



**Celebrating 150 years
of the Physiological Society
leading discovery science**

Physiology showcase booklet

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Foreword



Sam Carling MP, Member of Parliament for North West Cambridgeshire
Chair of the Parliamentary & Scientific Committee

It is a pleasure to be able to welcome the Physiological Society to celebrate its 150th anniversary in Parliament. Since my election as Chair of the Parliamentary & Scientific Committee as well as through my day-to-day parliamentary work, I have witnessed first-hand how the Society and its members seek to advocate for an evidence-based approach to policymaking on issues such as precision medicine, in vivo research, healthy ageing and climate change.

Taken separately, each of these are complex issues which require collaboration and deeply complex scientific research. It is testament to the breadth of the Society and its members' research that you have been able to successfully inform policymakers on all these topics and more.

It is also a real pleasure to see national policy measures being championed that can make a positive difference to challenges facing my constituents.

For example, in the Society's *Heat Resilience Strategy*, the focus on access to green space – to both cool the local area during periods of extreme heat, but also to help increase physical activity levels of people living nearby – chimes with Government priorities and provides a clear example of how policies can deliver many interlinked benefits to health.

Reading through the case studies in this booklet, it is clear that the Society is home to a breadth of academic research topics and I look forward to working with the Society and my parliamentary colleagues in the coming years to ensure the outputs of this research makes a tangible contribution to the work of both Houses of Parliament.

Ensuring the policy landscape has supported physiological research has been at the heart of the Society's mission since 1876 and I hope this will continue to be the case for the next 150 years. I wish the Society and its members every future success.

Society Foreword



Darrel Burdass FRSM
Chief Executive Officer,
Physiological Society

As The Physiological Society draws its 150th anniversary year to a close, it is a great pleasure and privilege to celebrate this remarkable milestone in Parliament, alongside MPs, peers, policymakers, our members, and the wider scientific community.

Founded in 1876, the Physiological Society is the world's oldest organisation dedicated to the science of life and the largest network of physiologists in Europe. For 150 years, our members have advanced understanding of how living systems function in health and disease, championed scientific excellence and collaboration, and supported generations of physiologists. We may be a relatively small scientific society, but we are a mighty community, with a proud history and a clear purpose: to ensure that physiological discovery contributes to healthier lives.

This anniversary year has brought an especially significant recognition of that contribution, with the Physiological Society being awarded a Royal Charter. The Charter formally recognises our long-standing contribution to science and the public good and is a great honour for everyone connected with the Society. It reflects the dedication of our members, trustees, staff and volunteers, whose collective efforts have sustained and strengthened the Society over 150 years.

The challenges facing society today make the contribution of physiology more important than ever. From healthy ageing and chronic diseases, including neurodegenerative and cardiovascular diseases, to artificial intelligence and climate change, many of the issues facing society today raise fundamental questions about how the human body works, adapts and responds. Understanding physiology provides an essential foundation for addressing these challenges and developing policies that can improve health, wellbeing and productivity.



**Professor Mike Tipton
MBE FTGS**
President, Physiological Society

But generating robust scientific knowledge is only part of the task. For science to make a difference, evidence must reach those who make decisions and shape policy. This requires an open and sustained relationship between scientists, Parliament, and policymakers. It is particularly fitting therefore that we should celebrate this achievement in Parliament. Policy engagement has been at the heart of the Society's purpose since its foundation. We began as a small group of influential medics and scientists who recognised the importance of ensuring that national policy was informed by scientific evidence. That principle remains as important today as it was in 1876.

This is why the Parliamentary Showcase is such an important part of our 150th anniversary celebrations. The researchers featured here demonstrate both the breadth of modern physiology and the many ways in which research can be translated into meaningful benefits for people and communities. Their work illustrates how physiology can help us understand some of the most pressing health challenges of our time, while providing evidence to inform the decisions that will shape our future.

It is therefore a particular pleasure to recognise the contribution of our members here in Parliament, 150 years after the Society was founded. In doing so, we celebrate not only our history but the continuing relevance of our discipline and the people who make it possible.

As we bring our 150th anniversary year to a close, we can look forward with confidence to what physiology, and our community of physiologists, can contribute over the next 150 years.

Here is to the next 150 years.

Exhibitor

When More Blood Doesn't Mean More Oxygen – Understanding chronic mountain sickness to improve healthcare in the Andes



Professor Daniela Bermudez Pumasunco
University of Oxford

International

Area of research: Human Physiology



What challenge does your research or project seek to address and why is it important for society or public policy?

Nearly 80 million people live at high altitudes (> 2500 m), most in low-income countries with very limited access to healthcare. In Peru, about a quarter of the population lives above this elevation, in areas marked by high poverty, and many of them are at risk of developing chronic mountain sickness (CMS), a debilitating but neglected disease caused by excessive production of red blood cells.

Despite having more red blood cells and increased oxygen content in their blood, people with CMS fail to deliver sufficient oxygen to their tissues, leading to severe symptoms such as fatigue, neurological impairment, cardiovascular complications and reduced quality of life. Current treatment relies largely on therapeutic phlebotomy, yet this practice has changed little in decades and lacks robust physiological evidence.

The project aims to understand why oxygen delivery fails in CMS to develop evidence-based treatments for an underserved population and to address broader healthcare challenges in a country with a significantly high-altitude population.

How does your research generate evidence that could inform policy, practice, or public health?

Identifying how oxygen fails to be released from red blood cells in CMS, will assist to determine when current treatments should be used and how they can be improved. The results will facilitate:

- The development of evidence-based clinical guidelines
- To establish personalised treatment protocols
- The Improvement in management of a neglected disease

Interestingly, countries with significant CMS populations struggle with low blood donation rates. In Peru, blood removed during therapeutic phlebotomy is currently discarded despite the country facing major shortages for life-saving transfusions. By investigating whether



this blood can be safely repurposed for transfusion, the project will develop a potential policy solution that simultaneously improves care for CMS patients and strengthens the national blood supply.

If you had five minutes with a policymaker, what would you want them to understand or do differently because of your research?

1. To recognise that neglected diseases affecting economically disadvantaged communities deserve access to evidence-based healthcare. This research provides an opportunity to improve healthcare access by developing personalised treatment and guidelines that better up patient outcomes while reducing unnecessary interventions.
2. To acknowledge that this is an opportunity to transform a healthcare challenge into a public health resource. Blood removed during treatment may become a valuable source for national blood banks, helping address critical shortages that disproportionately affect low-income countries.

3. Highlight the importance of international partnership between UK and Peruvian researchers to demonstrate how scientific collaboration can generate policy-relevant evidence and improve healthcare where the burden of disease is greatest.

What makes your research particularly suited to a parliamentary showcase?

Research like this one offers a good example for policymakers on how international research collaboration generates impact beyond academia by developing evidence-based policies and improving healthcare access for vulnerable populations. The combination of cutting-edge physiology with a set of practical public-health solutions for a challenging condition affecting vulnerable populations, demonstrates how fundamental physiological discoveries can be translated into measurable societal benefit. By showing how physiology can cross borders to solve major health challenges, this project brings together researchers from Oxford and Peru with clinicians, blood banks and local communities to address a neglected disease affecting vulnerable high-altitude populations.

What stage is your research at?

Early-stage/discovery research

What evidence of impact or future impact does your research have?

The major potential impact is the development of evidence-based treatment guidelines for CMS by replacing practices that have remained unchanged for decades. Additionally, the project will evaluate whether blood currently discarded during treatment could be considered as a product for national blood banks, offering an innovative solution to blood shortages in Peru and potentially other high-altitude countries.

This project builds on established collaborations between the University of Oxford, NHS Blood and Transplant, and blood services from Australia, Canada, and Spain. These partnerships provided a clear pathway from discovery science to implementation in terms of blood rejuvenation, which gives confidence in our idea.

Have you previously engaged with policymakers, government, patients, charities, or the public?

Yes. Our Peruvian team has a long history of working alongside high-altitude communities, healthcare providers and policymakers to improve the diagnosis and management of endemic diseases. Throughout this project, patients and community representatives will collaborate in dissemination activities, while receiving direct benefit from evidence-based phlebotomy treatments. At the same time, policymakers will gain evidence to develop guidelines for an underserved population in addition to revisiting hematology thresholds for red blood cell dysfunction to reflect specific community needs.



Exhibitor

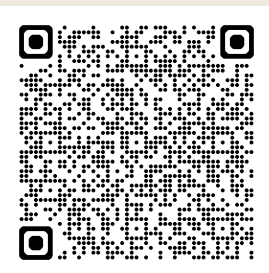
Like a duck to water: Physiology outreach with unseen communities



Marie Bowers
University of Glasgow

Scotland

Area of research: Education & Teaching



What challenge does your research or project seek to address and why is it important for society or public policy?

- Gypsy, Traveller, Roma, Showman and Boater (GTRSB) communities are among the most under-represented groups in UK science: only 3–4% of young GTRSB people enter higher education, against 43% of their peers.
- This is a loss to the communities, of equality, visibility and social mobility, and a loss to science of talent it never recruits.
- The *GTRSB into Higher Education Pledge* commits universities to change this, but there is almost no evidence on what actually works, leaving willing institutions with little to guide them.
- Science Travels uses physiology, “the science of life”, as an accessible, hands-on bridge into Science, Technology, Engineering, Mathematics, and Medicine (STEMM) for GTRSB children, co-designed with communities rather than imposed on them.
- Led by a Romany researcher, it treats inclusion in science as a matter of social justice and begins to build the missing evidence base.

How does your research generate evidence that could inform policy, practice, or public health?

Science Travels generates evidence in three connected ways:

- Testing what works in practice. Activities are piloted with children and refined through co-design with GTRSB community members. In one pilot, a partner school separated anonymised feedback from GTRSB and non-GTRSB pupils: the two groups responded equally positively, an early indication that the approach engages GTRSB children as effectively as their peers.
- Building the formal evidence base. The project gave rise to doctoral research (University of Aberdeen) where a scoping review establishes the near-total absence of GTRSB-specific STEMM peer-reviewed evidence. This highlights a dearth of data and a lack of research focus on this theme.



- Peer-reviewed and published outputs. A peer-reviewed essay (forthcoming, September 2026) and a chapter in a forthcoming Routledge volume (eds. Morgan, Clark and Marsh, October 2026) carry the findings into the academic record. Alongside this, the Society's reports and events have featured Science Travels.

If you had five minutes with a policymaker, what would you want them to understand or do differently because of your research?

One thing to understand:

- GTRSB communities are not "hard to reach," they are rarely reached out to. When science comes to them, in settings they trust, children engage with it readily. The barrier is structural, not a lack of interest or ability.

- The exclusion runs deep enough that prejudice toward these communities is still voiced openly within academic settings, something I have encountered directly while presenting this work. The very institutions asked to widen access are part of the problem they must solve.

Three things to do differently:

- Back community-led work such as Science Travels. The approach can reach GTRSB children who are otherwise written off. With sustained support, it could develop into a national pathway into science.
- Fund community-rooted STEMM engagement, to address the participation gap.
- Involve GTRSB people: co-design is not a courtesy; it is what makes the work effective and trusted.

In short: the evidence gap is fixable, the engagement works, and communities must be partners in it.

What makes your research particularly suited to a parliamentary showcase?

- Science Travels has already proven itself in this setting. The Physiological Society has twice chosen it for parliamentary platforms in Westminster (2022), and Holyrood (2023), where it was part of the Society and Royal Society of Edinburgh's celebration of Scottish research and the UN Sustainable Development Goals.
- The project was named on the floor of the Scottish Parliament in the debate marking International Day of Women and Girls in Science (2023).
- It engages policymakers naturally: the work is visual, hands-on and human. I have held conversations with parliamentarians previously.
- Being a Romany researcher, I bring a community voice rarely present in Parliament.

What stage is your research at?

Education

What evidence of impact or future impact does your research have?

- Recognition: Engaged Researcher of the Year (University of Glasgow, 2022); named in a Scottish Parliament debate (2023).
- Demand: schools have asked us to return; the Physiological Society has invited the project to successive parliamentary events.
- Embedded in education: Science Travels now informs teaching at Glasgow: an annual lecture to nursing students on community healthcare inequalities and sessions for life-sciences students on effective science communication.

- Scholarly reach: presented at PCST 2025 (Aberdeen) and BIG STEM Communicators at the Royal Institution (2025); forthcoming peer-reviewed essay and Routledge book chapter.
- Future impact: a transferable, low-cost model and a growing evidence base to inform widening participation in STEM and public engagement.

Have you previously engaged with policymakers, government, patients, charities, or the public?

- Parliament: exhibited and spoke with parliamentarians at Westminster (2022) and Holyrood (2023); Science Travels named in a Scottish Parliament debate (2023).
- Third sector: co-chair of ACERT (Advisory Council for the Education of Romany and other Travellers); founder of Science Travels.
- Public & communities: ARCAdia at University of Glasgow, repeat appearances at Explorathon and engagement with Physiology Week.
- Sector: invited talks for Higher Education and widening-participation organisations, and conference engagement.
- Commercial: Longstanding support from ADInstruments by way of the gift of biosensors.

