of clinical pregnancy was 3.74 times higher when sperm head retardance was within this range compared with when it fell outside this range.

That sperm retardance should be related to embryo development but not fertilization makes sense biologically. Sperm head retardance presumably reflects sperm DNA damage, and DNA damage affects embryo development more than fertilization. The paternal genome in the human embryo is activated only after the 8-cell stage of development. If confirmed, this work could have important clinical relevance. It has long been known that sperm DNA fragmentation is related to sperm quality. But existing tests of sperm DNA fragmentation involve destruction of the DNA. Sperm head retardance may provide a noninvasive and therefore clinically useful method to measure sperm head DNA integrity.—DK

Ecological Knowledge, Leadership, and the Evolution of Menopause in Killer Whales

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ABSTRACT

Nearly all animal species die around the same time they stop reproducing. Only 3 species—humans, killer whales (Orca orca), and short-finned pilot whales (Globicephala macrorhynchus)—routinely live 30 years after giving birth to their last baby. Female resident killer whales generally breed between the ages of 12 and 40 years and can survive into their 90s. Accumulating evidence suggests that menopause evolved in both postreproductive humans and killer whales through inclusive fitness benefits gained by helping kin. It is believed that reproductive success and/or survival of relatives is enhanced by long-term survival of females after menopause. It has been hypothesized that postmenopausal females buffer their kin against environmental hardships by storing and providing ecological information.

Shortage of salmon is a major contributing factor to mortality and reproductive success in resident killer whales. During the 9-summer salmon migrations, the research team studied leadership in Southern resident killer whales in the North Pacific ocean off the coasts of British Columbia and Washington. More than 700 hours of video footage of 102 individual migrating Southern resident killer whales (58 females and 44 males) was collected and examined.

Key findings were as follows: (1) postreproductively aged females were more likely to lead groups during collective movement in salmon foraging grounds and were especially likely to lead in years when salmon were in low supply and more difficult to locate; (2) females are more likely to lead their sons than their daughters. Sons offer greater potential inclusive fitness benefits most likely because they have higher reproductive potential. Sons mate outside the group, and their offspring do not compete for resources within the matriline.

These data provide the first evidence that a major benefit for long-term survival after menopause is that postreproductive females act as repositories of ecological knowledge. The oldest and most experienced individuals are those most likely to know where and when to find food when particularly scarce.

EDITORIAL COMMENT

(With the exception of the human, women are unique among mammals, in that they spend a significant portion of their lives in a postreproductive state. This is not merely an artifact of modern civilization. Throughout much of...
human history, the mean lifespan may have been in the 30s, but such a short mean lifespan hid significant variation. Babies dying postnatally and young mothers dying at childbirth were balanced by many women surviving to their early 40s, when fertility ceases, or early 50s, when men- ses stop. In contrast, men, as well as females from most other mammalian species, maintain reproductive capacity throughout their lives.

Such a prolonged postreproductive period may confer adaptive value, especially in species in which mothers invest heavily in offspring and in which childbirth is inherently life threatening. In such species, the loss of reproductive fitness may be counterbalanced by enhanced survival of extant offspring, who can be nurtured by their postreproductive mothers and grandmothers. Brent et al tested the hypothesis that reproductive aging contributes to group fitness by studying social behavior of postreproductive female whales and their offspring. Like women, killer whales (O. orca) and short-finned pilot whales (G. macrorhynchos) routinely live 30 years after last offspring. Female killer whales breed between the ages of 12 and 40 and survive to their 90s.

Access to adequate nutrition, specifically to salmon, is essential to the reproductive success and survival of killer whales. Brent et al studied killer whales off the coasts of British Columbia and Washington and found that postreproductive females tended to lead the hunt for salmon. This tendency was even more pronounced when salmon were sparse. They also found that the females were more likely to lead sons than daughters. The authors explain this observation by pointing out that sons represent greater opportunity to enhance reproductive fitness than daughters because sons reproduce more than females.

I suspect that the benefits of reproductive aging derived from escaping the hazards of reproduction, not from menopause itself. Nonetheless, this article adds to the mounting evidence that a prolonged postreproductive phase of some mammals may provide a unique strategy for enhancing reproductive fitness of the group.—DK

Immediate Post-Partum Initiation of Etonogestrel-Releasing Implant: A Randomized Controlled Trial on Breastfeeding Impact

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ABSTRACT

Women with unplanned pregnancies occurring at short interpregnancy intervals are at increased risk of preterm births and low birth weight, as well as maternal and neonatal morbidity and mortality. High rates of unplanned pregnancies and short interpregnancy intervals are a major concern in populations with low adherence to contraceptive methods. Initiating contraception immediately after delivery has been suggested as a method to prevent unplanned pregnancies, especially in vulnerable populations.

The etonogestrel-releasing contraceptive (ENG) implant is an extremely effective long-acting reversible contraceptive (LARC). Effectiveness is maintained for 3 years after insertion, and the 1-year continuity rate is higher than 80%. One limitation to recommending early start of contraception after delivery is concern over possible effects of the implant on the volume of milk ingested by newborns (NBs) during breast-feeding. Previous studies assessing the volume of breast-feeding milk used indirect methods. Breast milk volume has never been evaluated in NBs after insertion of the ENG implant immediately postpartum.