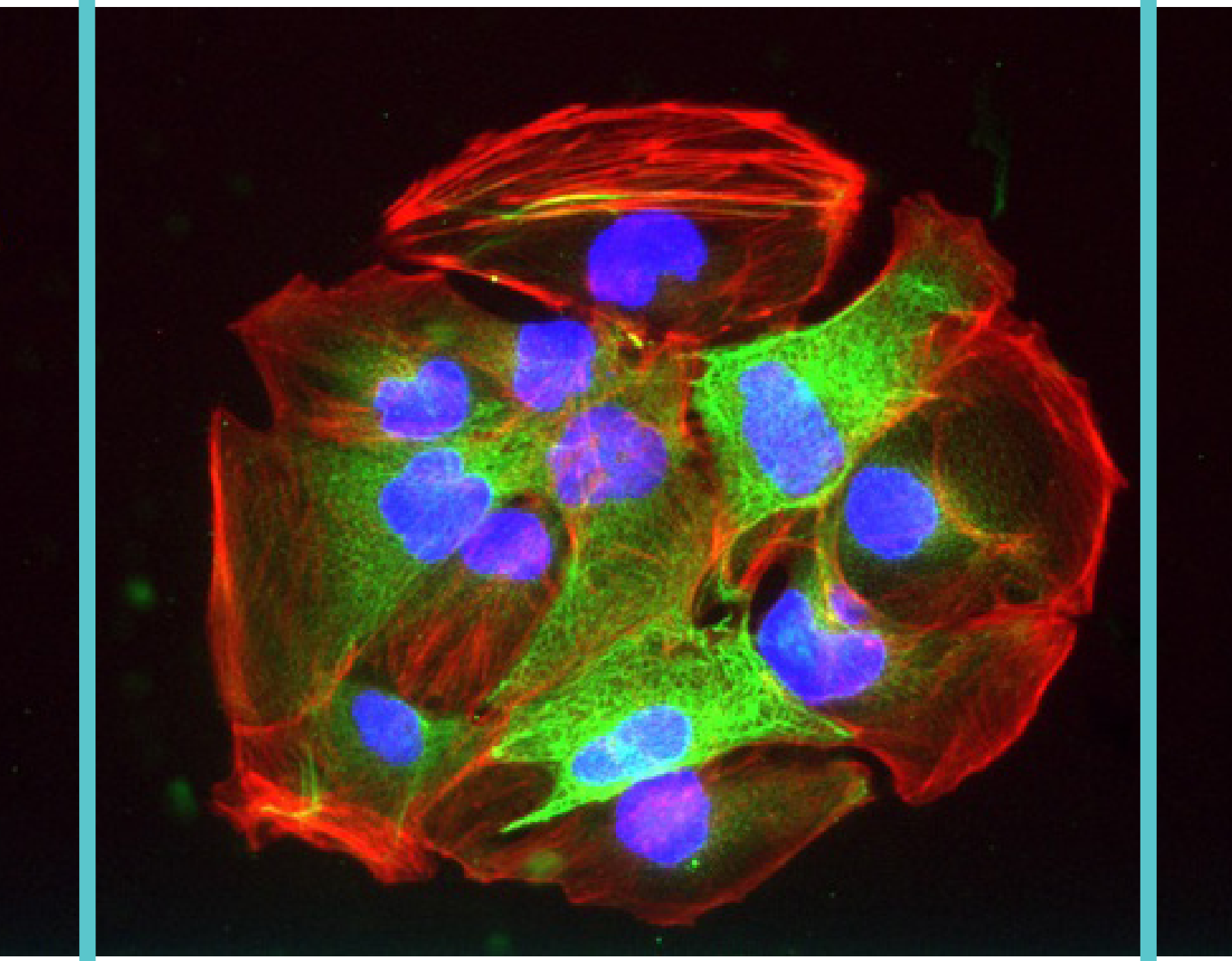
Centre for Trophoblast Research



UNIVERSITY OF CAMBRIDGE

A report prepared for the Donor

JUNE 2021

A message from
Professor Graham Burton

As I step down as Director of the CTR, my thoughts return to the various discussions we have had together, and with others, over the years as to what the aims of the Centre should be and what form it should take. Our ideas evolved over the years as we learnt from experience what works well and what the priorities are for the field, and the last few years have seen the project undoubtedly come to fruition. There has been a whole series of groundbreaking papers in the very top journals, from basic science to translational clinical studies. The placenta is no longer a forgotten organ as it was when you and I started our research careers, but is now featured on front covers of journals and in the media. Such increased awareness can only stimulate more and better research and encourage young investigators into the field, one of your principal objectives at the outset. What I also find particularly rewarding is the number of papers arising from collaborations between groups within the CTR, individuals working together, pooling their expertise as never before. This bodes well for the future.

I hand over to Professor Kathy Niakan, one of our former Next Generation Fellows, who will take the CTR forward to the next stage in its evolution. Thank you again for your vision and generosity in creating what is now undeniably a centre-of-excellence in trophoblast biology. I very much hope that some normality returns soon so that the CTR 'family' can meet again in person and celebrate all the successes.

"It has been a great honour to shape and lead the CTR, and I have appreciated your trust and support immensely."

With all best wishes,

Graham

Front and back cover images: Mouse trophoblast cells by Erica Watson.

Director's welcome

I am absolutely delighted to help further develop and support the CTR. The CTR helped nurture my research and launch my independent group. This is now my opportunity to give back.

The CTR was one of the University's first inter-school initiatives, and the collaborative and multidisciplinary approach has led to many landmark advances under Graham's leadership. Among many examples are the identification of the transcriptional networks underpinning trophoblast differentiation, recognition of the importance of the placenta for lifelong health of mother and child, derivation of organoid cultures of the endometrium and the trophoblast and providing evidence of the absence of a significant placental microbiome. The CTR has also fostered placental research internationally by hosting strategic scientific meetings, organising an annual Placental Biology course attended by delegates from over 34 countries, and running a programme of Next Generation Fellowships and graduate studentships. Many of the Fellows have gone on to be Group Leaders within the University and at other institutes.