Exhibitor

Maintaining physiological resilience across ageing, surgery, and inactivity



Tyler Daubrah-Scott,
University of Nottingham

East Midlands

Area of research: Human Physiology



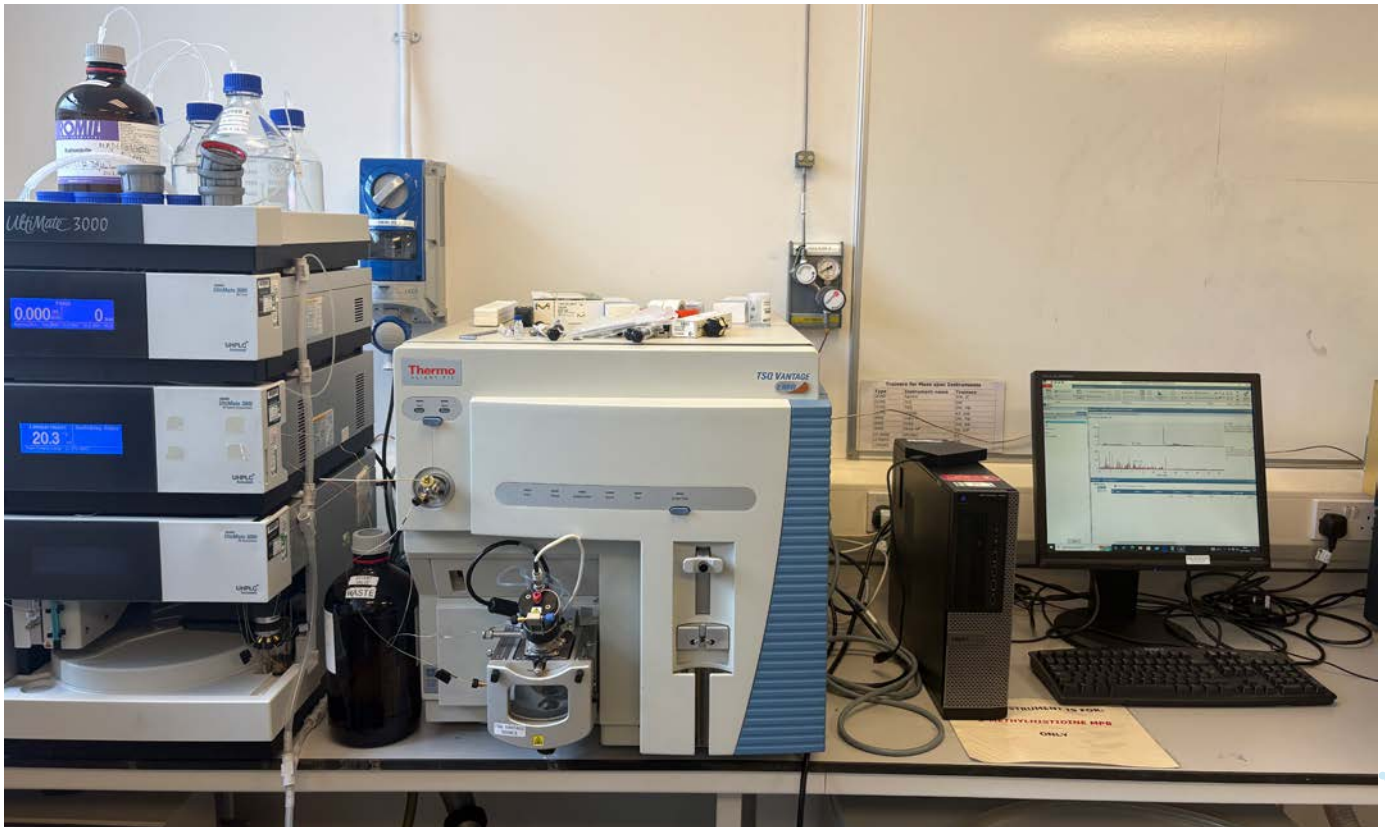
What challenge does your research or project seek to address and why is it important for society or public policy?

Colorectal cancer (CRC) is the fourth most common cancer in the UK, with 40,000+ new diagnoses annually. Around 66% of patients undergo surgery, and approximately 60% are aged over 75 years. Many of these patients enter surgery with reduced fitness, muscle loss, frailty, and multiple comorbidities, increasing their risk of postoperative complications and delayed recovery. Prehabilitation is the process of improving health and fitness before surgery and has emerged as a promising strategy to improve outcomes. However, current exercise programmes do not benefit all CRC patients, and the reasons for this remain unclear. This research investigates why some patients respond to exercise prehabilitation while others do not. By identifying the biological mechanisms underpinning exercise responsiveness and testing different exercise approaches, this work aims to improve surgical recovery, maintain functional independence, and reduce pressure on NHS services.

Current NHS cancer pathways provide a narrow window between diagnosis and treatment (31 days), limiting opportunities to optimise patient health before surgery. Although prehabilitation is increasingly recommended, evidence suggests that existing exercise interventions are not equally effective for all colorectal cancer patients. This research compares two exercise strategies delivered within the treatment timeframe: high-intensity interval training (HIIT) and a combined programme of HIIT and resistance exercise training (ReHIIT). Alongside measuring changes in fitness, muscle mass, and postoperative outcomes, the study investigates the molecular mechanisms that influence exercise adaptation.

How does your research generate evidence that could inform policy, practice, or public health?

The project will generate key evidence: assessing whether combining aerobic and resistance exercise produces superior clinical benefits compared with current approaches, identifying biological markers associated



with positive responses to prehabilitation, and it will improve understanding of why some patients fail to respond to exercise intervention. These findings could support future NHS guidance on cancer prehabilitation, help clinicians target interventions more effectively, and contribute to the development of personalised exercise programmes. More broadly, the work aligns with public health priorities focused on prevention, healthy ageing, reducing frailty, and improving outcomes for older adults undergoing major surgery.

If you had five minutes with a policymaker, what would you want them to understand or do differently because of your research?

I would want policymakers to recognise that preparing patients for surgery should be viewed as an essential component of treatment rather than an optional addition.

Older adults undergoing colorectal cancer surgery often experience substantial declines in physical function and independence following treatment. Many complications associated with surgery are influenced not only by the operation itself, but also by a patient's physiological resilience before entering theatre. Improving fitness and muscle function before surgery may therefore represent an opportunity to improve outcomes at relatively low cost. I would encourage policymakers to support wider implementation and evaluation of evidence-based prehabilitation services within cancer pathways. However, I would also emphasise that a "one-size-fits-all" approach is unlikely to be optimal. Prior research suggests that some patients may be biologically less responsive to certain exercise interventions, highlighting the need for personalised prehabilitation strategies. Ultimately, investment in effective prehabilitation could improve patient recovery, preserve independence, reduce

hospital stays and complications, and lessen demand on health and social care services. As the population ages and cancer incidence rises, supporting interventions that improve resilience before treatment may offer significant benefits for both patients and the NHS.

What makes your research particularly suited to a parliamentary showcase?

This research addresses several major policy priorities simultaneously: healthy ageing, cancer care, NHS efficiency, prevention, and personalised medicine. It focuses on improving outcomes for older adults, a rapidly growing patient population that accounts for many colorectal cancer surgeries in the UK. The project has clear relevance beyond academia because it examines practical interventions that could be implemented within existing NHS treatment pathways. It also explores how biological differences between patients may influence treatment success, supporting a move towards more personalised healthcare. Importantly, the benefits are easy to communicate and highly relevant to policymakers: helping older adults maintain independence, reducing complications after surgery, improving recovery, and potentially reducing demands on healthcare and social care services. The combination of clinical relevance, public health importance, and translational potential makes the research particularly well suited to a parliamentary audience.

What stage is your research at?

Translational (interim)

What evidence of impact or future impact does your research have?

Prehabilitation is well recognised in academia as a promising approach for improving surgical outcomes, and previous research from our group has demonstrated that exercise interventions can improve fitness before cancer surgery. However, evidence also suggests that current approaches are not equally effective in colorectal cancer patients. This project builds directly on those findings by investigating the mechanisms responsible for exercise responsiveness and testing whether combining resistance and aerobic exercise can improve outcomes. The research has clear translational potential, as both exercise interventions can be delivered within existing NHS cancer treatment pathways. Future impact could include improved prehabilitation guidelines, more personalised exercise routines, reduced postoperative complications, shorter hospital stays, and improved quality of life for older adults undergoing colorectal cancer surgery. The findings may also have broader relevance to other surgical populations affected by frailty and age-related physiological decline.

Have you previously engaged with policymakers, government, patients, charities, or the public?

My PhD is funded by the Vivensa Foundation, which supports translational research aimed at improving healthy ageing and clinical outcomes. As part of this work, I regularly contribute to patient and public involvement and engagement (PPIE) activities, including events involving previous research participants to discuss study design, priorities, and dissemination of findings. I have also attended policy-focused workshops hosted by the University of Nottingham that explored how academic research can inform policy development and healthcare decision-making. These experiences have strengthened my ability to communicate research findings to the lay audience and understand the importance of stakeholder engagement.

Exhibitor

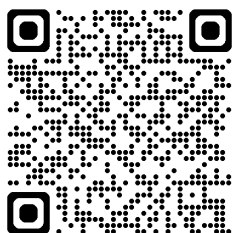
Differentiated Extravillous trophoblast organoids



Dr Priscilla Day-Walsh
University of Cambridge

East of England

Area of research: Placental
& Perinatal Physiology

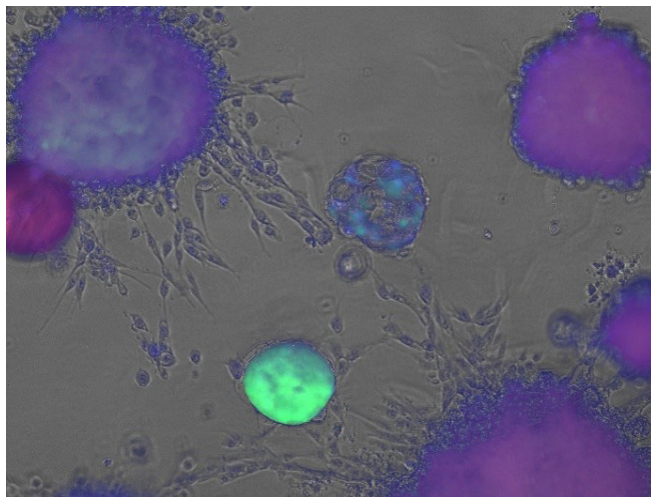


What challenge does your research or project seek to address and why is it important for society or public policy?

Uterine fibroids are benign tumours which affect up to 80% of women globally, and as many as 90% of Black women. Fibroids are associated with serious reproductive health consequences, including infertility, miscarriage, anaemia, and chronic pain. These complications drastically impair patients' quality of life and lead to social isolation. A 2024 NHS Confederation report concluded that absenteeism from work due to heavy and painful periods, endometriosis, fibroids and ovarian cysts costs the UK economy nearly £11 billion every year. Despite their prevalence, the physiology of uterine fibroids is poorly understood and there are no preventative measures. Moreover, although certain treatments preserve fertility potential, they suppress reproductive function during therapy, while others confer irreversible infertility. Fibroids are a contributing factor to the maternal health disparities black women experience in the UK, which include elevated rates of stillbirth, preterm birth, and maternal death. We seek to raise awareness to increase research and advance clinical care.

How does your research generate evidence that could inform policy, practice, or public health?

In November 2024 we hosted a landmark scoping event "Breaking the Silence about Uterine Fibroids: Confronting the Inequalities in Women's Health," that took place at Homerton College, University of Cambridge, co-funded by the Physiological Society. The event brought together researchers, clinicians, patient advocates, and policymakers and highlighted urgent needs surrounding uterine fibroids including lack of education, early diagnosis, treatment access, and culturally competent care. We subsequently presented these findings to a parliamentary session on "Reproductive Equity and the Fibroids Crisis", organised by the All-Party Parliamentary Group (APPG) on Black Health and hosted by Paulette Hamilton MP. The meeting highlighted the critical need for improved education and race-based data to inform and drive legislative reforms on uterine fibroids. We also



presented our findings to members of the Washington DC fibroid foundation and the Office of Congresswoman Yvette Clarke in at Rayburn House Washington DC, uniting UK, EU and USA advocates on fibroids.

In May 2026, we hosted a second symposium, “Breaking the Silence about Uterine Fibroids: A Pathway to Legislative Change,” bringing together local and international relevant stakeholders to understand where and how fibroids need to be prioritised at the national and international scale.

If you had five minutes with a policymaker, what would you want them to understand or do differently because of your research?

Uterine fibroids are a major yet under recognised public health issue, which drives substantial healthcare burden and costs as well as productivity loss. Despite this, care remains reactive rather than preventative, with many women diagnosed only after severe symptoms such as heavy bleeding and anaemia have already compromised their life quality.

A shift toward prevention is urgently needed, including early detection through routine blood tests for anaemia and ferritin in primary care, followed by timely ultrasound referral where needed. Increased research funding, culturally sensitive care pathways, and a national awareness campaign

are also essential to reduce disparities, improve outcomes, and lower long-term healthcare costs.

Fibroids are a clear driver of reproductive health inequalities. They disproportionately affect Black women, who experience delayed diagnosis, more severe disease, and poorer pregnancy outcomes. Importantly, fibroids are not just a reproductive issue; they are associated with increased long-term cardiometabolic risk, making them a lifelong health concern.

While the USA has acknowledged this through the Stephanie Tubbs Jones Uterine Fibroid Research and Education Act, the UK lacks a comparable national strategy. We want policymakers to commit to a dedicated UK fibroids research and education strategy, so that progress does not remain dependent on fractionated attempts, but rather a concerted national effort.

What makes your research particularly suited to a parliamentary showcase?

We have been instrumental in enabling the All-Party Parliamentary Group (APPG) on Black Health to turn evidence into action and advance meaningful policy change for Black people across the UK. We have contributed by providing evidence highlighting that uterine fibroids represent a significant public health crisis (<https://www.cahn.org.uk/fibroidsreport/>). This evidence has informed the recently published Black Health Improvement Plan (BHIP): <https://www.cahn.org.uk/bhip/>.

Our work addresses critical clinical and policy priorities by identifying the key factors contributing to reproductive health inequalities in the UK. It also provides a clear pathway for improving outcomes, building on the recommendations of the National Maternity and Neonatal Investigation, led by Baroness Amos: <https://www.matneoinv.org.uk/>.

In addition, our research will make an important contribution to the development of the renewed Women's Health Strategy for England, led by Professor Dame Lesley Regan: <https://www.gov.uk/government/publications/renewed-womens-health-strategy-for-england>.

We are working with international partners in the USA and EU to bring meaningful change to uterine fibroid care.

What stage is your research at?

Early-stage/discovery research

What evidence of impact or future impact does your research have?

The *Breaking the Silence about Uterine Fibroids* series has created sustained impact through ongoing knowledge dissemination, advocacy, and policy engagement. The publicly available event recordings provide a lasting educational resource for researchers, clinicians, policymakers, and patient communities, extending the reach of expert discussions on research, early diagnosis, practitioner education, and legislative reform. Social media significantly amplified the impact of our symposia, e.g. WHUM Instagram posts related to the most recent event (4–20 May) generated 17,927 views and reached 4,560 unique accounts, 80% of whom were new audiences. LinkedIn posts from attendees and partners further highlighted the event's role in building collaborations and advancing health equity, while coverage by the Fibroid Foundation and Cambridge Reproduction expanded public engagement. Collectively, these activities have strengthened advocacy networks, increased awareness, and supported policy influence, contributing to recognition of uterine fibroids as a UK public health priority and informing ongoing legislative and women's health policy discussions.

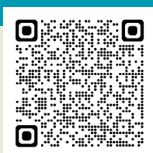
Have you previously engaged with policymakers, government, patients, charities, or the public?

Twice to parliamentary members through the Physiological Society. We have worked with the UK's APPG on Black Health and engaged with the office of Congresswoman Yvette Clarke at the Rayburn House, Washington DC. We are currently collaborating with the National Institute for Health and Care Excellence to develop educational materials and contribute to uterine fibroids clinical guidelines. We also work with patient and advocacy organisations, including the Fibroid Forum UK, the Netherlands Fibroid Foundation and Fibroid Foundation, Washington DC, and collaborate with former MEP Samira Rafaela and founder of the *Let's Talk About Our Bodies* initiative.



Exhibitor

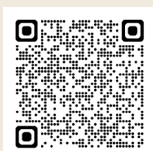
Drowning Prevention: From Lab to Lifesaving



Dr Clare Eglin
*University of
Portsmouth*



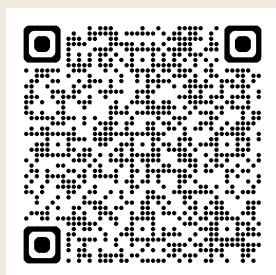
**Professor
Mike Tipton**
*University of
Portsmouth*



**Dr Heather
Massey**
*University of
Portsmouth*

South East England

Area of research: Human Physiology



What challenge does your research or project seek to address and why is it important for society or public policy?

