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The belligerence of breeding: female aggression after mating

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Sex changes us. In addition to the overwhelming Puberty-Blues kind of way, sex induces physical changes that occur across the entire animal kingdom, from elephants to fruit flies. Yet, there's one glaring aspect of sex that few scientists have studied - female aggression. That's where my research comes in. I study how mating increases female aggression in fruit flies.

Female aggression towards other females has traditionally been ignored in evolutionary biology. But females do compete, just over different things than males do. Female dung beetles compete over dung to feed their offspring, while female eclectus parrots fight over the best nesting sites to raise chicks. These contests have dramatic effects on females' reproductive success and their offspring's survival, but we still know very little about how and when females compete.

Mating is one logical answer. Females invest heavily in their offspring, whether they lay hundreds of eggs, or raise one offspring to adulthood - you need a lot of fuel to keep going! But just because all of a sudden you're hungrier, it doesn't mean that there is more food available in the environment. You're still competing with other females to get access to that food, but now you want a larger slice of the pie. That means to get more, you need to get aggressive.

I tested this idea in fruit flies, an organism in which we can easily manipulate specific genes and behaviours to test what influences female aggression. I found that females that mated once, spent twice as long fighting over food compared to virgin females. At first glance, this could be explained by the fact that females that are producing eggs need more food and get more aggressive towards other females to get it. But, it turns out, it's not that simple. If you perform the same experiment with females that cannot produce eggs, and who therefore shouldn't need more food or need to get aggressive, you see exactly the same increase in aggression after mating. Sterile mated females still fought for twice as long as virgins, despite not needing extra food.

If eggs aren't responsible for females getting more aggressive, than what is? The answer - sperm. Females that mate but do not receive sperm do not show any increase in aggression after mating - they're exactly the same as virgins. Sperm is necessary for females to become more aggressive. A substance that males make and transfer to females alters female behaviour towards other females.

Creepy.

In addition, sperm doesn't act alone. It is accompanied by a multitude of proteins that tag along in the seminal fluid. In fruit flies there is one tiny protein called "sex peptide" which has huge effects on female behaviour and physiology. Females that receive sex peptide lay many more eggs, become less likely to mate with other males, eat more, and sleep less. I found out that sex peptide also plays a role in increasing female aggression after mating. Females that did not receive sex peptide during mating showed an intermediate level of aggression, halfway between virgin females and females that received sex peptide. This is all due to one miniscule protein.

Even creepier.

The fact that two substances made by males and transferred to females during mating can alter female behaviour towards other females suggests that males may be changing female

behaviour to suit themselves. Males and females have conflicts of interest over how many eggs a female should lay, when she should lay them, and how much she should invest in them. A female may prefer to spread out her energy across several batches of eggs, and have multiple mates, to increase the diversity of her offspring. A male, on the other hand, would prefer females to invest as much as possible in the current brood because they are his offspring, even if this comes at the expense of her future reproductive success.

Sexual conflict has been demonstrated in fruit flies, where sex peptide can be good for males, but bad for females. Females receiving sex peptide over their lifetime died sooner and laid fewer eggs than those that did not receive sex peptide. It has not previously been proposed, however, that female-female aggression could be a behaviour under sexual conflict.

And let's not forget - sperm, seminal proteins, and sexual conflict are not just confined to fruit flies. Seminal proteins may affect female aggression in other species, potentially even humans, but so far we've only tested it in fruit flies. Who knows how sex has already changed us?