One of my immediate priorities is to build on this strong foundation by further supporting the Next Generation Fellowships and PhD students, especially during this challenging and disruptive year. I would also like to promote and foster further collaborative opportunities, especially between clinical and basic sciences. Through the virtual Placental Biology Course and future in-person courses, meetings and training opportunities, I have a motivation to promote diversity and inclusion. I think there is a real opportunity for us to again lead the way in how to promote and foster this. The other area I would like to promote is access to specialist equipment and primary human samples, whether this is through the CTR Biobank or through the development of a CTR HFEA licence for human embryo research and training. This is an exciting opportunity for us to be flexible and responsive and to help further the CTR's scientific strengths and collaborative opportunities.

Wishing you all the very best,

Kathy

Professor Kathy Niakan

Director, Centre for Trophoblast Research

Mary Marshall and Arthur Walton Professor of Reproductive Physiology

Chair, Strategic Research Initiative in Reproduction

Grand Challenges

The mission of the CTR is to foster collaborations and promote excellence in the study of trophoblast biology. As a virtual centre we bridge trophoblast-related research across the School of Biological Sciences (PDN, Pathology, Genetics), Clinical School (Institute of Metabolic Science, MRC Epidemiology Unit and Obstetrics & Gynaecology) and affiliated institutes (Gurdon, Sanger, Babraham and the Cambridge Stem Cell Institutes).

MRC Epidemiology Unit

wellcome sanger institute

Babraham Institute

Department of genetics

UNIVERSITY OF CAMBRIDGE
School of Biological Sciences

pdn
Department of Physiology, Development and Neuroscience

UNIVERSITY OF CAMBRIDGE
Department of Pathology

wellcome-MRC cambridge stem cell institute

Wellcome Trust | MRC IMS Institute of Metabolic Science

UNIVERSITY OF CAMBRIDGE
Department of Obstetrics and Gynaecology

Gurdon INSTITUTE

In September 2019 we revisited our priorities and refreshed our Grand Challenges. We have four strategic priorities:

1. How are the extra-embryonic lineages established, defined developmentally and epigenetically, and what transcriptional networks maintain placental stem cells to regulate differentiation and growth?