Accidental immersion in cold water remains a major contributor to drowning and water-related fatalities in the UK.

- Public awareness about the dangers of cold water immersion often focuses on hypothermia, research evidence shows that the greatest danger is the cold shock response.
- The cold shock response occurs on entry into cold water and involves a rapid, involuntary gasp followed by uncontrollable hyperventilation, tachycardia and hypertension. These responses can cause drowning and cardiac arrest within the first minutes of immersion.
- Participation in open-water swimming and blue-space activities is increasing rapidly, bringing both potential health benefits and greater exposure to risk.
- Our research seeks to improve understanding of how people respond to cold water, identify factors that increase or reduce risk, and evaluate how water safety messages are communicated.
- Consequently, our research informs drowning prevention strategies, public health guidance, education campaigns, and policies that enable people to enjoy water-based activities safely.

How does your research generate evidence that could inform policy, practice, or public health?

- We investigate the mechanisms underlying the cold shock response, habituation to repeated cold-water exposure, and the factors that influence safety during accidental or intentional cold-water immersion.
- A key aspect of our work is translating physiological evidence into practical safety advice. For example, our research has helped demonstrate that the first minute after immersion is often the most dangerous period and floating until breathing is under control is a critical survival strategy.



- We have also shown that online information about cold-water risks is frequently incomplete or inaccurate, highlighting opportunities to improve public communication.
- The evidence generated supports organisations involved in drowning prevention for example: RNLI, Royal Society for the Prevention of Accidents, Surf Lifesaving GB (SLSGB).
- Our research has informed guidance on risk communication, education campaigns, signage, training and safe participation in cold-water activities.
- Through provision of robust scientific evidence, our work helps policymakers balance the promotion of water-based activity with the need to reduce preventable deaths and injuries.

If you had five minutes with a policymaker, what would you want them to understand or do differently because of your research?

We would want policymakers to understand:

- Public awareness often focuses on becoming dangerously cold, whereas the greatest risk may arise immediately on immersion. This is particularly important in Spring when the air temperature may be high, but water temperature is still dangerously low. In recent years this has resulted in a cluster of preventable drownings in May.
- Improvement in public understanding of the cold shock response and appropriate survival behaviours, combined with stronger national leadership and coordination, could have a substantial impact on reducing preventable fatalities.

What we want policymakers to do differently:

- As participation in open-water swimming and other water-based activities continues to grow, evidence-based education must be a central component of drowning prevention. Policymakers should support consistent, scientifically accurate water safety messaging across national campaigns, schools, recreational organisations and public spaces.
- We would like to see responsibility for water safety brought together under a single ministerial portfolio. Currently, water safety spans multiple government departments and policy areas, including health, education, sport, transport, environmental management and emergency services. A dedicated ministerial lead would provide clearer accountability, improve coordination across sectors, and support the National Water Safety Forum in its development of a coherent national water safety strategy.

What makes your research particularly suited to a parliamentary showcase?

- Our work demonstrates a clear pathway from physiological science to practical interventions that save lives.
- Our world-leading research has informed the RNLI's "Float to Live" campaign which has been adopted in Ireland, Scandinavia, Canada, Australia and New Zealand.



- This topic is timely given the water-related deaths that occurred in recent heatwaves and summers in the UK.
- We can communicate the concepts underpinning the public health messaging effectively in a relatable and engaging way to policymakers.

What stage is your research at?

Implementation/translation

What evidence of impact or future impact does your research have?

- There are multiple case studies that demonstrate how “Float to Live” has saved lives, details are available on the RNLI website and in our “From Lab to Lifesaving” paper.
- The “Float to Live” message has already been adopted by other countries and work to expand the reach is ongoing.
- This year’s World Drowning Prevention Day on 25th July will focus on “Find your Float”. This campaign is also based on our research and provides opportunities to learn how to float and practice it in venues around the UK.
- Our research on the cold shock response has also led to the development of emergency underwater breathing apparatus that are used by civilian and military personnel.

Have you previously engaged with policymakers, government, patients, charities, or the public?

As a team, we have extensive experience in engaging with the public on water safety issues, examples are given below:

- Public: radio, media and public outreach events
- Patients: public patient involvement and engagement to support research associated with cold water immersion
- Charities: RNLI, SLSGB, local independent lifeboat stations, community interest companies involved in outdoor swimming and water safety
- Government agencies/NGOs: HSE, Environment agency, MoD, Swim England
- Policy makers: MPs, local council

Our outreach activities have ensured that our research is accessible and has real world impact.



Exhibitor

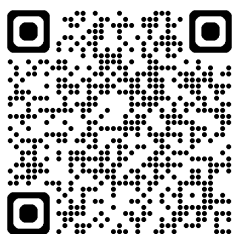
Effects of fetal hypoxia on arrhythmia susceptibility in a mouse model of catecholaminergic polymorphic ventricular tachycardia



Dr Zarin Gias
*The University of
Manchester*

North West England

Area of research: : Cardiovascular,
Respiratory and Autonomic Control



What challenge does your research or project seek to address and why is it important for society or public policy?

Inherited cardiac channelopathies cause malignant ventricular arrhythmias that are responsible for over 40% of all sudden unexplained deaths. However, individual carriers of channelopathy mutations exhibit broad variability in the type and severity of symptoms. Numerous factors have been proposed to contribute to this variability, but to our knowledge, no one has considered the role of the fetal environment.

Importantly, our preliminary data suggests a lack of oxygen during fetal development (fetal hypoxia) increases in vitro arrhythmia susceptibility in a mutant mouse model of the cardiac channelopathy CPVT (catecholaminergic polymorphic ventricular tachycardia). In this study, we will investigate the effects of fetal hypoxia on spontaneous arrhythmias in free-ranging CPVT mice with radiotelemetry. We will also use fluorescent microscopy and electrophysiology to determine the cellular and molecular pathways that increase arrhythmia susceptibility in CPVT offspring exposed to fetal hypoxia.

Our over-arching hypothesis is that fetal hypoxia will increase spontaneous arrhythmias in CPVT mutant mice via abnormal calcium cycling, increased ventricular sympathetic innervation and adrenergic hypersensitivity. If the data support our hypothesis, we will demonstrate for the first time that the fetal environment can modify channelopathy outcomes, improving risk stratification in these patients.

How does your research generate evidence that could inform policy, practice, or public health?

This research will generate evidence on how fetal hypoxia increases the risk of life-threatening ventricular arrhythmias in individuals with inherited CPVT. By identifying the underlying cellular and molecular mechanisms, such as altered calcium handling, RyR dysfunction, and enhanced adrenergic signalling, the findings could inform risk stratification, guide clinical management of high-risk pregnancies and offspring,

and identify potential therapeutic targets to reduce arrhythmia risk. I would want policymakers to recognise that conditions during pregnancy can have lifelong effects on cardiovascular health, particularly in individuals who are genetically susceptible to inherited arrhythmias such as CPVT. Our research investigates how fetal hypoxia alters calcium handling and sympathetic signalling to increase the risk of life-threatening ventricular arrhythmias in adulthood. Understanding these mechanisms could support policies that prioritise maternal health, improve monitoring of high-risk pregnancies, and encourage long-term follow-up of children exposed to adverse prenatal environments. In the longer term, this evidence could also inform clinical guidelines and stimulate the development of targeted therapies to reduce the risk of sudden cardiac death in vulnerable populations.

If you had five minutes with a policymaker, what would you want them to understand or do differently because of your research?

This research addresses an important public health question: how conditions during pregnancy influence the lifelong risk of serious cardiac disease. By investigating how fetal hypoxia increases susceptibility to life-threatening arrhythmias in individuals with inherited CPVT, the project bridges developmental biology, cardiovascular research, and precision medicine. The findings have the potential to inform strategies for identifying high-risk individuals, improving maternal and fetal healthcare, and supporting the development of targeted therapies to prevent sudden cardiac death.

What makes your research particularly suited to a parliamentary showcase?

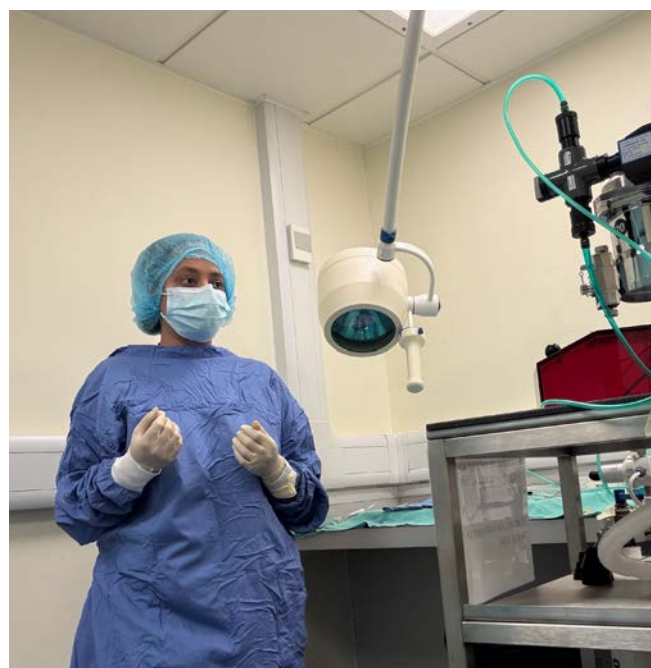
The research is well suited to a parliamentary showcase because it highlights how investment in fundamental biomedical research can generate evidence that ultimately improves healthcare, informs clinical practice, and addresses long-term health outcomes across the life course.

What stage is your research at?

Preclinical research

What evidence of impact or future impact does your research have

Our preliminary data show that fetal hypoxia increases arrhythmia susceptibility in a mouse model of CPVT, providing strong evidence that the fetal environment influences inherited cardiac disease. This project will determine whether fetal hypoxia increases spontaneous ventricular arrhythmias and identify the underlying cellular and molecular mechanisms. If successful, the findings could improve risk stratification, support more personalised management of patients with inherited arrhythmias, and identify new therapeutic targets. The research may also inform prenatal counselling and strategies to reduce the risk of sudden cardiac death in genetically susceptible individuals. I have presented my research at scientific conferences and engaged with researchers and clinicians, discussing the implications of my work and receiving feedback from experts in the field. While I have not yet had the opportunity to engage directly with policymakers or government, I am keen to communicate research beyond academia. I welcome opportunities to engage with patients, charities, the public, and policymakers to ensure that research findings are accessible and can inform healthcare and future policy.



Exhibitor

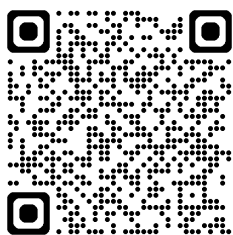
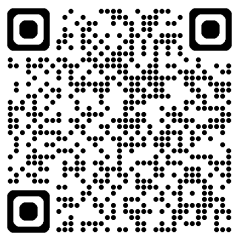
Can Fatty Liver Affect Your Brain? Exploring the hidden connection between liver and brain health



Dr Anna Hadjihambi
KCL

Greater London

Area of research: Microvascular
& Endothelial Physiology



What challenge does your research or project seek to address and why is it important for society or public policy?

What if one of the biggest risk factors for dementia isn't in the brain but in the liver? Metabolic dysfunction-associated steatotic liver disease (MASLD) affects ~30% of the population and is one of the fastest-growing chronic diseases worldwide. While traditionally viewed as a liver disorder, MASLD is associated with cognitive impairment, poor mental health, accelerated ageing and increased risk of dementia. However, this research investigates how MASLD alters the brain's blood vessels, impairing oxygen delivery and waste clearance, and whether liver-brain signalling pathways can be therapeutically targeted. This is important because MASLD imposes a substantial socio-economic burden, costing Europe and the UK ~£30 billion annually. If MASLD causes persistent cerebrovascular damage, it could increase susceptibility to neurodegenerative diseases even after liver disease resolves. Determining whether these brain changes are reversible could inform prevention strategies, healthy ageing policies and future therapies.

How does your research generate evidence that could inform policy, practice, or public health?

Our research generates evidence on how MASLD affects brain health. By combining mechanistic studies with analyses of large population-based cohorts, including the UK Biobank, we investigate pathways linking MASLD to cerebrovascular dysfunction, cognitive decline and accelerated brain ageing. We investigate whether these changes can be prevented or reversed through lifestyle interventions or modulation of the liver-brain axis via the hepatic branch of the vagus nerve. This work could support the development of novel neuroprotective therapies, including non-invasive neuromodulation strategies, to prevent neurological complications and improve brain health in people with MASLD.

The findings will inform clinical practice by identifying individuals at greatest risk of cognitive impairment and providing evidence to support earlier identification,



monitoring and intervention. The research will also inform public health and policy by clarifying the long-term neurological consequences of a highly prevalent disease that places a substantial burden on healthcare and social systems through direct medical costs and loss of productivity.

Importantly, if MASLD-induced cerebrovascular damage persists despite resolution of liver disease, it may accelerate age-related vascular dysfunction and increase susceptibility to neurodegenerative diseases. This would identify a significant and under-recognised public health risk, strengthening the case for earlier prevention, long-term monitoring and healthy ageing strategies.

If you had five minutes with a policymaker, what would you want them to understand or do differently because of your research?

I would want policymakers to recognise that MASLD is not only a liver disease but also a potential threat to brain health: one that is already a major socio-economic burden and could cost the economy billions. Traditionally considered asymptomatic until the later stages of disease, emerging evidence suggests that many working age patients experience under-recognised

neurocognitive symptoms, including cognitive impairment, poor mental health and reduced quality of life.

Our research suggests that fat accumulation in the liver, independent of obesity, may damage the brain's blood vessels, contributing to cognitive decline and increasing vulnerability to neurodegenerative diseases. Importantly, we do not yet know whether these brain changes are reversible once liver disease has resolved. If some effects prove persistent, this would represent a significant new public health emergency.

Dementia and cognitive impairment affect millions, placing a growing burden on individuals, society and healthcare systems. Despite decades of research, progress developing effective treatments has been limited. Policymakers must support earlier prevention strategies for MASLD and to invest in research exploring modifiable pathways that link liver and brain health. This could help inform prevention strategies and therapies, reducing the burgeoning toll of neurodegenerative disease on the economy and society.

What makes your research particularly suited to a parliamentary showcase?

This research is suited to a parliamentary showcase because it addresses an under-recognised public health challenge with major implications for healthy ageing, healthcare sustainability and economic participation. MASLD is highly prevalent, yet it is often over-looked due to the stigma associated with liver disease and misconceptions about alcoholism being the cause of disease. Parliamentarians need to understand the true picture in order to shape the policy responses the country desperately needs.

Our research combines mechanistic physiological investigation with analyses of large population cohorts, generating evidence that is scientifically rigorous and can help shape public health policies.

