Mothers' hard work pays off with big brains for their babies

March 28 2011

Brain growth in babies is linked to the amount of time and energy mothers 'invest', according to new research published today.

The study of 128 mammal species, including humans, shows that brain growth in babies is determined by the duration of pregnancy and how long they suckle. The Durham University research concludes that the longer the pregnancy and breastfeeding period in mammals, the bigger the baby's brain grows.

The researchers say the findings reinforce the suggestion that breast is best for brain development and add further weight to the World Health Organisation's advice of six months' exclusive breastfeeding followed by continuing breastfeeding up to the age of two or beyond supplemented with solid foods.

The study, published in the Proceedings of the National Academy of Sciences, helps to explain why humans, who suckle their babies for up to three years in addition to their nine-month pregnancies, have such a long period of dependency as this is necessary to support the growth of our enormous 1300cc brains.

In comparison, species such as fallow deer, which are about the same body weight as humans, are only pregnant for seven months with a suckling period of up to six months, resulting in brains of only 220cc, six times smaller than the human brain.

The anthropologists, from Durham's Evolutionary Anthropology Research Group, analysed statistical evidence on brain and body size, maternal investment, and life history variables in mammals, including species such as gorillas, elephants and whales.

They found that brain size relative to body size was most closely linked to maternal investment – the amount of time a mother spends carrying her offspring in pregnancy and how long she continues to breastfeed. The study shows that length of the pregnancy determines brain size at birth and the period of lactation decides brain growth after birth. It also shows that mothers with higher metabolic rates can afford to fuel faster brain growth in the foetus.

Lead investigator, Professor Robert Barton from Durham University's Department of Anthropology, said: "We already know that large-brained species develop slowly, mature later and have longer lifespans but what has not always been clear is why brains and life histories are related.

"One theory is that large brains increase lifespan by making the animal more generally flexible in its behavioural responses to unpredictable challenges, permitting slower life histories. However, our findings suggest that the slow-down in life histories is directly related to the costs rather than the benefits of growing a large brain. The necessary benefits to offset these costs could come in other ways, such as improving specific perceptual and cognitive abilities, rather than through some generalized flexibility.

"Our findings help us to understand what the implications are of evolutionary changes at different stages, before and after birth, but we now need to do more research to pinpoint exactly how changes to the pre- and postnatal growth phases affect the structure of the brain."

Provided by Durham University