2. What are the signals from the mother, fetus and placenta that regulate early placental development, immunological interactions, nutrient resource allocation and other key processes, and how are these signals integrated?

3. How are these signals perturbed by environmental cues, maternal health and metabolism to cause pathological complications of human pregnancy, and can knowledge of the basic science involved be translated into novel predictive, preventative or therapeutic interventions?

4. What are the consequences of poor placentation across generations, and how are these effects mediated?

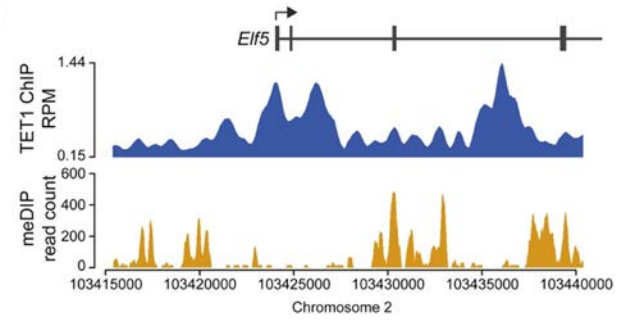
Scientific highlights

Members of the CTR have made significant advances during 2019 and 2020, despite the challenges due to the Covid-19 pandemic and lockdowns.

Trophoblast and endometrial biology.

The study of epigenetic regulation of the trophoblast lineage continues to be an area of focus. We highlight two cutting-edge examples from our NGFs who have recently published major significant studies.

Claire Senner demonstrated the importance of the ten-eleven translocation factor TET1 and its conferred epigenetic modification 5-hydroxymethylcytosine (5hmC) for maintenance of the trophoblast stem cell state. TET1 binding in trophoblast stem cells forms long-range interactions with key trophoblast genes. They also found that trophoblast stem cell differentiation-associated loss of 5hmC is slowed down in hypoxia.



Senner et al (2020). **TET1 and 5-hydroxymethylation preserve the stem cell state of mouse trophoblast**. *Stem Cell Reports*. doi:10.1016/j.stemcr.2020.04.009