Through interdisciplinary collaborations, we have developed an immersive, interactive experience that can engage policy-makers in a very direct and compelling way. This is perfect for a showcase. We will not just tell them about the disease and its societal impact, we will enable people to feel first-hand what it is like to have MASLD.

What stage is your research at?

Translational

What evidence of impact or future impact does your research have?

My research has contributed to changing how the scientific community views MASLD, providing evidence that liver disease, independent of obesity, may contribute to brain dysfunction and cognitive decline. This work has been disseminated through publications, conferences and interdisciplinary initiatives that bring together scientists and healthcare professionals.

Beyond academia, I have developed public engagement activities, including a prototype immersive co-created exhibit that enables participants to experience symptoms associated with MASLD and better understand its impact on daily life. Developed with patients and experience designers, the project demonstrates the potential to increase awareness of this condition.

The future impact of this research lies in informing earlier prevention and intervention strategies, improving identification of individuals at risk of

cognitive decline, and supporting healthy ageing and dementia prevention efforts. By identifying pathways linking liver and brain function, the programme may enable the development of non-invasive therapies to improve cerebrovascular and cognitive health.

Have you previously engaged with policymakers, government, patients, charities, or the public?

I have actively engaged with patients and healthcare professionals through the co-creation of an immersive public engagement prototype exploring the lived experience of individuals with MASLD. Developed in collaboration with UCL's Person-Environment-Activity Research Laboratory (PEARL), the project brought together patients, clinicians, neuroscientists, sensory researchers and experience designers to create and test a multisensory exhibit. The prototype was evaluated by patient representatives, healthcare professionals and researchers, generating valuable feedback to improve accessibility and impact. I also regularly engage with patient groups, the public and scientific communities through talks, workshops and public dissemination activities (e.g. public lectures).



Exhibitor

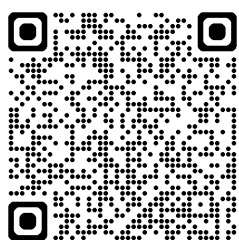
Environmental Physiology of Exercise



Professor Michael Koehle
*University of British
Columbia, Canada*

International

Area of research: Human Physiology



What challenge does your research or project seek to address and why is it important for society or public policy?

Climate change is increasing exposure to wildfire smoke, air pollution, and extreme heat, creating new challenges for public health. At the same time, regular physical activity remains one of the most effective strategies for preventing chronic disease and improving mental health.

Our research examines how environmental exposures affect the health benefits and risks of physical activity. We study how air pollution, wildfire smoke, heat, and other environmental stressors influence the respiratory and cardiovascular systems during exercise, and identify strategies that allow people to remain active while minimizing health risks.

This work is increasingly important for public policy because governments must balance climate adaptation, public health protection, active transportation, recreation, and occupational risks. Evidence is needed to guide decisions about wildfire smoke responses, air quality advisories, urban planning, worker protection, and community recreation. Our goal is to provide the physiological evidence needed to help people remain healthy, active, and resilient in a changing environment.

How does your research generate evidence that could inform policy, practice, or public health?

Our research combines laboratory physiology, environmental exposure studies, epidemiology, and field-based research to understand how environmental conditions influence human health and physical activity. We measure how exposures such as air pollution, wildfire smoke, ozone, heat, and altitude affect respiratory, cardiovascular, and exercise responses in healthy individuals, athletes, workers, and people with chronic disease.

The research programme is highly interdisciplinary, bringing together physiology, atmospheric chemistry, respiratory medicine, environmental health, and public health.

Our findings help inform guidance for exercising during poor air quality, wildfire smoke events, and extreme heat. The work also contributes to climate adaptation planning, active transportation initiatives, occupational health, and sport participation policies. Through partnerships with governments, professional societies, sport organisations, and public health stakeholders, we translate physiological evidence into practical recommendations that can be used by policymakers and the public.

If you had five minutes with a policymaker, what would you want them to understand or do differently because of your research?

I would emphasise that air pollution, wildfire smoke, and extreme heat are not only environmental issues—they are increasingly important barriers to physical activity and population health.



Physical activity is one of our most effective public health interventions, yet environmental conditions can make it difficult or unsafe for people to exercise outdoors. As climate change increases these exposures, policymakers need strategies that both reduce environmental risks and preserve opportunities for safe physical activity.

I would encourage policymakers to invest in clean-air and climate-resilient infrastructure, including improved air quality monitoring, cleaner transportation systems, shaded active transportation networks, clean-air community spaces during wildfire events, and policies that protect outdoor workers and recreational participants.

I would also encourage greater integration of physiological evidence into climate adaptation planning. Decisions about air quality, transportation, urban design, emergency preparedness, and recreation policy all influence health. By considering how environmental exposures affect the ability of people to remain physically active, policymakers can generate benefits that extend beyond environmental protection to include chronic disease prevention, mental health, and healthcare sustainability.

What makes your research particularly suited to a parliamentary showcase?

Our research is physiology-based and sits at the intersection of climate change, public health, environmental policy, and physical activity—issues that are increasingly important to governments and communities.

The work addresses highly visible challenges such as wildfire smoke, poor air quality, and extreme heat while providing evidence-based solutions that help people remain active and healthy. These issues affect athletes, workers, children, older adults, and entire communities. The UK is increasingly exposed to transboundary sources of pollution (e.g. wildfire smoke, Icelandic ash); at the same time wildfire activity is increasing in Britain, as are temperatures and ozone levels.

The research is also highly accessible to non-scientific audiences because everyone can relate to questions such as: Is it safe to work or exercise outdoors when air quality is poor? How should communities respond to climate events? How can we stay active as the climate changes?

A parliamentary showcase provides an opportunity to demonstrate how physiological research can inform practical policy decisions and improve public health outcomes. It highlights how investments in research generate evidence that directly supports climate adaptation, environmental health, and community resilience.

What stage is your research at?

Population/public health research

What evidence of impact or future impact does your research have?

The research has already influenced scientific, clinical, and public discussions surrounding air pollution, wildfire smoke, climate change, and physical activity. Findings have informed educational resources, professional guidance, clinical recommendations, and public-facing advice related to exercising safely during poor environmental conditions. Our goal to help the population stay active despite the challenges of climate change is critical to ensure a healthier United Kingdom, through the prevention and mitigation of diseases related not only to pollution, but to physical inactivity as well.

As climate change increases the frequency and severity of wildfire smoke and extreme heat events, the importance of this research will continue to grow. Ongoing projects examining ozone exposure, climate-related respiratory health, and interactions between atmospheric chemistry and physiology will provide evidence that supports future policies related to air quality, climate adaptation, active transportation, sport participation, and public health.

Have you previously engaged with policymakers, government, patients, charities, or the public?

- Theme lead for the Society's *2025 Global Climate and Health Summit*, participating in the concurrent working session in the House of Lords
- Contributor – *Extreme Heat in the Workplace Report* – 2026

- Co-author – 2026 "Physiological thresholds and limits" policy brief – The Physiological Society
- Member – International Olympic Committee's Environmental Hazards Experts Committee
- Scientific Lead – Canadian Standards Association's "Heat and Air Pollution Risks for Canadian Youth" initiative
- Contributor – "Maximum indoor working temperature guidelines" UK Health Security Agency (UKHSA) and The Physiological Society
- Consultant Sport and Exercise Medicine Physician, incorporating this knowledge into my clinical work with patients."



Exhibitor

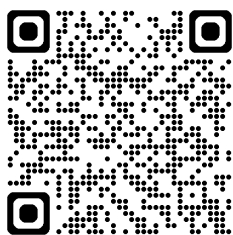
Small Moves, Big Returns: How Healthy Is Your Daily Movement?



Professor Gladys Pearson
*Manchester Metropolitan
University*

North West England

Area of research: Health
& Wellbeing Physiology



What challenge does your research or project seek to address and why is it important for society or public policy?

1. Physical inactivity and prolonged sedentary behaviour are major, modifiable drivers of frailty, loss of function and reduced quality of life across ageing and many chronic conditions.
2. Public health guidance has traditionally focused on achieving weekly exercise targets, yet less attention has been given to how movement and sitting are accumulated throughout the day, despite growing physiological evidence that these patterns independently influence health.
3. Many people (including older adults and those living with neurological, musculoskeletal and inflammatory conditions) face barriers to achieving conventional exercise recommendations.
4. My research seeks to identify practical, evidence-based movement strategies that are feasible, scalable and capable of improving physical function, independence and long-term health.
5. By generating objective physiological evidence, my work supports policies and interventions that promote prevention, reduce healthcare demand, and enable people to live healthier, more independent lives for longer.

How does your research generate evidence that could inform policy, practice, or public health?

My research combines laboratory physiology, wearable technologies and population studies to generate robust evidence on how daily movement behaviours (physical activity and sedentary behaviour) influence musculoskeletal health, healthy ageing and chronic disease.

The evidence challenges traditional public health messages by demonstrating that how physical activity and sedentary behaviour are accumulated throughout the day is as important as how much exercise people perform. This has direct implications for older adults and people living with chronic conditions, for whom conventional exercise recommendations may be difficult to achieve.

The findings have informed the 2019 *UK Chief Medical Officers' Physical Activity Guidelines*, contributed to professional guidance for exercise practitioners (BASES/CIMSPA), and underpin my NIHR-funded MOVE SMART clinical trial, translating physiological evidence into scalable NHS-relevant interventions.

Beyond the UK, the research has informed international policy discussions through citations in policy documents, while citations in patents demonstrate emerging commercial translation. Together, these pathways show how physiological research can influence public policy, professional practice, healthcare innovation and product development.

Ultimately, my research provides policymakers with practical, evidence-based strategies to reduce frailty, improve healthy ageing, lessen pressure on health and social care services, and support healthier lives through achievable changes in everyday movement.

If you had five minutes with a policymaker, what would you want them to understand or do differently because of your research?

If I had five minutes with a policymaker, I would encourage them to recognise that preventing disease and maintaining independence is not only about encouraging people to exercise more, but also about helping people sit less and move more throughout the day.

Specifically, I would ask them to:

- Update public health guidance to include evidence-based recommendations on interrupting prolonged sitting, recognising that when and how people move throughout the day are important determinants of health, independent of achieving weekly physical activity targets.

- Embed movement behaviour into national policy, commissioning practical guidance for healthcare, workplaces, education and social care that supports regular movement throughout the day across the lifespan.
- Invest in scalable lifestyle micro-interventions, supported by physiology, that can be integrated into NHS prevention and rehabilitation pathways, particularly for older adults and people living with chronic conditions.
- Recognise physiology as a foundation for prevention, ensuring continued investment in physiological research to inform public policy, healthcare innovation and evidence-based practice.

These actions have the potential to improve healthy ageing, reduce frailty and chronic disease burden, and lessen future pressures on health and social care services.

What makes your research particularly suited to a parliamentary showcase?

- It addresses issues of direct relevance to Parliament, including healthy ageing, frailty, chronic disease prevention, self-management, NHS sustainability, and extending healthy, independent lives.
- It translates complex physiological science into a simple, actionable message: small changes in daily movement behaviours can deliver meaningful health benefits.
- The research has already informed UK public health policy, professional guidance, NHS-relevant clinical research, and international policy discussions, demonstrating clear pathways from discovery to societal impact.
- The exhibit would illustrate how physiology underpins evidence-based policymaking and prevention, showing how research can improve health outcomes while reducing demands on health and social care.



- The concepts are highly visual, interactive and easily understood by non-specialists, making them particularly well suited to engaging parliamentarians, policymakers and the public within a short exhibition format.

What stage is your research at?

Translational

What evidence of impact or future impact does your research have?

1. Contributed directly to the 2019 *UK Chief Medical Officers' Physical Activity Guidelines*, helping shape national public health recommendations.
2. Informed professional practice through BASES/ CIMSPA guidance for exercise professionals working with older adults.
3. Underpins the NIHR-funded MOVE SMART trial, translating physiological evidence into an NHS-relevant intervention for people living with psoriasis.
4. Demonstrates international policy reach, with research cited in policy documents from organisations in the UK, Canada, Germany and wider international policy networks, spanning public health, healthy ageing and workforce policy.
5. Demonstrates emerging commercial translation, with citations in patents, indicating uptake of the research within innovation and product development pathways.
6. Current work focuses on translating this evidence into future UK public health policy through Parliamentary engagement, policy briefings and scalable prevention strategies aimed at reducing frailty, improving lifelong physical function and reducing pressure on health and social care.

Have you previously engaged with policymakers, government, patients, charities, or the public?

1. Government & policymakers: Research informed the 2019 *UK Chief Medical Officers' Physical Activity Guidelines*, Parliamentary consultations (Department of Health, DEFRA), and a policy briefing shared with MPs, Select Committees and All-Party Parliamentary Groups. Attended networking events at the Houses of Parliament and the Treasury.
2. Patients & healthcare: Co-designed and lead the NIHR-funded MOVE SMART programme with people living with psoriasis, NHS partners and patient representatives.
3. Professional practice: Authored BASES/CIMSPA Expert Statements and contribute to national and international Delphi studies informing research standards and clinical practice.
4. Public engagement: Regular contributor to national media and public-facing science communication.



Exhibitor

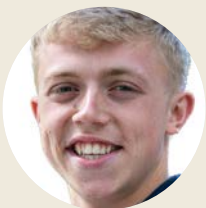
Mind the Strength Gap: Why Strength, Ageing, and Ethnicity Matter



Dr Jonny Quinlan
University of Birmingham



Dr Marie Korzepa
University of Birmingham



Dr Archie Belfield
University of Birmingham

West Midlands

Area of research: Muscle Physiology and Ageing



What challenge does your research or project seek to address and why is it important for society or public policy?

The age-related loss of skeletal muscle mass and function (i.e., sarcopenia) affects ~11% of older adults, impairing physical capacity and increasing risk for non-communicable disease. Sarcopenia contributes to the gap between life and health-span in ageing populations; however this disparity may be compounded by ethnic inequalities, and this is the focus of our research. Specifically, our collective knowledge of sarcopenia impact and mechanisms in the UK's large South Asian (SA) population (~5.5million people) is drastically lacking, compromising our ability to reduce health inequalities and meet the UK Government's 2035 target of '5 extra healthy years of ageing'. Furthermore, 25% of the UK population is predicted to be 65+ years by 2046, increasing sarcopenia prevalence and thus economic impact, with muscle weakness costing £2.5 billion annually. We must understand musculoskeletal decline across all ethnicities to improve quality of life, functional capacity and well-being for all older adults in the UK and worldwide.

How does your research generate evidence that could inform policy, practice, or public health?

Our research generates evidence across the translational pathway, from understanding the physiological mechanisms underpinning healthy ageing to developing practical, co-designed solutions that can improve public health. Specifically, through interdisciplinary collaboration, we combine physiological assessments with qualitative research and co-design approaches to ensure that the research questions we aim to address, and in turn the interventions we develop, reflect the needs and priorities of the communities we serve.

