case."

"It's quite a fascinating process that's fairly understudied," said Olivier Pourqui?, a biologist at the Stowers Institute for Medical Research in Missouri and lead author of the study.

An embryo grows in an anterior to posterior sequence, first forming a head then expanding in the direction of a tail, and along the way divides into somites-- body segments that correspond to vertebrae. "While it grows," said Pourqui?, "it produces blocks, somites, in a rhythmic fashion." In mouse embryogenesis, a new somite is formed every two hours; in humans every five hours. The timing of that rhythm is determined by an oscillating molecular signal called the segmentation clock.

That signal moves down the body of the embryo, following a "wavefront" of maturation of newly-formed cells. As the clock moves through generations of cells, it produces a periodic molecular signal that results in the formation of a new somite at its current location. Then, it continues down the growing body, periodically determining new somites.

The team tracked expression of genes involved in somitogenesis in corn snake, mouse, zebrafish, and chicken embryos. They found evidence of the "clock-and-wavefront" mechanism in all four species, and concluded that the number of somites in an embryo is determined by the ratio between the pace of the segmentation clock and the growth rate of the organism.

So why do snakes have so many somites? "In snakes," noted Pourqui?, "we found that relative to their [growth rate], the clock ticks faster." This conclusion came as a surprise, he said, because the team expected the large number of somites to correspond to a longer embryonic growth period, not a quickened clock.

"The relative speeding up of the clock is an important finding," said Andrew Oates, a group leader at the Max Planck Institute for Cell Biology and Genetics who was not involved in the study. "Maybe the next big question in the field," he said, "is, what is the specific molecular dial that you turn on the protein level or genetic level to make it tick faster or slower?"

But Pourqui?'s team is now switching its focus to human medicine, studying mutations in the candidate clock genes which cause scoliosis and severe spine defects. "All this talk about snakes," said Pourqui?, "has direct application in terms of humans."

*Image courtesy of Olivier Pourqui?*