Killer whales and the mystery of human menopause

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A mother and her child watch a captive killer whale. Credit: aconant

The evolutionary mystery of menopause is a step closer to being solved thanks to research on killer whales.

A study by the Universities of Exeter and Cambridge has found a link between killer whales, pilot whales and humans — the only three known species where females stop breeding relatively early in their lifespan.

Despite very different social structures between the three species, the research shows that in each case females become increasingly genetically related to those they live with as they get older. Because of this, there is a motivation for older females to do what is best for the survival of those around them.

This creates a 'grandmother' role, where the success rate of breeding in the group can be helped by older females sharing parenting knowledge and stopping breeding to allow younger females easier access to resources.

The research, published in the Proceedings of the Royal Society B, is the first to provide a plausible explanation why these species in particular are the only ones in which females finish reproduction while they still have decades left to live.

Dr Michael Cant, from the University of Exeter's School of Biosciences (Cornwall Campus) and a Royal Society University Research Fellow, said: "It's always been puzzling as to why only humans and toothed whales have evolved menopause, while females in all other long-lived species continue breeding until late in life.

"Although the social behaviours of the three menopausal species are very different, there is a common link: their social systems mean females become more related to those around them as they get older. This predisposes females of our species, and those of killer whales and pilot whales, to the evolution of menopause and late life helping".

Humans are thought to have evolved in groups in which young females left their group to find a mate. This would have meant they started their reproductive lives in families to whom they were genetically unrelated. Later in life, however, as their offspring start to breed, they become more genetically related to those around them and have the option to cease reproduction to help raise their 'grand-offspring'.

However, this argument doesn't seem to explain menopause in killer whales or pilot whales, in which both sexes remain in their natal family groups throughout their life, but occasionally come together with other groups to mate. The new research, however, shows this very different

social system has the same overall effect on patterns of genetic similarity within groups: females become more closely related to infants in the group as they get older.

By contrast with humans and menopausal whales, in other long lived mammals it is typically males who leave the group to breed, and females who stay with their mother. According to the research, in this case older females will be selected to continue breeding rather than give up reproduction to help raise grandchildren.

Dr Rufus Johnstone, from the Department of Zoology at the University of Cambridge, and co-author of the study, said: "For the first time we can see a common link between menopausal species which provides a valid explanation as to why this trait might have evolved. This isn't likely to be the only factor relevant to the evolution of 'grandmothering' and menopause, but it does give us an idea why it is restricted to so few species in the animal kingdom."

Provided by University of Exeter