A particular focus of our work is understanding to what extent older South Asian adults experience accelerated age-related declines in muscle health. Our current and future research aims focus on generating robust mechanistic evidence to advance our understanding of ethnicity driven differences in



muscle mass, strength and function. Ultimately, these data may help to identify groups at greatest risk and informs more targeted prevention strategies.

Finally, working alongside community partners, we have co-created culturally appropriate educational resources and physical activity initiatives that aim to improve strength training engagement in South Asian women. Collectively, our research provides evidence that can inform clinical practice, public health initiatives and in turn policies aimed at reducing health inequalities, promoting preventative healthcare, and supporting healthier ageing across the UK's diverse population.

If you had five minutes with a policymaker, what would you want them to understand or do differently because of your research?

We would stress that healthy ageing is not experienced uniformly across the population and that ethnicity is a vital, yet under-researched determinant of age-related muscle decline. Whilst ageing is an inevitable process, the trajectory of functional decline can be modified through interventions such as physical activity, exercise and nutrition. However, the evidence underpinning current prevention strategies has been generated predominantly via White adult populations, severely limiting our

understanding of how these interventions translate across the UK's ethnically diverse communities. Inevitably, this significantly impacts healthcare provision as we cannot be confident that current recommendations and preventative strategies are equally effective for everyone.

Our group's research has demonstrated that older South Asian populations exhibit lower muscle mass and strength and may experience accelerated declines in muscle health, yet they remain substantially underrepresented in human physiological research. As a result, the communities at greatest risk of poor health outcomes are often those for whom the least evidence exists.

We would urge policymakers to recognise that reducing health inequalities requires sustained investment in inclusive physiological research and culturally appropriate prevention strategies. If policymakers are serious about delivering equitable healthy ageing, our evidence base must reflect the diversity of our population.

What makes your research particularly suited to a parliamentary showcase?

The research addresses two of the UK's most pressing societal challenges: healthy ageing and health inequalities. The UK is an ageing population, and the prevalence of chronic conditions and functional decline therefore increases. Preventing functional decline through evidence-based lifestyle interventions is essential to improving quality of life while reducing pressure on health and social care services. Our research also focuses on addressing disparities in healthy ageing, particularly among underserved communities who experience disproportionate risks of age-related conditions. The combination of human physiological research with community co-design, this research aims to generate practical, culturally appropriate strategies that can support preventative healthcare strategies; aligning closely to the continued focus on prevention set out in the NHS 10-Year Health Plan, 'Fit for the Future'.

The parliamentary showcase provides an ideal opportunity to demonstrate how the research can inform policies that promote healthier ageing, improve population health, and deliver equitable health outcomes.

What stage is your research at?

Early-stage/discovery research

Translational

Population/public health research

What evidence of impact or future impact does your research have?

This research has already demonstrated societal impact through meaningful engagement with local communities and the co-development of resources designed to improve awareness of muscle health and promote participation in strength-based exercise. Working alongside South Asian communities and community organisations, we have co-created the culturally appropriate Shakti Hai, Toh Sehat Hai animation, ensuring research outputs are accessible, relevant and responsive to community needs.

Alongside these translational activities, our research is generating novel physiological evidence to address a major gap in our understanding of ethnic differences in muscle ageing and responses to lifestyle (i.e., exercise and nutrition) interventions. These data provide an important foundation for future clinical practice, public health initiatives and policy development by informing more inclusive prevention strategies. As the UK's population continues to diversify, ensuring that healthy ageing recommendations are based on representative evidence has the potential to improve health outcomes, reduce inequalities and support more equitable healthcare delivery.

Have you previously engaged with policymakers, government, patients, charities, or the public?

I have consistently engaged with members of the public and charitable organisations locally and have actively sought partnerships with local government and public health teams. These activities have strengthened the translation and relevance of my research; however, I have had limited opportunities to engage directly with national policymakers. Therefore, the opportunity to discuss my research and its implications with such individuals would be invaluable, enabling me to better understand how physiological evidence can inform policy and decision-making. As a new Assistant Professor, this opportunity would facilitate meaningful relationships with policymakers and strengthen the societal impact of my research.



Applicant

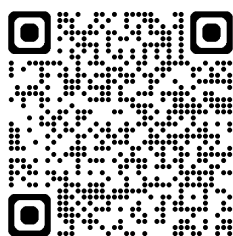
Research-Driven Physiology Education at the University of Aberdeen: Linking Environmental Chemical Exposure to Health and Policy



Dr Tarek M. Abdelghany
University of Aberdeen

Scotland

Area of research: Education & Teaching



What challenge does your research or project seek to address and why is it important for society or public policy?

Global health, environmental exposure, and sustainability challenges require graduates who can connect mechanisms in cells and tissues with chemical safety, public health, industry, and policy. My project addresses this by transforming undergraduate physiology from a mainly taught subject into a research-driven, policy-aware learning experience.

Students engage with a real, ongoing multidisciplinary research project through wet-lab practicals, data interpretation, symposium presentations, and public-facing outputs. They investigate physiological and toxicological responses to widely used environmental chemicals, including alternative “green” solvents, and consider why sustainability must be matched with biological safety.

The project draws on my research in epithelial physiology, environmental toxicology, mitochondrial dysfunction, chemical safety, and potential environmental triggers of autoimmune liver disease, alongside regulatory insights from my Food Standards Agency (FSA) Committee on Toxicity role.

This supports safer healthcare, environmental protection, sustainability, employability, and evidence-informed policy, aligning with SDG 3, SDG 4, SDG 9, SDG 12, and SDG 13.

How does your research generate evidence that could inform policy, practice, or public health?

My research generates evidence by embedding a real, ongoing multidisciplinary research project into undergraduate physiology education, including hands-on wet-lab practicals and scientific symposium-based assessment.

Students investigate cellular responses to exposure to widely used environmental chemicals and toxicants, using models relevant to epithelial physiology, environmental toxicology, mitochondrial function, cellular transport, and chemical safety. This helps them understand how laboratory evidence can reveal mechanisms of toxicity and potential links between environmental exposure and disease, including autoimmune liver disease.



The project also introduces sustainability-focused questions, such as whether alternative or “green” solvents are not only environmentally preferable but also biologically safe. Students therefore learn that sustainability decisions must be supported by physiological and toxicological evidence.

My regulatory work with the UK FSA Committee on Toxicity informs the teaching by introducing students to hazard identification, risk assessment, uncertainty, weight-of-evidence evaluation, and risk communication.

Through symposium presentations, infographics, lab reports, and scientific discussions, students translate experimental findings for scientific and non-specialist audiences. Educational impact is evaluated through student outputs, course feedback, and assessment performance, including development in technical skills, critical thinking, employability, career readiness, public health literacy, and policy-facing science communication.

If you had five minutes with a policymaker, what would you want them to understand or do differently because of your research?

I would want policymakers to understand that undergraduate physiology education is not only about teaching biological facts; it is a strategic investment in the future scientific, healthcare, regulatory, and industrial workforce.

My research shows how students can be trained to connect mechanisms in cells and tissues with real-world challenges, including environmental chemical exposure, sustainability, autoimmune disease mechanisms, and public health protection. Through wet-lab practicals, regulatory case studies, symposium presentations, infographics, and graphical abstracts, students learn how evidence is generated, interpreted, challenged, and communicated.

I would ask policymakers to support research-driven undergraduate education that gives students authentic practical experience, exposure to regulatory thinking, and opportunities to communicate science beyond academia.

Because of this research, I would want them to recognise that sustainability policy should not focus only on whether a chemical or solvent is “green”, but also whether it is biologically safe. I would also want them to see physiology education as a bridge between universities, healthcare, industry, environmental protection, and evidence-informed policy.

What makes your research particularly suited to a parliamentary showcase?

This project is particularly suited to a parliamentary showcase because it presents physiology as a bridge between education, research, regulation, sustainability, and public engagement.

It offers a clear visual story: undergraduate students engage with a real multidisciplinary research project, investigate cellular responses to environmental chemicals through wet-lab practicals, interpret data, and translate

findings through symposium presentations, infographics, graphical abstracts, and public-facing outputs.

The project connects directly with policy-relevant themes including healthcare workforce development, environmental chemical safety, sustainability, public health literacy, and evidence-informed regulation. My work with the FSA Committee on Toxicity strengthens this link by bringing regulatory concepts such as hazard, risk, uncertainty, and weight-of-evidence assessment into undergraduate physiology education.

Supported by more than 20 related publications, international conference dissemination, and teaching and research awards, the exhibit is accessible to non-specialists and shows policymakers how research-driven physiology education prepares graduates to address real societal challenges. I would exhibit an interactive “undergraduate research journey” showing how physiology students move from wet-lab experiments to environmental health, sustainability, public awareness, and policy thinking.

The exhibit would include international conference posters summarising the project, student-created infographics and graphical abstracts, photos from practical and symposium activities, and examples of student presentations and lab-based outputs.

Policymakers would experience a clear pathway: chemical exposure → cellular response → evidence evaluation → public communication → policy relevance. They would take part in two brief activities: “green but safe?”, exploring whether sustainable solvents also require biological safety assessment, and “hazard or risk?”, showing how regulatory toxicology weighs exposure, uncertainty, and evidence.

What stage is your research at?

Implementation/translation

What evidence of impact or future impact does your research have?

This project is already embedded in undergraduate physiology teaching and assessment at the University of Aberdeen. Evidence of impact includes hands-on

wet-lab practicals, symposium presentations, student-created infographics, lab reports, scientific discussions, and course feedback evaluating students’ technical skills, critical thinking, employability, career readiness, public health literacy, and science communication.

Student feedback indicates improved understanding of how physiology research connects with health, environmental safety, sustainability, and regulation, with some students expressing interest in future research, regulatory careers, industry careers, and PhD study. This demonstrates impact on STEM education, aspiration, and workforce development.

The project is supported by more than 20 related publications, international conference posters and abstracts, and recognition through awards from the University of Aberdeen, the British Pharmacological Society, and the British Toxicology Society.

Future impact includes developing graduates who can translate physiology across healthcare, industry, environmental safety, sustainability, regulation, and policy.

Have you previously engaged with policymakers, government, patients, charities, or the public?

Yes. I bring policy-facing expertise through my work with the UK FSA Committee on Toxicity and my listing on the FSA Register of Specialists. My engagement includes public health evidence review, University of Aberdeen policy-making masterclass training, a UKRI ICURE grant with research commercialisation training, British Council FameLab finalist science communication, and leadership training through the US National Academies.

I have contributed to international research and education projects, including two EU-funded Erasmus projects, and received science communication training at University of Poitiers/Espace Mendès France. Through NIHR-supported HPRU activities at Newcastle University, I engaged the public on chemical safety and health.

Applicant

From Climate Worry to Climate-Ready Graduates



Dr Roslina Abdul Rahim
International Islamic University, Malaysia

International

Area of research: Health & Wellbeing Physiology



What challenge does your research or project seek to address and why is it important for society or public policy?

Climate change is not only an environmental threat; it is also affecting how young people think, feel, study and prepare for the future. Our research addresses climate anxiety among our undergraduate university students, a group who will become future healthcare professionals, educators, scientists and policymakers.

In a survey of 222 undergraduates at International Islamic University Malaysia, students showed substantial emotional concern and negative future-oriented beliefs, although disruption to daily functioning was generally modest. This matters because unmanaged climate distress may affect wellbeing, motivation, academic engagement and confidence in taking constructive action.

The policy challenge is therefore twofold: protecting young people's mental wellbeing while transforming concern into resilience and informed action. Evidence is needed to guide climate-health education, university support services and youth mental-health strategies, particularly in countries facing rising temperatures and environmental disruption but where local data remain limited.

How does your research generate evidence that could inform policy, practice, or public health?

Our research provides locally generated evidence on the emotional, cognitive and functional dimensions of climate anxiety among 222 Malaysian undergraduates. Using an adapted validated climate-anxiety questionnaire, we compared responses by gender and field of study and examined relationships between the three domains.

Key policy-relevant findings include:

- Most students expressed concern that climate change threatens people and the planet.
- Negative beliefs about the future were associated with stronger emotional responses and greater functional impact.

- Emotional concern did not automatically translate into impaired daily functioning, indicating that climate anxiety should not automatically be treated as a disorder.
- Responses differed between health and non-health students, suggesting that one-size-fits-all educational approaches may be insufficient.

The evidence can inform:

- Climate-health literacy, coping skills and action-oriented learning within university curricula.
- Training for counsellors and educators to recognise climate-related distress without medicalising normal concern.
- Targeted support for groups demonstrating stronger responses.
- National youth mental-health and climate-adaptation strategies.
- Multi-institutional monitoring and evaluation of interventions.
- The study also demonstrates how commitments to Sustainable Development Goal 13 can be assessed through students' lived responses.

If you had five minutes with a policymaker, what would you want them to understand or do differently because of your research?

I would ask policymakers to recognise climate anxiety as an emerging climate-health issue, not simply an individual weakness or a reason to dismiss young people as overly worried.

The central message is that concern can be constructive when young people are given knowledge, agency and realistic pathways to act. Our students were highly emotionally engaged, but most were still functioning well. Policy should therefore prevent distress from escalating while converting concern into resilience, participation and preparedness.

I would recommend three actions:

1. Embed climate-health literacy and practical adaptation skills across higher education, including health, education and public-policy programmes.
2. Equip universities with guidance for identifying and supporting climate-related distress through counselling, peer support and staff training.
3. Fund representative, multi-institutional research and longitudinal monitoring of climate anxiety, wellbeing and educational functioning.

Climate policy and mental-health policy should not operate separately. Preparing climate-resilient societies requires supporting the wellbeing of the generation expected to deliver future healthcare, education, community leadership and policy.

What makes your research particularly suited to a parliamentary showcase?

The project translates a global challenge into a clear human story: what happens when young people understand the climate threat but are uncertain about the future and their ability to respond.

It is well suited to Parliament because it:

- Connects climate policy with health, education, workforce preparedness and youth wellbeing.
- Presents original evidence from Malaysia, adding a Global South perspective to an international challenge.
- Demonstrates how environmental stress may influence emotional, cognitive and functional responses.
- Produces practical policy messages rather than only describing the problem.
- Can be communicated through striking, accessible data visualisations and short student-centred scenarios.
- Encourages discussion about what institutions and governments can do now.

The exhibit would enable policymakers to move quickly from evidence to action by identifying how curriculum development, student support and climate policy can work together to build climate-ready and resilient future professionals.

What stage is your research at?

Population/public health research

What evidence of impact or future impact does your research have?

The study has generated one of the first institution-specific datasets on climate anxiety among Malaysian undergraduates and has identified actionable patterns rather than simply measuring general concern.

- It provides a baseline for climate-health education and student wellbeing planning at university level.
- It identifies differences between student groups that can guide targeted communication and support.
- It supports integrating climate literacy with mental wellbeing rather than treating them as separate agendas.
- The manuscript has progressed through peer review, demonstrating scientific scrutiny and readiness for wider dissemination.

