**Study suggests our organs may have their own sexual identity**

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*Image above: Fly intestines showing genetically induced tumours (in green). Growth is significantly greater in female guts (right) than male (left)​. Credit: MRC Clinical Sciences Centre.*

A study, published today in the journal *Nature*, suggests that the stem cells that make up our organs ‘know’ whether they are ‘male’ or ‘female’, and that this sexual identity could influence how they grow and behave.

It is commonly thought that non-reproductive organs are the same in both sexes, and function differently because of the differences in circulating hormones.

This new research in fruit flies discovered a set of genes, which are also present in mammals, that may be responsible for differences between ‘male’ and ‘female’ organs distinct from any differences due to circulating hormones.

The finding could shed light on why some diseases, such as certain cancers, are more common in women than men and vice versa, and raises the possibility that men and women may respond differently to treatments.

Researchers at the [MRC Clinical Sciences Centre](https://www.mrc.ac.uk/about/institutes-units-centres/mrc-clinical-sciences-centre/), based at Imperial College London, examined stem cells in fruit flies’ intestines. They used genetic tools which allowed them to turn genes ‘on’ and ‘off’ specifically in these cells. This meant they could tailor the cells to be more ‘male’ or ‘female’. When the team masculinised or feminised the stem cells, it changed the extent to which the cells multiplied. Interestingly, feminised, or ‘female’ cells, were better able to multiply.

Dr Irene Miguel-Aliaga, head of the Gut Signalling and Metabolism Group at the MRC Clinical Sciences Centre, and lead author of the study, said: “We wanted to ask a very basic question: whether it is just the cells of the sex organs of a fully developed organism that ‘know’ their sexual identity, or whether this is true of cells in other organs too - and whether that matters.

“We have found a new mechanism which potentially means that every cell in the fly has a sexual identity.”

Interestingly, the researchers found that the female intestine was more prone to genetically induced tumours, and the researchers suspect this is because a trade-off is occurring. Females need increased adaptability to cope with reproduction, but in certain circumstances, this can be disadvantageous and make the female gut more susceptible to tumours.

However, the team also discovered that the sex of the intestine was actively maintained and therefore reversible, as manipulation of the genes responsible for this sexual identity could alter the way the organs behave without affecting their development or circulating hormones.

Dr Bruno Hudry, an EMBO-funded post-doctoral fellow at the MRC Clinical Sciences Centre and first author of the study, said: “We found that if we take a female fly and masculinise the stem cells in the adult intestine, within three weeks the gut shrinks to the smaller, male-like size.

“We think that the sexual identity of these stem cells is giving the female gut its adaptability.”

Dr Des Walsh, head of the population and systems medicine board at the MRC, said: “This study is an interesting piece of biological research that extends our understanding of why male and female physiology is different, beyond the obvious.

“Further research is now needed to see how this finding translates to humans. If this intrinsic knowledge held by stem cells is indeed driving the way our organs behave, it could also influence the way these same organs respond to treatment.”

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