Medical Xpress

Why newborn babies can't walk

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(PhysOrg.com) -- The first steps of an infant is a real milestone in the development of all mammals including humans, but little is known about why some animals can walk soon after birth, while others need months, or in the case of humans, a year or so, to take those first steps. Now a new study by scientists in Sweden has shed light on the mystery, finding that the time it takes for all mammals to start walking closely correlates with the size of their adult brains.

The researchers from Lund University, led by neurophysiologist Martin Garwicz, found that motor development milestones in rats and ferrets, such as crawling and walking, followed the same timetable but at different rates, being faster for rats. The team then wondered if similar results would be found for other mammals.

They used a multiple-regression model to study the time between conception and walking for 24 mammal species, including sheep, chimpanzees, guinea pigs, camels, and aardvarks. They then analyzed these results against variables such as gestation time, adult body size, and the mass of the adult brain. When the time is measured from conception rather than from birth, the pattern became clear.

Their results, reported in the Proceedings of the National Academy of Sciences (*PNAS*) in the U.S. this week indicate that the mass of the adult brain accounts for 94 percent of the variance between species in the time from conception to walking, so mammals with larger brains, such as humans, take longer to master walking than species with smaller brains.

A further 3.8% of the variance could be explained by the differences in functional limb anatomy in the different species, or in other words, whether the species walks with heels on the ground or on its toes, like horses and cats. Those that walk on the heels (like humans) take the longest time to learn to walk, which the scientists thought might also be related to the brain since this kind of walking is more complex and probably takes more brain power.

Garwicz said the results indicate that similar neuronal mechanisms are activated at a similar relative point in time during brain development of the different species.

One remarkable result of the research is that the model of the walking time's relationship to adult brain mass for the other 23 species leads to an almost perfect prediction of when humans will begin to walk. Garwicz said that we are not an exceptional species in this respect and we start walking at exactly the time predicted from studying the other mammals.

The effect of gestation and the birth brain mass were also analyzed and found to correlate with walking time for most of the animals studied, but not for humans, and the scientists believe this is because humans spend a much smaller percentage of development time in the uterus, and more of the brain mass is developed after birth than it is in many of the other species studied.

Animals such as horses also fit the model of adult brain mass/walking time even though newborn horses walk almost immediately after birth, because the model takes the walking time from conception and not from birth, and horses have a long gestation period.

The researchers said the timing of acquisition of motor skills such as walking seems to have been highly conserved in the evolution of mammals, because the ancestors of some of the species in the study "diverged in phylogenesis as long as 100 million years ago." This would mean that fundamental patterns of early human development may have evolved before the evolution of primates.

More information: A unifying model for timing of walking onset in humans and other mammals, Martin Garwicz et al., DOI:10.1073/pnas.0905777106