Future impact:

- Informing curriculum development, counselling guidance and staff training.
- Supporting national and regional youth climate-health strategies.
- Providing a model for multi-university monitoring in Malaysia and comparable settings.
- Helping universities evaluate whether sustainability commitments are reflected in student understanding, resilience and agency.
- Strengthening the evidence required to prevent climate concern from developing into functional distress.

Have you previously engaged with policymakers, government, patients, charities, or the public?

This project engaged the university community through an anonymous online survey distributed via institutional communication channels, enabling students to contribute their experiences of climate change and wellbeing.

I have also engaged with the wider physiology and climate-health community through the Physiological Society, including accepting an invitation to participate online in its *Global Climate and Health Summit* and involvement in its *Climate and Physiological Resilience Network*. These activities strengthened the project's policy-facing perspective.

Direct engagement with parliamentarians and government departments is the next step; the parliamentary showcase would provide an important opportunity to translate the findings into focused policy discussion.

Applicant

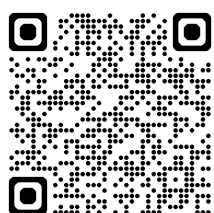
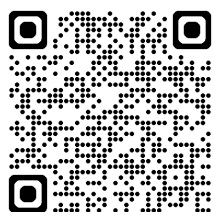
Distinguishing Harmless from Harmful: Functional Insights into Ion Channel Variants



Professor Mike Althaus
*Institute for Functional Gene-Analytics,
Bonn-Rhein-Sieg
University of Applied
Sciences, Germany*

International

Area of research: Epithelia
& Membrane Transport



What challenge does your research or project seek to address and why is it important for society or public policy?

My group is investigating functional consequences of variants in genes encoding ion channels of high physiological and clinical relevance, including ENaC, CFTR and TMEM175. Malfunctions in these channels are linked to hypertension, cystic fibrosis and neurodegenerative disorders (Parkinson's disease). Hypertension alone affects millions of people and contributes substantially to healthcare costs.

Advances in genome sequencing are identifying increasing numbers of genetic variants in ion channel genes, but for many variants it remains unclear whether they cause disease. This creates a major challenge for the development of personalised medicine: patients may receive uncertain diagnoses and clinicians often lack evidence to guide treatment decisions.

By linking genetic variation to physiological function, we help distinguish harmless variants from disease-causing mutations, supporting more accurate diagnosis, personalised treatment and improved health outcomes. This work helps ensure that investments in genomic medicine translate into tangible benefits for patients and healthcare systems.

How does your research generate evidence that could inform policy, practice, or public health?

Our research generates functional evidence showing how specific genetic variants alter the activity of ion channels that are essential for human physiology and play a key role in human disease. Within an interdisciplinary research cluster, we are establishing robust workflows that connect genomic information and computational modelling with physiological measurements. These approaches enable the functional assessment of variants in genes such as ENaC, CFTR and TMEM175, helping to determine whether a variant is likely to contribute to disease. Furthermore, our research can provide direct pharmacological evidence for the effectiveness of ion channel modulators as precision treatment strategies based on a given gene variant.



This evidence can support:

- More accurate interpretation of genetic test results.
- Improved diagnosis of inherited channelopathies.
- Better patient stratification and treatment decisions (e.g. selecting the correct CFTR-modulator treatment based on the patient's genotype).
- More effective implementation of personalised medicine.
- Reduced uncertainty surrounding variants of unknown significance.

At a policy level, our work highlights the importance of integrating physiological expertise into genomic medicine initiatives.

If you had five minutes with a policymaker, what would you want them to understand or do differently because of your research?

I would want policymakers to understand that genomic medicine can only deliver its full promise when genetic information is linked to physiological function.

Sequencing technologies are advancing rapidly and generating vast amounts of data. However, many newly identified genetic variants cannot currently be interpreted with confidence. Physiologists provide the expertise needed to bridge this gap by determining how genetic variation affects cellular and organ function.

I would ask policymakers to:

- Recognise physiological functional testing as a critical component of personalised medicine.
- Support long-term investment in specialist physiology research infrastructure and highly skilled staff.
- Strengthen links between genomic medicine, clinical practice and physiological research.
- Promote sustainable funding models that preserve specialist expertise.

The key message is that precision medicine requires more than sequencing genomes. It requires understanding the functional consequences of genetic variation.

What makes your research particularly suited to a parliamentary showcase?

Our research addresses major societal and policy priorities, including personalised medicine, cardiovascular health and neurodegenerative diseases in ageing societies, and the translation of genomic discoveries into healthcare benefits.

Channelopathies provide a clear and accessible example of how physiology helps convert genetic data into actionable medical knowledge. It demonstrates how researchers can determine whether a genetic variant is harmless or disease-causing and why this matters for patients, clinicians and healthcare systems.

As a researcher based in Germany and an active member of the Physiological Society for over ten years, I contribute to collaborative efforts that address shared health challenges across borders, highlighting the international nature of physiological research.

What stage is your research at?

Early-stage/discovery research

What evidence of impact or future impact does your research have?

Current impacts include:

- development of specialist expertise in ion channel physiology and membrane transport, e.g. recently contributed to the identification of TMEM175 function in lysosomes, linked to Parkinson's disease (doi: 10.1073/pnas.2503909123)
- creation of workflows and experimental approaches for assessing genetic variants, including industry collaboration to advance technical innovation and development,
- integration of physiological and genomic research, and training of international researchers in advanced physiological techniques.

Future impacts include:

- improved interpretation of genetic test results,
- more accurate diagnosis of inherited channelopathies,
- support for personalised treatment strategies, and
- stronger implementation of genomic medicine within healthcare systems.
- One Health impact: Epithelial and membrane transport is often conserved across species. Insights and tools developed in our research can also be applied to other species, and may contribute to understanding physiological adaptation and resilience in animals facing a changing environment.

Have you previously engaged with policymakers, government, patients, charities, or the public?

- Engaged with research funders and government ministries (e.g. Federal Ministry of Research, Technology and Space, Germany or Federal Institute for Drugs and Medical Devices, Germany) regarding research, funding schemes and innovation.
- Participated in several science communication and public engagement activities, including public lectures and public research displays (e.g. Bonn Science Night)
- Contributed to outreach events promoting physiology and biomedical science. (e.g. Ion Channel Games at Bonn Science Night 2026)
- Regularly communicate research findings to diverse audiences including policymakers, stakeholders and the public



Applicant

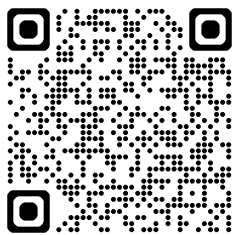
Low-gravity locomotion in space: Physio-biomechanics of countermeasures against muscle-bone loss



Professor Alberto
Enrico Minetti
University of Milan, Italy

International

Area of focus: Locomotion



What challenge does your research or project seek to address and why is it important for society or public policy?

A comprehensive understanding of the mechanical, metabolic, motor control, environmental determinants of human locomotion in health and disease, in ordinary gaits and in sport, on Earth and on low gravity celestial bodies as the Moon and Mars. Physiology and Biomechanics are the tools we use to shed light on this topic and predict the adaptation of the same musculo-skeletal system to a number of external challenges.

How does your research generate evidence that could inform policy, practice, or public health?

My laboratory analyses the movement of body segments during gaits both via multi-camera system, by also measuring the force the lower limbs exert on the ground and electromyographic activity of the main muscles involved. From these data the body centre of mass in the 3D space can be estimated. Depending on its trajectory, conclusions about the dynamic paradigm, either a pendulum, a 'pogo-stick' or a combination of the two, can be drawn. Also, the electrical activity of the main muscle involved complete the picture by describing the control motor pattern. All these data enable to infer the mechanical work necessary to move and to compare it with metabolic consumption, simultaneously sampled, to obtain an estimate of the efficiency of locomotion in different conditions. Sometimes we also design computerised mathematical models to simulate movements that could be challenging to reproduce experimentally, as locomotion at very different gravity with respect to Earth. Another solution is to assemble emulator analogue of, say, low gravity, where the body weight is reduced by a harness vertically linked to a bungee-jumping rope, programmatically tensed as to simulate a given weight relief.



If you had five minutes with a policymaker, what would you want them to understand or do differently because of your research?

In space exploration and particularly on imminent Artemis missions, humans will stay on the Moon for prolonged periods of time, during which they will suffer muscle and bone loss, balance impairment and cardiovascular deconditioning unless a proper countermeasures regime is followed. Recently we practically demonstrated that humans can run horizontally inside a Wall-of-Death in low gravity emulation, a task achievable on Earth only by powered motorcycles. Our venue secured one of those structure and our research need to move to the pre-clinical level of checking whether such an exercise, briefly performed twice a day (by astronauts on the Moon on the inside walls of their round barracks) effectively counteracts the detrimental function loss of prolonged bed-rest on Earth (an analogue of prolonged stay on the Moon).

What makes your research particularly suited to a parliamentary showcase?

Space exploration is at the top of general public interest, particularly due to the imminent Artemis missions. The cost of a bed-rest study is substantially high, and operatively need a contiguous arrangement for the 'Wall-of-Death Gym' and the hospital hosting the experimental subjects, thus it could be sustained by governmental funds. A parliamentary showcase should benefit from a video illustration of early experiments of horizontal running, and astronauts could be invited to discuss their view on



such an easy countermeasure. Finally, in case of funding, even the general public could be involved in experiencing on Earth the lunar low gravity emulation and the 'exciting' horizontal running inside the Wall-of-Death.

What stage is your research at?

Preclinical research

What evidence of impact or future impact does your research have?

Physiology and Biomechanics of body movement and locomotion, based on physics, IT and mathematical models, proved to successfully predicts, in advance, the motion pattern in altered conditions, and to inform sport industry about how to design more effective, efficient and comfortable apparels for leisure and competitive exercise sessions. This will be particularly true for Space exploration, as the Moon surface is covered by a thick layer of dust-like particles, called regolith, that alters the physiological pattern of walking, hopping, skipping and running.

Have you previously engaged with policymakers, government, patients, charities, or the public?

Yes, in my career I delivered more than 120 invited lectures, most of them about the science of locomotion. Depending on the venue, the speech types was tailored either for a generalist audience or for large groups of specialist scientists.

Applicant

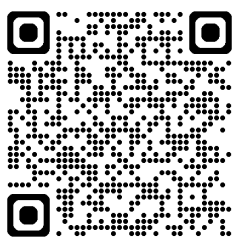
Modelling and Visualising Placental Function: 3D Organ-on-a-Chip Systems and Ultrasound Imaging



Dr Colin Murdoch
University of Dundee

Scotland

Area of research: Cardiovascular, Respiratory and Autonomic Control



What challenge does your research or project seek to address and why is it important for society or public policy?

My research addresses a critical gap in understanding how extreme heat exposure during pregnancy affects maternal and fetal health. Pregnant women are among the most vulnerable groups to climate change, yet the physiological and molecular pathways through which heat impacts pregnancy outcomes remain poorly understood.

Current evidence is largely observational and cannot explain causation or identify mechanisms of harm. Without this knowledge, it is difficult to design effective public health guidance, workplace protections, or clinical interventions tailored to pregnant populations.

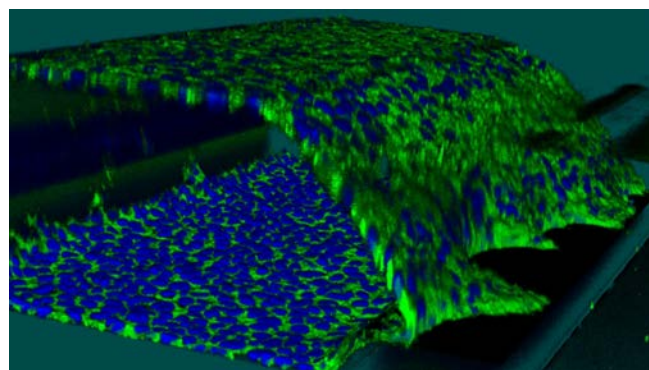
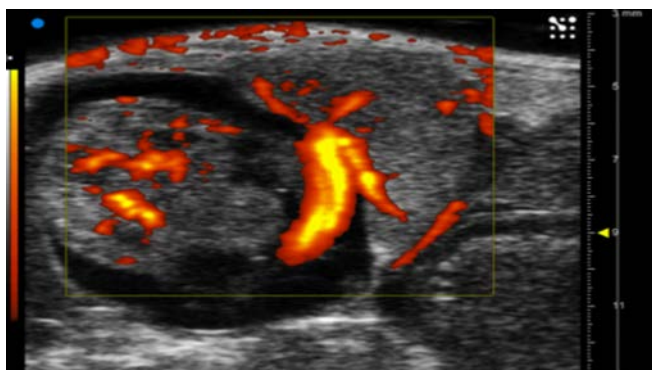
By developing model systems that link physiological changes with underlying molecular pathways, this research aims to provide the mechanistic evidence needed to understand how and when heat poses the greatest risk during pregnancy.

This is essential for informing evidence-based policy and ensuring that strategies to protect maternal and fetal health keep pace with the increasing frequency and intensity of heat exposure.

How does your research generate evidence that could inform policy, practice, or public health?

My research develops controlled animal models of heat exposure during pregnancy, combined with advanced ultrasound imaging to quantify maternal and fetal physiology in real time. This approach provides mechanistic evidence that cannot be obtained from human observational studies alone.

We measure key indicators such as fetal brain sparing, umbilical blood flow, and maternal cardiovascular adaptation, and link these physiological changes to underlying molecular and pathological pathways. This allows us to move beyond correlation to establish causation between heat exposure and adverse pregnancy outcomes.



These model systems are essential for identifying critical windows of vulnerability during gestation, as well as for discovering biomarkers that could enable early detection of risk in clinical settings. They also provide a rigorous platform to test potential interventions or preventative strategies before translation into human studies.

By generating causative, physiologically integrated data, this research strengthens the evidence base needed to inform public health guidance, workplace safety regulations, and clinical advice for pregnant women in the context of increasing environmental heat exposure."

If you had five minutes with a policymaker, what would you want them to understand or do differently because of your research?

I would highlight a critical gap in how we understand and protect maternal and fetal health in a warming climate. Extreme heat exposure is increasing, yet we lack the mechanistic evidence needed to explain how it affects the placenta—the organ that underpins fetal development and lifelong health.

We already know that impaired placental function, as seen in conditions such as obesity and diabetes, has both immediate consequences for pregnancy outcomes and lasting effects on cardiovascular and metabolic health in mother and child. However, for heat exposure, current evidence is largely observational. Without robust experimental models,

we cannot determine causation, identify physiological mechanisms, or design effective interventions.

I would therefore urge policymakers to prioritise investment in foundational physiological research, including validated model systems that replicate human pregnancy. These models enable us to test hypotheses (e.g. heat adaptation or fetal brain sparing), identify critical windows of vulnerability, and evaluate potential therapies or preventative strategies before clinical trials.

