HORMONES ON THE BRAIN
Vascular Health in the Brain and Eye across the Menstrual Cycle

M.E. Wright1, A. Crofts1, S. Davies1, H. Chandler1, J.J. Steventon2, K. Murphy1
1 Cardiff University Brain Research Imaging Centre (CUBRIC), School of Physics and Astronomy, Cardiff University, Wales, CF24 4HQ
2 School of Optometry and Vision Sciences, Cardiff University, Wales, CF24 4HQ

1 Fluctuations in hormone level across a woman’s life show associations with brain health.

What are hormones?
Hormones are chemical messengers that travel around the body via blood vessels. They promote a wide range of functions essential for health and wellbeing.

2 How do they change in cisgender women?
Oestradiol and progesterone—These hormones fluctuate greatly across a menstrual cycle and pregnancy. They also gradually decrease across a lifetime, before dramatically decreasing with menopause.

3 Other hormonal changes (e.g., menstruation) can be tied to brain health and functioning. Cells that detect hormones are present all over the eye and brain.

4 Hormone changes across a menstrual cycle were associated with increasing and eye health.

5 Hormone changes across a menstrual cycle impact blood flow in both the eye and the brain.

Hormone Analysis
A blood sample was taken so the exact hormone level could be investigated. How oestrogen levels vary across a menstrual cycle can differ between people and months, so it is important to measure the exact hormone level for that day.

6 Animal research suggests that hormones are closely tied to brain health and functioning. Cells that detect hormones are present all over the eye and brain.

7 Animal research has found individual neurons (cells that carry electrical information around the eye and brain) and found that the shape and connections of these cells are closely tied to oestrogen levels.

8 Animal research also finds that oestrogen affects the vascular system, which supports the body’s blood supply.

9 Oestrogen increased blood flow, thus increased blood barrier permeability and improved recovery from ischaemic conditions such as stroke in rodent models.

10 More research is vital for women’s health.

11 However, little is known about how oestrogen influences this vascular supply in humans.

12 It can’t be assumed that what we see in animal models will translate to humans. Each cohort of interest (e.g., menstrual cycle, menopause, PCOS) has unique aspects that mean they must be investigated individually and specifically.

13 This study highlights how oestrogen may influence the vascular system in healthy menopausal women, which may explain its protective effect.

14 This study investigated the influence of oestrogen levels across a menstrual cycle on vascular health in both the eye and brain.

15 Oestrogen was found to influence brain and eye blood flow, which may help to explain menstrual-related symptoms.

16 Current work at Cardiff University is investigating the link between hormone-driven changes in the vascular system and menstrual symptoms in more detail.

17 Importantly, this study highlights how oestrogen may influence vasculature and in turn may be protective against dementia and cardiovascular disease.

18 This also opens up questions in other areas of women’s hormonal health.

19 We need more women’s health research!

METHODS
In this study, we investigated how changes of the hormone oestrogen across a menstrual cycle influence vascular health in a sample of 27 healthy young menstruating women, using advanced imaging techniques.

RESULTS
Oestrogen changes across a menstrual cycle were associated with increasing blood flow in both the eye and the brain.

CONCLUSIONS
This study highlights how oestrogen may influence the vascular system in healthy menstruating women, which may explain its protective effect.

1. This study investigated the influence of oestrogen levels across a menstrual cycle on vascular health in both the eye and brain.

2. Oestrogen was found to influence brain and eye blood flow, which may help to explain menstrual-related symptoms.

3. Current work at Cardiff University is investigating the link between hormone-driven changes in the vascular system and menstrual symptoms in more detail.

4. Importantly, this study highlights how oestrogen may influence vasculature and in turn may be protective against dementia and cardiovascular disease.

5. This also opens up questions in other areas of women’s hormonal health.

6. We need more women’s health research!

Take home messages
- Hormone changes across a menstrual cycle impact blood supply in both the eye and brain.
- This could explain menstrual symptoms, such as migraines.
- We need more women’s health research!