RESEARCH SUMMARY

Report on "The First and Forever Bond" by Angela Spivey, Endeavors*, Winter 2001;* ***and "Mothering and Oxytocin or Hormonal Cocktails for Two" by Sarah Blaffer Hrdy and C. Sue Carter*** *from* Natural History*, 12/95*

Both of these reports present tantalising evidence of the effect of early nurture and environments on the brain chemistry of mammals. In individuals, these effects relate specifically to the ability to form close relationships, handle stress and provide nurturance to one's offspring in later life.

Both reports centre on the importance of the hormone oxytocin to explain this process. A pregnant female mammal experiences an increase in various hormone levels that are designed to prepare her in a unique way to deal with pregnancy, childbirth and caring for her young. While a combination of several hormones, such as estrogen and progesterone, both at high levels during pregnancy, may account for maternal responsiveness, the hormone oxytocin proved to be crucial in this aspect in laboratory experiments carried out on rats and domestic sheep. Sarah Blaffer Hrdy and C. Sue Carter report in *Natural History* that in experiments at the University of Cambridge "As a lamb move[d] down the birth canal, nerves stimulated during the passage trigger[ed] the release of oxytocin in the mother's nervous system. Only if oxytocin [was] present at birth or injected so that it reache[d] the brain at the same time a mother [met] her newborn, [did] she bond with her offspring. If release of oxytocin [was] blocked, the ewe reject[ed] her lamb. High levels of oxytocin also are found in mother's milk, raising the possibility that this hormone plays a role in making the mother infant attachment mutual" (para 5). This may also explain why, they say, virgin laboratory rats (who do not have the same oxytocin levels as the pregnant rats) take several days to respond protectively towards baby rats while pregnant rats do so immediately.

Angela Spivey in *Endeavors* has reinforced these findings in her report on the first bond between mother and child. She refers to the work of Maria Boccia, scientist at the Frank Porter Graham Child Development Center, and Cort Pedersen, professor of psychiatry, who have shown that in "rats, neurotransmitters (substances that nerve cells use to signal each other) regulate how much nurturing a mother gives her baby". More than 20 years ago, Pedersen discovered that when he administered oxytocin into female rats' brains, it would stimulate mothering behavior. This behaviour manifested itself in the form of increased licking and arched-back nursing of the babies by the mother rat.

However, the amount of care and affection a mother showed her baby seemed also to depend on the time they spent together. When a group of baby rats were separated from their mother for short periods (15 minutes once a day), their mothers responded by giving the babies "more licking and arched-backed nursing". But rats who were separated for longer (three hours a day) got the opposite—less mothering [*Endeavors*].

Even more interesting was the finding that suggests that oxytocin's role has long-term effects. Pedersen and Boccia found that the rats who had received loving nurturance from their mothers were able to respond to hazards (a confusing maze) with far less stress than those who had not received similar nurturance. They seemed also to "have a lot more oxytocin receptors in some parts of their brains. (After the rats are euthanized, researchers examine the rats' brains, using radioactive labeling to count the numbers of receptors.) 'It looks like early nurturing behavior from mom can alter the development of oxytocin receptors in some parts of the brain,' Pedersen says. 'And the more of these good types of mothering

Website: http://www.whataboutthechildren.org.uk
What About The Children? (***WATCh?)*:** Company No. 5252973 - Reg. Charity No. 1108816
Registered Office: 4 Upton Quarry, Langton Green, Kent, TN3 0HA **Tel:** 01892 863 245

behaviors a rat gets when it's a baby, the more oxytocin binding there is in certain parts of the brain.' The difference in amount of oxytocin receptors between rats who got more "good mothering" compared with those who got less was 250 percent in some brain areas".

Even more important, early care in rats seems to have transgenerational effects, in that, the "female rats who get more licking and arched-backed nursing as pups also show more of these behaviors to their babies when they grow up". Scientists found that "the mothers' nurturing behavior is changing the amount of oxytocin receptors in their babies' brains for the long term" [*Endeavors*].

It is important to stress that these experiments were carried out on animals and not humans. But, as in many other cases pertaining to biological and medical systems in mammals, it is reasonable to expect that humans have similar, if not the same, systems in place to deal with similar evolutionary challenges. An indication of this came in an experiment carried out on humans where "the hormone oxytocin was shown to be associated with the ability to maintain healthy interpersonal relationships and healthy psychological boundaries with other people" ("Hormone involved in reproduction may have role in the maintenance of relationships", 14 July 1999, www.ucsf.edu). Taken together these reports may suggest that high levels of oxytocin in the new mother prompt her to lavish care and affection on her young which, in turn, increases oytocin binding in certain important parts of the baby's brain. As a result, there is enough oxytocin available for the baby in later life for it to deal competently with stress, build relationships and look after its own children. It will be some time before scientists can fully explain how this process works but it will be foolish to ignore the direction these findings seem to be taking and deny the uniqueness of the mother-and-baby bond.

Summary by Dr Sasmita Sinha

Website: http://www.whataboutthechildren.org.uk
What About The Children? (***WATCh?***)**:** Company No. 5252973 - Reg. Charity No. 1108816
Registered Office: 4 Upton Quarry, Langton Green, Kent, TN3 0HA **Tel:** 01892 863 245