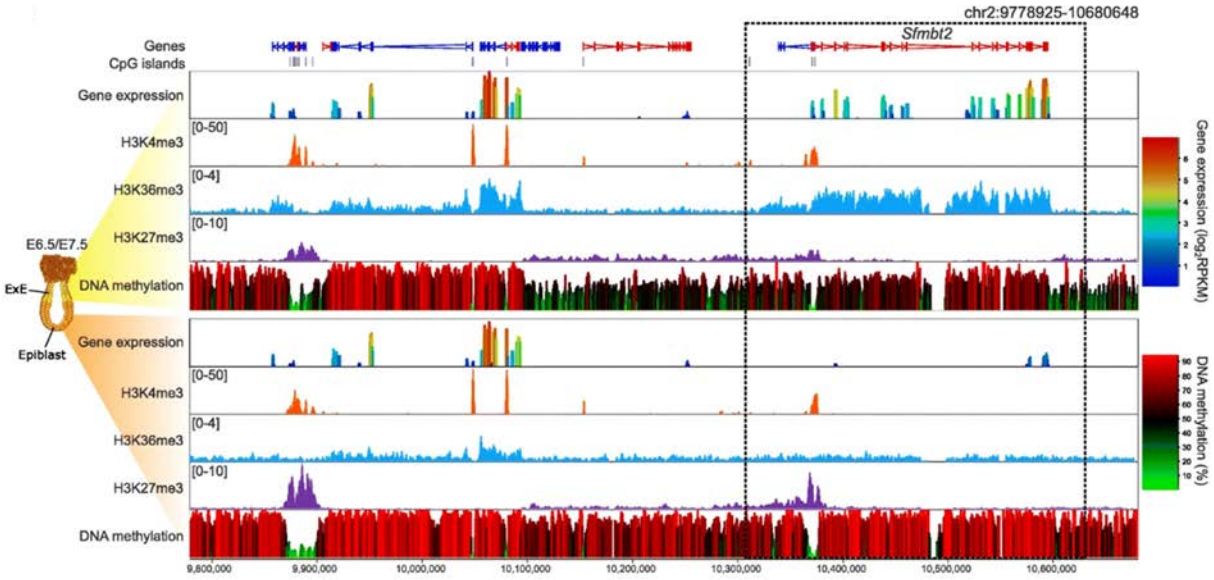
Dr Claire Senner

NGF since October 2019, studying the many facets of epigenetic regulation within the trophoblast lineage.

Courtney Hanna showed how endogenous retroviral insertions regulate imprinting of genes in the extra-embryonic tissues. This study reveals distinct epigenetic mechanisms regulating non-canonical imprinted gene expression between embryonic and extra-embryonic development and identifies an integral role for ERVK LTR repetitive elements.

Dr Courtney Hanna

NGF since June 2018, investigating the mechanisms of epigenetic inheritance and gene regulation in the developing placenta.



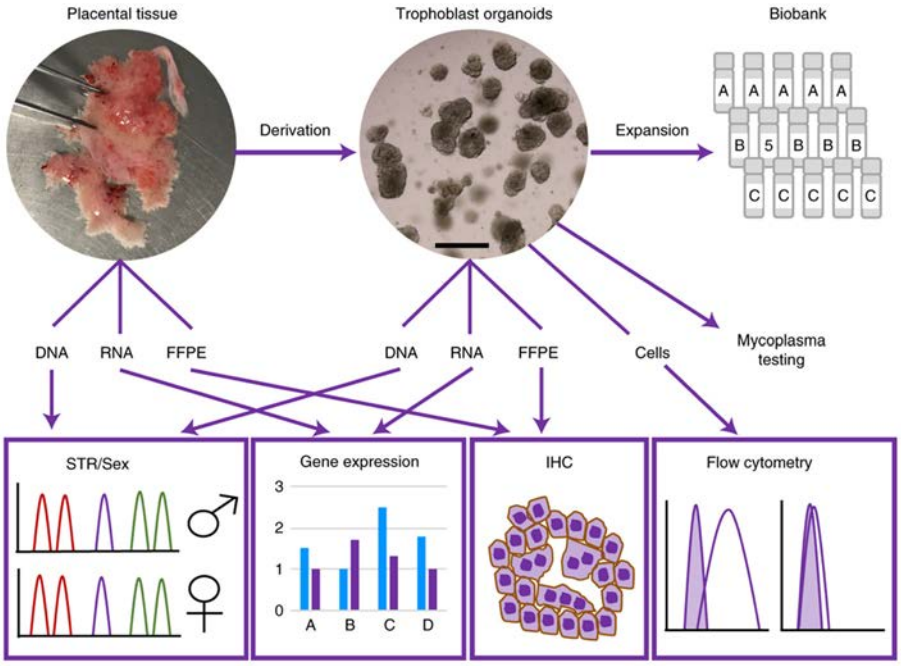
Hanna et al (2019). **Endogenous retroviral insertions drive non-canonical imprinting in extra-embryonic tissues**. *Genome Biology*, 20(1), 225. doi:10.1186/s13059-019-1833-x

Trophoblast organoids.

Pioneering work led by Margherita Turco as part of a fruitful collaboration between Ashley Moffett, Graham Burton and Myriam Hemberger's labs in the CTR led to the establishment of placental organoids. Since then, Margherita's lab has continued to further refine methods to culture in vitro cellular models of the placenta. Given the great international interest in the establishment of placental organoids, the Turco lab has developed a detailed protocol to facilitate trophoblast research globally.

