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# Why Humans Give Birth to Helpless Babies

By Kate Wong | August 28, 2012

Human babies enter the world utterly dependent on caregivers to tend to their every need. Although newborns of other primate species rely on caregivers, too, human infants are especially helpless because their brains are comparatively underdeveloped. Indeed, by one estimation a human fetus would have to undergo a gestation period of 18 to 21 months instead of the usual nine to be born at a neurological and cognitive development stage comparable to that of a chimpanzee newborn. Anthropologists have long thought that the size of the pelvis has limited human gestation length. **New research may challenge that view.**

The traditional explanation for our nine-month gestation period and helpless newborns is that natural selection favored childbirth at an earlier stage of fetal development to accommodate selection for both large brain size and upright locomotion—defining characteristics of the human lineage. In this view, adaptations to bipedalism restricted the width of the birth canal and, hence, the size of the baby that can pass through it. Human babies are thus born when their brains are less than 30 percent of adult brain size so that they can fit through the narrow passageway. They then continue development outside of the womb, with brain size nearly doubling in the first year.

But when Holly M. Dunsworth of the University of Rhode Island and her colleagues tested this so-called obstetrical dilemma hypothesis, their findings did not match its predictions. For example, the hypothesis predicts that because the female pelvis is broader than the male pelvis, walking and running should be more energetically demanding for women than for men. Yet most studies of the energetics and mechanics of locomotion in women and men found no such penalties for having a wider pelvis, the researchers report.

Furthermore, the team asserts, to accommodate an infant at a chimplike stage of brain development—that is, a brain that is 40 percent of adult brain size, or 640 cubic centimeters—the pelvic inlet (the top of the birth canal, which is the narrowest part) would only have to expand by three centimeters on average. Some women today have pelvic inlets that wide, and those larger dimensions have no measurable effect on locomotor cost. The researchers argue that instead of fetal brain expansion being

constrained by the dimensions of the pelvis, the dimensions of the human pelvis have evolved to accommodate babies, and some other factor has kept newborn size in check.

**That other factor,** they contend, is mom's metabolic rate. "Gestation places a heavy metabolic burden (measured in calories consumed) on the mother," Dunsworth and her co-authors explain. Data from a wide range of mammals suggest that there is a limit to how large and energetically expensive a fetus can grow before it has to check out of the womb. Once outside of the womb, the baby's growth slows down to a more sustainable rate for the mother. Building on an idea previously put forth by study co-author Peter T. Ellison of Harvard University known as the metabolic crossover hypothesis, the team proposes that "energetic constraints of both mother and fetus are the primary determinants of gestation length and fetal growth in humans and across mammals." By nine months or so, the metabolic demands of a human fetus threaten to exceed the mother's ability to meet both the baby's energy requirements and her own, so she delivers the baby.

In their report, to be published online this week in the *Proceedings of the National Academy of Sciences USA*, Dunsworth and her collaborators conclude that "if the human reproductive system poses a dilemma between competing needs, then fetal energy needs and maternal energy supply are the competitors, rather than [brain expansion] and bipedalism."

When I asked paleoanthropologist Karen Rosenberg of the University of Delaware, an expert on the evolution of human birth, what she thought about the new work, she called it "important and interesting." But "just because there's a metabolic moment when it becomes reasonable to have a baby doesn't mean it isn't also true that the pelvis is a tradeoff between giving birth and walking on two legs," she contends.

Given how difficult human birth is, one would think that if the pelvis could get bigger without compromising locomotion then it would–but it doesn't, Rosenberg observes. "I think it's still the case that the pelvis is adapted to functions that select in opposite directions," she says.

Rosenberg additionally noted—and I found this especially fascinating—that the authors mention the possibility that the timing of birth actually optimizes cognitive and motor neuronal development. That idea, first proposed by Swiss zoologist Adolf Portman in the 1960s, is worth pursuing, she says. "Maybe human newborns are adapted to soaking up all this cultural stuff and maybe being born earlier lets you do this," she muses. "Maybe being born earlier is better if you're a cultural animal." Food for thought.