BACK BOX

Wallaby embryos wait for the sun

Tammar wallabies are a feature of Kangaroo Island. They also live in the dry mallee scrubs of South and Western Australia. Like others of their kind, they have become well adapted to the harsh environment that they inhabit.

In particular, their breeding cycle is so well synchronized with the local seasons that nearly all the joeys leave their mothers just when the winter rains have yielded a lush growth of spring grass.

Although sensible, this arrangement is unusual. Red kangaroos can breed at any time of year, and the two species of grey kangaroos have breeding seasons that may last several months. Consequently the young of these and most other kangaroo and wallaby species leave the pouch at various times of the year.

Most tammar wallabies give birth during late January and early February. All the young are born and enter their mothers' pouches within a few days of one another. They then remain in the pouch or at foot for 8 months before becoming completely independent of their mothers the following spring.

The females mate in February just after giving birth. Development of embryos in most kangaroo and wallaby species takes about 4 weeks. Something therefore has to be holding up development of the tammar wallaby foetuses,

Tammar wallaby.

most of which remain in their mothers' uteruses for as long as 11 months.

Intrigued by this fact, Dr Hugh Tyndale-Biscoe, formerly of the Australian National University but now of the CSIRO Division of Wildlife Research, investigated. What he, and Dr John Hearn and Dr Marilyn Renfree (who were then Ph.D. students at the Australian National University), found out was this: the embryo starts to form after mating, but about 8 days later, having reached the stage when it consists of about 80–90 cells, it stops. It remains in this suspended state until the following December — until, in fact, the summer solstice on about December 21. All embryos then begin to develop simultaneously, with the result that all the young are born 27 days later.

But it seems that passing the longest day isn't the only factor involved in triggering the embryo's development. The full moon seems to be involved as well. If the moon becomes full in the week preceding the longest day, then the embryos in some females begin to develop just before the solstice.

What controls this finely tuned mechanism? Dr Tyndale-Biscoe and his colleagues have now shown that hormones from the pituitary gland in the brain control both when breeding occurs and suppression of the embryo in its early stages. What's more, the process is intimately tied up with sucking by the young in the pouch.

In all mammals, including human mothers, a hormone called prolactin stimulates production of milk for the young. In many, sucking appears to prevent pregnancy.

In the tammar wallaby, prolactin seems to suppress the activity of the *corpus luteum* (a hormone-secreting body that develops from the ovary after the egg has dropped into the uterus).

Hormones appear to do two things: stimulate development of new ovarian follicles and cause the embryo to grow. It now appears that prolactin is secreted at just such a concentration that it suppresses the *corpus luteum* enough to keep the embryo dormant, but not enough to stop new follicles developing.

Up until about the end of June, prolactin seems to be the main factor suppressing the *corpus luteum* — if the sucking young dies, then the latent embryo in the mother's uterus will start to develop and be born a few weeks later. After the end of June the embryo will not develop, even if the sucking young dies. So something other than prolactin may be involved.

This something must also come from the pituitary gland: remove this gland and the embryo starts to develop even after June. Current studies at the Division of Wildlife Research should give the answer.

Hormone control of embryonic diapause and reactivation in the tammar wallaby. C. H. Tyndale-Biscoe. In 'Maternal Recognition of Pregnancy' ed. R. B. Heap and J. Whelan. (Ciba: London 1979.)