Dr Margherita Yayoi Turco

Royal Society Dorothy Hodgkin Fellow

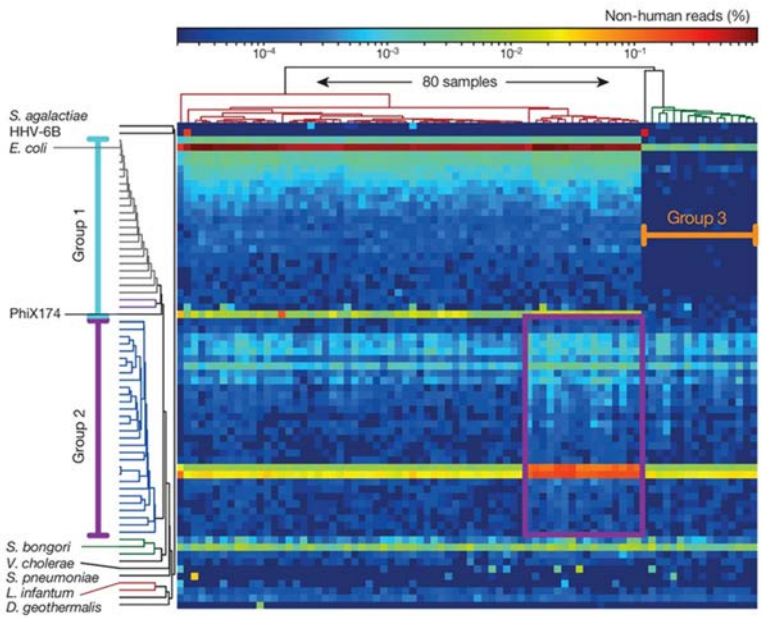


Sheridan et al (2020). **Establishment and differentiation of long-term trophoblast organoid cultures from the human placenta**. *Nature Protocols* 15, 3,441–3,463. doi:10.1038/s41596-020-0381-x

The placental microbiome.

Gordon Smith and Steve Charnock-Jones demonstrated elegantly that there is a lack of a significant microbiome in normal health placenta. Their collaboration revealed that previous studies suggesting a microbiome had been confounded by bacterial DNA contaminants in the kits used to process the placental samples.

The Smith and Charnock-Jones groups were unable to identify the presence of bacteria in a large cohort of placenta from healthy pregnancies and others complicated by growth restriction or pre-eclampsia, with the exception of *Streptococcus agalactiae* (group B Streptococcus), for which non-contaminant signals were detected in approximately 5% of samples. They concluded that there is no placental micobiome in health or disease, but that the placenta does represent a potential site of perinatal acquisition of *S. agalactiae*, a major cause of neonatal sepsis.



de Goffau et al (2019). **Human placenta has no microbiome but can contain potential pathogens**. *Nature*, 572(7769): 329–334.

Professor Gordon Smith

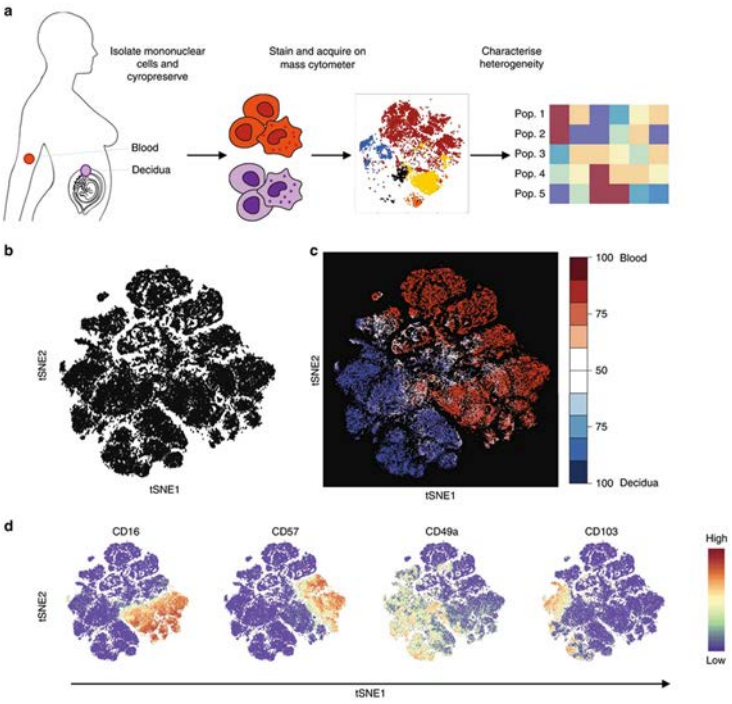
Head of Department, Department of Obstetrics and Gynaecology

Professor Steve Charnock-Jones

Professor of Reproductive Biology, Department of Obstetrics and Gynaecology

Distinctive phenotypes and functions of innate lymphoid cells in human decidua.