Supporting this work will ensure that public health guidance, workplace protections, and clinical interventions for pregnant women are evidence-based, equitable, and fit for a changing climate.

What makes your research particularly suited to a parliamentary showcase?

This research addresses a highly visible and policy-relevant issue: protecting maternal health during increasingly frequent heatwaves. Policymakers are already aware of heat exposure risks in everyday settings, such as commuting and workplaces, this project directly connects those concerns to pregnancy outcomes.

It is also highly accessible and engaging for a non-specialist audience. Using advanced ultrasound imaging, we can provide clear visualisation of blood flow in the fetus and placenta, making complex physiological changes immediately understandable.

The work highlights an important equity issue, women's health research remains underfunded, and demonstrates why investment in this area is critical for public health. It also showcases the essential role of preclinical research in underpinning safe and effective clinical translation.

Finally, the project exemplifies how cutting-edge UKRI-funded technology is being used to address real-world challenges, alongside collaboration with industry partners to standardise methods and enable wider adoption. Supported by UKRI funding, our lab was among the first in the UK to deploy this cutting-edge ultrasound technology, in partnership with industry to standardise measurements for wider use.

Together, this makes a compelling, visual, and policy-relevant exhibit for a parliamentary audience. I want to travel down from Scotland to show that UKRI supported research across the country has a significant impact.

What stage is your research at?

Early-stage/discovery research

What evidence of impact or future impact does your research have?

Our preclinical model of short-term extreme heat exposure during mid-gestation has already demonstrated measurable impacts on maternal and fetal physiology, including altered fetal brain sparing, placental dysfunction, and impaired maternal cardiac adaptation. These findings provide early mechanistic evidence linking heat exposure to adverse pregnancy outcomes.

The initial dataset has been shared via a public repository, and we are completing in-depth molecular analyses to

underpin a full peer-reviewed publication. Together, this work establishes a platform for identifying the biological pathways affected by heat stress during pregnancy.

This research has clear future impact. It will inform the design of human studies by identifying critical physiological endpoints and windows of vulnerability, and support the development of biomarkers for early risk detection. In the longer term, it provides a validated framework for testing interventions to protect maternal and fetal health.

Collectively, these outputs strengthen the evidence base needed to inform public health guidance and clinical practice in the context of rising global temperatures.

Have you previously engaged with policymakers, government, patients, charities, or the public?

While I have not previously engaged specifically on extreme heat exposure in pregnancy, I bring relevant experience from leading the EU Horizon-funded iPlacenta consortium, focused on modelling placental and maternal function. This project was awarded Best Project at Scotland's Higher Education Awards (2025) and received national media coverage (including The Herald and BBC).

I have also contributed to public engagement through international media, including an interview for the Understanding Pregnancy podcast. In addition, I have worked with patients and charities to promote engagement in research, supporting PhD students to connect their work with wider audiences. I was an in person delegate at the Physiological Society's *Global Climate and Health Summit*.

Applicant

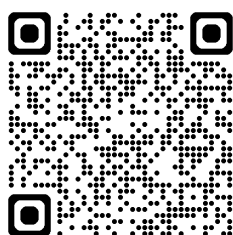
Breast is best, can it get better



Dr Gareth Nye
University of Salford

North West England

Area of research: Placental
& Perinatal Physiology



What challenge does your research or project seek to address and why is it important for society or public policy?

My research addresses the critical challenge of maternal and neonatal morbidity, particularly among vulnerable preterm infants. Despite medical advances, complications like fetal growth restriction and neonatal sepsis remain leading causes of early-life mortality.

My work bridges cellular placental physiology with clinical interventions, heavily focusing on the therapeutic immunological properties of human breast milk. By demonstrating how breast milk actively adapts to support premature infants, this research directly informs clinical practice.

For public policy and society, this is vital. It provides an evidence base to optimise human milk banking—enabling targeted donor matching to protect premature babies from severe infections like sepsis. Furthermore, my qualitative work on antenatal care communication offers a framework to refine maternity service guidelines. Ultimately, by improving early-life interventions and maternal care pathways, we can reduce systemic healthcare burdens and secure healthier starts for our most vulnerable populations.

How does your research generate evidence that could inform policy, practice, or public health?

My research generates concrete evidence to reform clinical practice and maternal public health strategies by focusing on the physiological and structural aspects of early-life care. By analysing human breast milk in collaboration with the North West Human Milk Bank, we have demonstrated that immunological components—specifically sIgA—adapt significantly following preterm deliveries. This provides actionable evidence to update milk banking protocols, suggesting that donor milk could be deliberately matched to premature infants to optimise immune development and reduce the risk of neonatal sepsis. Furthermore, my investigations into placental function—using advanced imaging and ex vivo models to map oxygen transfer—clarify the

mechanisms behind fetal growth restriction. Uncovering the placenta's role in the Developmental Origins of Health and Disease (DOHaD) provides public health evidence on how the maternal environment shapes a child's lifelong metabolic health. Additionally, my qualitative evaluation of antenatal communication offers direct recommendations for refining maternity care guidelines. Together, this research provides healthcare professionals and policymakers with the necessary data to implement targeted clinical interventions, improve patient-provider communication, and secure better long-term outcomes for both mothers and their babies.

If you had five minutes with a policymaker, what would you want them to understand or do differently because of your research?

If I had five minutes with a policymaker, I would urge them to recognise human breast milk as a dynamic, life-saving medical intervention.

My research demonstrates that milk produced following premature deliveries—and crucially, after unsuccessful pregnancy outcomes—possesses a tailored, elevated immunological profile (specifically sIgA antibodies) designed to protect vulnerable infants from infections like neonatal sepsis.

Policymakers must drive two major changes. First, we must fund human milk banks to implement targeted donor matching. By matching the bespoke immune profiles of donor milk to high-risk premature infants, we can actively reduce early-life mortality and alleviate pressure on neonatal intensive care units.

Second, this evidence must overhaul postnatal messaging. Generic breastfeeding campaigns often induce guilt. Instead, we must empower mothers of preterm infants by communicating that their milk is a clinical-grade medicine adapting to their baby's exact needs. Furthermore, recognizing the immense immunological value of milk after a pregnancy loss can profoundly empower bereaved mothers who choose to donate, providing a tangible, life-saving legacy.

By treating donor milk as personalised medicine and refining postnatal communication, we can improve neonatal survival and fundamentally better support maternal well-being. My research is uniquely suited for a parliamentary showcase because it perfectly bridges urgent clinical evidence with highly accessible public communication—two elements essential for driving effective policy change.

What makes your research particularly suited to a parliamentary showcase?

1. High-Impact, Actionable Policy Implications

A successful showcase must present solutions to pressing societal challenges. My work on the tailored immunological properties of human breast milk following premature deliveries and pregnancy loss offers a direct, evidence-based solution to combat neonatal sepsis. By demonstrating how we can optimise human milk banking through targeted donor matching, this research provides a clear roadmap to reduce neonatal mortality and alleviate the immense financial and operational pressures on neonatal intensive care units.

2. Proven Expertise in Public Science Communication

Presenting to Parliament requires translating complex biomedical data into clear, compelling narratives for a non-specialist audience. As an active science communicator with a significant following on platforms like TikTok and a regular expert contributor to national media like the Daily Star, I have extensive experience breaking down physiological concepts. I know how to distil dense research into engaging formats that resonate with both the public and policymakers.

What stage is your research at?

Early-stage/discovery research

What evidence of impact or future impact does your research have?

My research demonstrates direct clinical impact by fundamentally changing how we treat vulnerable newborns and support mothers. My collaboration with the North West Human Milk Bank proves that breast milk adapts its immunological profile—specifically sIgA levels—following premature birth or pregnancy loss. The future impact of this work is the implementation of "targeted donor matching" in human milk banks. By treating donor milk as a personalised, clinical-grade intervention, we can actively combat neonatal sepsis, lower early-life mortality, and alleviate financial pressures on intensive care units. Additionally, my foundational research into placental oxygen transfer clarifies the mechanisms behind fetal growth restriction, informing earlier interventions for at-risk pregnancies. Finally, my qualitative work on antenatal communication provides actionable frameworks to refine national maternity care guidelines. Together, this research translates complex physiology into tangible public health strategies, ensuring better long-term health outcomes for both mothers and their children.

Have you previously engaged with policymakers, government, patients, charities, or the public?

Professionally, my research involves direct engagement with organisations like the North West Human Milk Bank. I work closely with them and their donors and patient advocacy groups to ensure samples are treated with care and respect and that there is clear meaning behind its usage in research.

I have extensive experience engaging the public and broader community. As an active science communicator, I run successful social media channels dedicated to debunking health misinformation and explaining medical science to non-specialist audiences.

I regularly collaborate with national media outlets like the Daily Star, providing expert commentary on public health and physiology.

I have huge experience working with Diabetes UK to advocate for patients due to my own personal family issues with the condition. This led us on a national campaign to create equal access to technology for type 1 diabetes across the country which involved working with policymakers and government officials.

Applicant

Mechanobiology of the spinal cord in neurodegeneration and injury: informing therapies and biomedical devices for SMA, ALS and spinal cord injury



Dr Cian O'Connor
*Royal College of
Surgeons in Ireland &
Harvard University, USA*

Republic of Ireland

Area of research:
Cellular Neurophysiology



What challenge does your research or project seek to address and why is it important for society or public policy?

My research focuses on spinal muscular atrophy (SMA), amyotrophic lateral sclerosis (ALS) and spinal cord injury, which cause paralysis and early mortality. Despite “breakthrough” drugs, most patients still face limited recovery because we do not address how diseased tissues physically change and how this drives ongoing neuronal loss. This limits the effectiveness of therapies and medical devices due to our lack of understanding of how cells respond to changes in their environment.

My research tackles how the mechanical and structural properties of the spinal cord regulate neuronal degeneration and response to treatment. Using biomaterials, patient-derived cells and gene-delivery, I identify “mechanobiology” pathways that can be targeted and exploited for therapeutic applications.

My work speaks directly to how we can prioritise research funding for rare diseases, understanding basic physiology for the development of therapeutics and medical devices and how to embed patient and public involvement (PPI) in cross-border pre-clinical science.

How does your research generate evidence that could inform policy, practice, or public health?

By recreating healthy and diseased spinal cord environments in laboratory models using biomaterials and patient-derived neurons, I define how changes in tissue biophysical properties drive neuronal death in disease. My work proposes a new lens to study how these diseases progress from a physical and not just a biological perspective.

My work pinpoints “mechanosensitive” pathways that become dysregulated in disease. These pathways underpin future biomarkers to stratify patients, choose treatment windows and monitor disease progression for patients while providing a new avenue for developing therapeutic targets.

I also work to de-risk therapies and biomedical devices for these diseases. I developed approaches to make standardised physiologically relevant 3D scaffold models that mimic human neural tissues to reduce the use of animals in research. These biomaterial platforms are now used as reproducible test-beds for next-generation implants, gene therapies and neural interfaces to better understand the human physiology of neurodegenerative disease.

Through engaging pre-clinical public and patient involvement (PPI) panels in spinal cord research, I work with people with lived experience of spinal injuries and disease to co-shape research questions, ensuring physiological research can be translated into meaningful change for patients and to develop guidelines for researchers/policymakers to mandate meaningful PPI in research.

If you had five minutes with a policymaker, what would you want them to understand or do differently because of your research?

1. Physiology underpins whether advanced therapies and biomedical devices work: drugs, gene therapies and biomaterial-based biomedical devices succeed or fail within a living tissue environment. Changes in tissue mechanics and cell-matrix interactions are not side-effects; they are active drivers of degeneration and recovery. As such, I want to ensure discovery-based neurophysiology and basic science are prioritised in UK and Ireland funding calls on translational research.
2. Rare diseases require interdisciplinary, collaborative, cross-border efforts to develop therapeutics: SMA, ALS and spinal cord injury are rare but enormously costly in human and economic terms. To better understand and develop therapies for these diseases, collaboration of interdisciplinary experts and resources across borders is vital to tackle these diseases for human health. I would highlight the importance of my ongoing cross-border collaborations (UK-Ireland-EU-US) for access to patient-derived cell lines, biobanks and shared modelling platforms, to advance interdisciplinary collaborative research for rare neurological diseases.

3. Patients must have a voice in pre-clinical science: I would propose implementing PPI requirements and resources into pre-clinical physiology and regenerative medicine funding, with guidance drawn from existing internationally established PPI guidelines, to ensure patients can have a voice in both basic and translational research.

What makes your research particularly suited to a parliamentary showcase?

Government priorities: My work sits at the intersection of rare disease, personalised medicine, advanced therapeutics and medical devices, all current priorities for UK health, life sciences and innovation policy.

UK-Ireland-USA collaboration and Society support: I was trained and have always been a physiologist, have been a Physiological Society member since 2017, and have received Society studentships and training awards. I now collaborate with UK and Irish clinicians and researchers, and with US partners at Harvard, demonstrating the international reach in physiology-led innovation and supporting the development of physiologists not just in the UK but abroad.

Strong engagement track record: I bring experience in explaining complex neurophysiology to patients, charities, school students and the public, and in co-creating PPI frameworks that could be scaled or adapted by policymakers. As such, I have extensive experience in communicating my research to a range of audiences to maximise engagement and inspire curiosity in research.

The primary component of my exhibit would be the display of tactile biomaterial samples. A series of safe biomaterials that, from our previous work, have now been used for peripheral nerve, bone, cardiac, cartilage and spinal cord repair applications. These practical examples would highlight how basic physiological discoveries have inspired the design and optimisation of these biomaterials and how that has translated these materials to the clinic. Policymakers will be able to physically pick up the biomaterials, which are FDA-approved and safe for handling, to experience first-hand how basic research in mechanobiology can be used to guide the

design of different implants (i.e. seeing how simply tuning the stiffness and the alignment of a material can promote regeneration). I would also present visuals in the form of a concise poster describing background information with images and quotes from people in our PPI research and how PPI has guided our research.

What stage is your research at?

Translational

What evidence of impact or future impact does your research have?

I have several lead-author publications in advanced biomaterials and basic biological science journals spanning biomaterial development, exploring mechanistic pathways and developing gene treatments for different biological tissues while primarily focusing on spinal cord applications.

I have been awarded >40 early-career awards for my work to date, including an Anatomical Society Scholarship (2019), a Fulbright Scholarship (2024). I have received Young Investigator Awards from Neuroscience Ireland (2021), the Anatomical Society (2022), the European Federation of Experimental Morphology (2021), SMA-EU (2026), and I have delivered over >50 national and international presentations.

I have demonstrated impact in mentoring the next generation of physiologists, with two of my students winning Gold Rob Clarke Physiological Society awards, and I have supervised several other students who have gone on to win major fellowships, supporting the next generation of researchers.

Have you previously engaged with policymakers, government, patients, charities, or the public?

Patients and charities: Co-founding member of an award-winning spinal cord PPI panel (funded by the IRFU Charitable Trust). I actively engage with charities such as the SMA Foundation and SMA-EU to ensure patient priorities are embedded in basic and translational research.

Public and schools: I co-founded the *Junior Researcher Programme*, bringing scientific research into socio-economically disadvantaged schools, funded by the Research Ireland-DISCOVER programme. I have also created microscopy-art exhibitions to inspire the wider public's engagement with science through art.

Additionally, I have served on institutional committees shaping governance, equity and research culture in the Royal College of Surgeons in Ireland.

Applicant

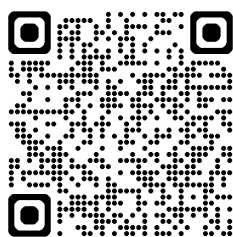
Genetic susceptibility to weight gain in dogs as a model for understanding obesity in people



Dr Eleanor Raffan
University of Cambridge

East of England

Area of research: Neuroendocrinology/
Endocrinology



What challenge does your research or project seek to address and why is it important for society or public policy?

I study the genetics and physiology of obesity, a major public health problem. By investigating why pet dogs gain weight, we have identified important new biology about how the brain controls appetite and body weight in people too.

How does your research generate evidence that could inform policy, practice, or public health?

1. Identifying new genes and molecular pathways that affect physiology, as the basis for future drug targets.
2. Providing compelling and relatable evidence about how genes govern susceptibility to an 'obesogenic' environment – changing the narrative away from viewing obesity as a lifestyle choice and towards better understanding that some people are particularly vulnerable to weight gain in our modern world.

If you had five minutes with a policymaker, what would you want them to understand or do differently because of your research?

I would want to show them how viewing obesity as a lifestyle choice is unhelpful, and to help them understand via our data that some people's genetics make them particularly vulnerable to weight gain in our modern world.

What makes your research particularly suited to a parliamentary showcase?

It is relatable – dogs! – and addresses an important research problem – how can we help obesity?

What stage is your research at?

Preclinical research

What evidence of impact or future impact does your research have?

My work has changed the veterinary text books already with regard to pet obesity management.

No direct human translational relevance as yet.

Have you previously engaged with policymakers, government, patients, charities, or the public?

Lots of public engagement in the media when past papers have been published. I regularly give talks to vets, pet owners or at science festival type events.

Applicant

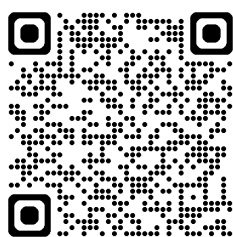
Our Dynamic Brain in a Changing World: Temperature, Sleep, and Biological Time



Dr Nina M Rzechorzek
University of Cambridge

East of England

Area of research: Human Physiology



What challenge does your research or project seek to address and why is it important for society or public policy?

My research as Principal Investigator and MRC Clinician Scientist asks how brain temperature, sleep, and biological time influence brain health and disease.

Healthy brain temperature is not fixed: it varies by region, age, sex, and time of day. Sleep and circadian rhythms coordinate neural, metabolic, and thermal physiology, with potential implications for how biomarkers are interpreted. I created the first 4D map of human brain temperature and showed that loss of its daily rhythm is strongly associated with mortality after traumatic brain injury. My wider programme links human neuroimaging with temperature- and time-resolved studies in human neural cells and tissues.

This matters because sleep disruption, shift work, neurological disease, and rising heat exposure affect brain health, safety, and productivity. RAND projected that insufficient sleep could cost the UK up to 2.17% of GDP in 2030.¹ Physiology that captures changing state—not isolated snapshots—could support safer work, climate resilience, better monitoring, timely intervention, and disease prevention.

How does your research generate evidence that could inform policy, practice, or public health?

My research generates evidence at three connected levels:

- Human brain physiology: advanced neuroimaging and clinical datasets reveal daily brain temperature rhythms and show that their disruption is clinically meaningful after brain injury.
- Sleep and biological timing: experimental medicine studies integrate sleep, circadian, and wearable measures to test how dynamic state influences function, fatigue, and resilience.

1. Hafner, M., Stepanek, M., Taylor, J., Troxel, W. M., & Stolk, C. V. (2016). *Why sleep matters -- the economic costs of insufficient sleep: A cross-country comparative analysis*. RAND Corporation. <https://doi.org/10.7249/rr1791>

- Mechanistic and translational models: human neural cells and brain organoids are used to test how physiological temperature cycles interact with cellular 'clocks', electrical activity, and disease-relevant molecular pathways.

This supports a practical approach for policy and healthcare: measurements should be interpreted in physiological context, not as isolated snapshots. Biological time, sleep schedules, temperature, and environmental exposure may all affect what a biomarker or wearable signal means.

Potential applications include better monitoring; improved timing of measurements and interventions; evidence-based fatigue and shift-work policy; clinically meaningful validation of wearable technologies; and climate-aware approaches to brain health. The goal is decision-grade evidence that improves both precision and accuracy—distinct requirements that are often conflated. Clinical, employer, and policy strategies must be deployed at the right time for a given population, under real-world conditions. We need precision, timed for practice.

If you had five minutes with a policymaker, what would you want them to understand or do differently because of your research?

I would want policymakers to understand that the brain is not physiologically constant. It changes with biological time, sleep, temperature, illness, and environment—and those changes affect health, safety, recovery, and performance.

I would ask them to act in three ways:

- Preserve context. Healthcare, research, and digital systems should retain time of measurement, sleep–wake state, physiological temperature, and relevant environmental exposure, rather than averaging them away.
- Demand physiologically credible AI. Algorithms and wearables can become more precise without becoming more accurate if trained on decontextualised snapshots. They should be validated across times of day, populations, and real-world conditions before informing decisions.
- Treat fatigue and heat as system risks. Shift work, sleep loss, and rising temperatures affect cognition, judgement, and neurological vulnerability, especially in healthcare and other safety-critical sectors. Policy should support safer rotas, resilient buildings, better monitoring, and climate-aware care pathways.

The principle is simple: measure change, interpret it in context and intervene at the right time.

Policymakers should fund the pathway from discovery to implementation so that physiology informs clinical decisions, workplace design, and public policy. Precision without physiological context is not accuracy.

What makes your research particularly suited to a parliamentary showcase?

This research is ideal for a parliamentary showcase because it makes an invisible physiological process visual, surprising, and policy-relevant.

- Immediate visual impact: few people realise how hot the brain is or how much its temperature varies. Interactive visualisations of our 4D HEATWAVE map could show how brain temperature varies by biological sex, across brain regions and over time.
- Familiar route into policy: sleep, fatigue, heat, and jet lag are widely understood experiences, but they connect directly to neurological health, NHS resilience, shift work, ageing, productivity, and climate adaptation.
- Breadth of modern physiology: the research spans advanced neuroimaging, clinical data, wearable monitoring, and time- and temperature-resolved studies in human neural cells and brain tissues.

Policymakers could grasp the central idea within seconds, then explore its implications. The message is memorable and actionable: the brain is dynamic, and better decisions depend on understanding when, how, and under what conditions physiology is measured.

What stage is your research at?

Translational

What evidence of impact or future impact does your research have?

My research has established that human brain temperature varies with brain region, biological sex, age, and time, and that disruption of its daily rhythm is associated with mortality after brain injury. Published in *Brain* and selected as Editor's Choice, the work attracted international scientific, clinical, and public attention.

Future impact lies in translating thermal and circadian physiology across scales. Linking neuroimaging, sleep, wearable, and clinical data with mechanistic studies in human neural cells and brain tissues could support:

- dynamic biomarkers of vulnerability, recovery, and treatment response;
- better interpretation and timing of neurological measurements and interventions;
- safer fatigue, shift-work, and heat-exposure policies;
- physiologically credible validation of wearables and AI-enabled monitoring.

The wider impact is conceptual and practical: testing whether temperature variability contributes to efficient brain information processing could reveal principles relevant to sustainable computing and AI infrastructure, while improving precision and accuracy in decision-making across healthcare, workplaces, and public policy.

Have you previously engaged with policymakers, government, patients, charities, or the public?

I submitted published evidence to the House of Lords Science and Technology Committee inquiry, Innovation in the NHS: personalised medicine and AI. I have contributed to a DHSC-linked Centre for Science and Policy workshop, the UCL–The Lancet Neurology–Wellcome workshop on climate change and neurological disorders, The Physiological Society's Global Climate and Health Summit, a UKHSA–Physiological Society roundtable on maximum indoor temperatures, and an NHS Staff Council HSWG roundtable on fatigue. Public engagement includes Cambridge Pint of Science, an MRC LMB Open Day lecture, podcasts, radio, the Science Media Centre, and international media coverage.

I welcome opportunities for academic and industry collaboration to advance the translation of brain temperature and circadian physiology into clinically meaningful biomarkers, interventions and health technologies. Anyone interested in discussing this research or potential partnerships is very welcome to contact me directly at nmr28@cam.ac.uk.

Applicant

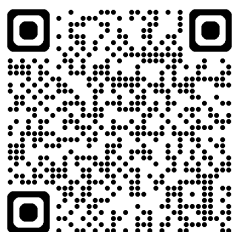
How well is our education preparing paramedic students to meet criteria in NICE CG109 regarding ECG patterns during transient loss of consciousness?



Dr Harry Witchel
*Brighton and Sussex
Medical School, University
of Sussex campus*

South East England

Area of research: Education & Teaching



What challenge does your research or project seek to address and why is it important for society or public policy?

There are many patients in the community who experience transient loss of consciousness (blackouts), most of whom have benign causes. However, a small proportion have underlying cardiac conditions associated with sudden cardiac death and require urgent specialist assessment. NICE Clinical Guideline CG109 recommends that frontline clinicians recognise specific high-risk ECG abnormalities and arrange urgent referral.

Paramedics are frequently the first healthcare professionals to assess these patients and must decide whether hospital assessment is required or whether it is safe to discharge them at the scene. Our research examines whether final-year paramedic students possess the ECG interpretation skills needed to implement this national guidance consistently. Understanding whether current educational outcomes match the competencies expected by national policy is essential for improving paramedic education, supporting consistent implementation of NICE guidance, and reducing avoidable harm across the NHS.

How does your research generate evidence that could inform policy, practice, or public health?

Our most recent research directly demonstrates that there is a mismatch between the abilities of final-year paramedic students and the expectations listed in NICE Clinical Guidelines CG109. We show how this mismatch could translate into inappropriate failure to refer onward for a small subset of patients presenting with transient loss of consciousness.

By comparing interpretation accuracy, referral decisions and confidence levels, our research identifies where educational outcomes diverge from national expectations and highlights which ECG abnormalities require greater emphasis during training.

These findings provide evidence for universities, ambulance services, professional regulators and policymakers responsible for healthcare education and

patient safety. They also support recent recommendations from the Health Services Safety Investigation Body for clearer national standards in ECG education and competency assessment for paramedic students – and potentially for practising first-responders. Our results also identify which dangerous ECG abnormalities are most frequently missed, allowing educational interventions to be targeted toward where they are likely to have the greatest impact.

This research provides evidence that can help ensure that newly qualified paramedics are better prepared to implement NICE guidance consistently, reducing the risk of missed referrals for patients with potentially life-threatening cardiac conditions, and improving the quality and safety of pre-hospital care.

If you had five minutes with a policymaker, what would you want them to understand or do differently because of your research?

I would encourage policymakers to recognise that publishing clinical guidance alone does not guarantee that it can be implemented consistently in practice. National guidance should be formulated in consultation with relevant educators and accompanied by clear educational standards. This will ensure that healthcare professionals are trained and assessed against the competencies required to deliver that guidance safely.

Our findings suggest that while most final-year paramedic students make appropriate referral decisions, some clinically important ECG abnormalities associated with sudden cardiac death remain under-recognised, creating the potential for missed referrals of patients at increased cardiac risk. This highlights the need for closer alignment between NICE recommendations, higher education curricula and professional competency frameworks.

I would encourage policymakers to support nationally agreed minimum standards for ECG interpretation in paramedic education, together with appropriate assessment and continuing professional development. Relatively modest improvements in education and could

strengthen implementation of existing NICE guidance, improve consistency across ambulance services and universities, and ultimately reduce avoidable harm through earlier identification and referral of high-risk patients.

What makes your research particularly suited to a parliamentary showcase?

1. Our research is directly related to policy at a national level because CG109 is a policy document focused on patient safety in a demanding and uncontrolled environment: in the community and in people's homes.
2. Our research question is easy to understand: "Why might clinicians miss something subtle on the ECG?" And the story is easy to communicate: "Have you ever fainted? OK, imagine you are entertaining at home and one of your guests inexplicably falls unconscious. This happens in real life -- it's common. You call for the emergency services, and by the time the ambulance arrives, your guest has regained consciousness, and they say they feel, 'Mostly fine, but a little slow.' Should the paramedics take your guest to hospital?"
- (3) Our research question is about a matter of life and death, so its importance is immediate.
- (4) The electrocardiogram is very visual and very experiential.

What stage is your research at?

Research on healthcare standards

What evidence of impact or future impact does your research have?

Our research provides evidence to strengthen implementation of existing national guidance rather than requiring new policy. Our findings identify specific gaps between the ECG interpretation competencies expected by NICE CG109 and the abilities of final-year paramedic students, highlighting areas where educational provision could be strengthened.

The results complement recent recommendations from the Health Services Safety Investigation Body calling for clearer national standards of teaching and assessment for ECG education in paramedic programmes.

Our next phase of research will evaluate practising clinicians across multiple healthcare professions to determine whether similar gaps exist in the current workforce. By informing curriculum development, competency standards and targeted ECG education, this programme has the potential to improve recognition of life-threatening cardiac conditions, increase consistency in referral decisions, and support earlier diagnosis and treatment for patients presenting with transient loss of consciousness.

Have you previously engaged with policymakers, government, patients, charities, or the public?

Our team has extensively engaged at all these levels. Harry Witchel was on the committee that produced the Physiological Society's *The Future of Interdisciplinary Research Beyond REF 2021*, which was presented by the Society to Parliament in 2021. Harry Witchel has led many studies on multiple sclerosis, and has interacted with charities representing these cohorts (MS Sussex and SEDS Connective), and interacted with individuals in these cohorts both in experiments as well as during Patient and Public Involvement. Sam Smith is a practising paramedic and is now a trained doctor, bringing extensive front-line clinical experience and direct patient engagement to the project.



The Physiological Society

As the largest network of physiologists in Europe, with academic journals of global reach, The Physiological Society continues a 150-year tradition of being at the forefront of the life sciences. We support the advancement of physiology by promoting collaboration between physiologists around the world, organising world-class conferences, publishing the latest developments in our scientific journals, and bringing scientific evidence and expertise to policy. We are a rigorous and independent source of scientific knowledge, drawing on the expertise of a diverse community of physiologists across career stages who support us in our various activities, including our policy work. Through this work, we connect policymakers and other stakeholders with the latest evidence and expertise from the physiological sciences, helping to inform decisions that affect health and society. Research in physiology helps us to understand how the body works in health, what goes wrong in disease, and how the body responds to the challenges of everyday life.



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