A collaboration led by Francesco Colucci and Ashley Moffett used single mass cytometry to characterise five main decidual innate lymphoid subsets of cells (dILCs): decidual NK cells (dNK)1-3, ILC3s and proliferating NK cells. They showed that dILCs are unique and provide specialised functions dedicated to achieving placental development and successful reproduction. The paper was selected in 2020 as the *Nature Communications* Editors' Highlights of the Year.



Huhn et al (2020). **Distinctive phenotypes and functions of innate lymphoid cells in human decidua during early pregnancy**. *Nature Communications* 11, 381. https://doi.org/10.1038/s41467-019-14123-z

Dr Francesco Colucci

University Reader in Immunology, Department of Obstetrics and Gynaecology

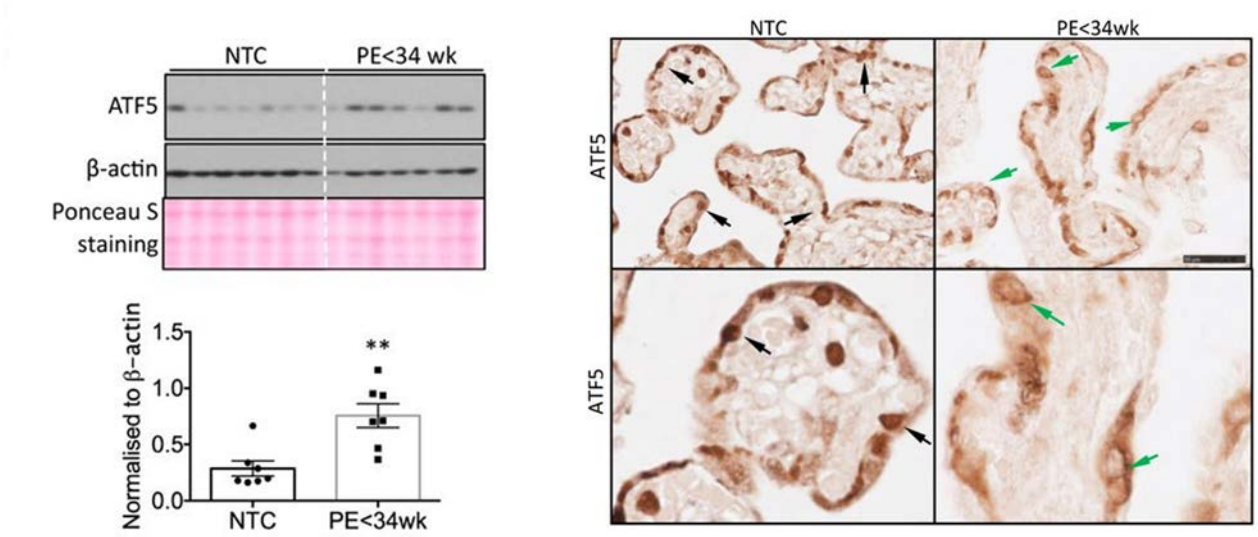
Professor Ashley Moffett

Principal Investigator, Department of Pathology

Placental stress.

Placental stress is widely held to be a key intermediary stage in the development of preeclampsia, in particular the early-onset form that develops before 34 weeks of gestation. Dr Hong Wa (Billy) Yung and Graham Burton were the first to report the phenomenon of endoplasmic reticulum stress in these placentas, leading to activation of the unfolded protein response pathways. They have gone on to show that mitochondrial function in these placentas is impaired, with reduced capacity for oxidative phosphorylation. Reduced energetics will lead to a compromise of placental function, and may contribute to preeclampsia.

Professor Graham Burton

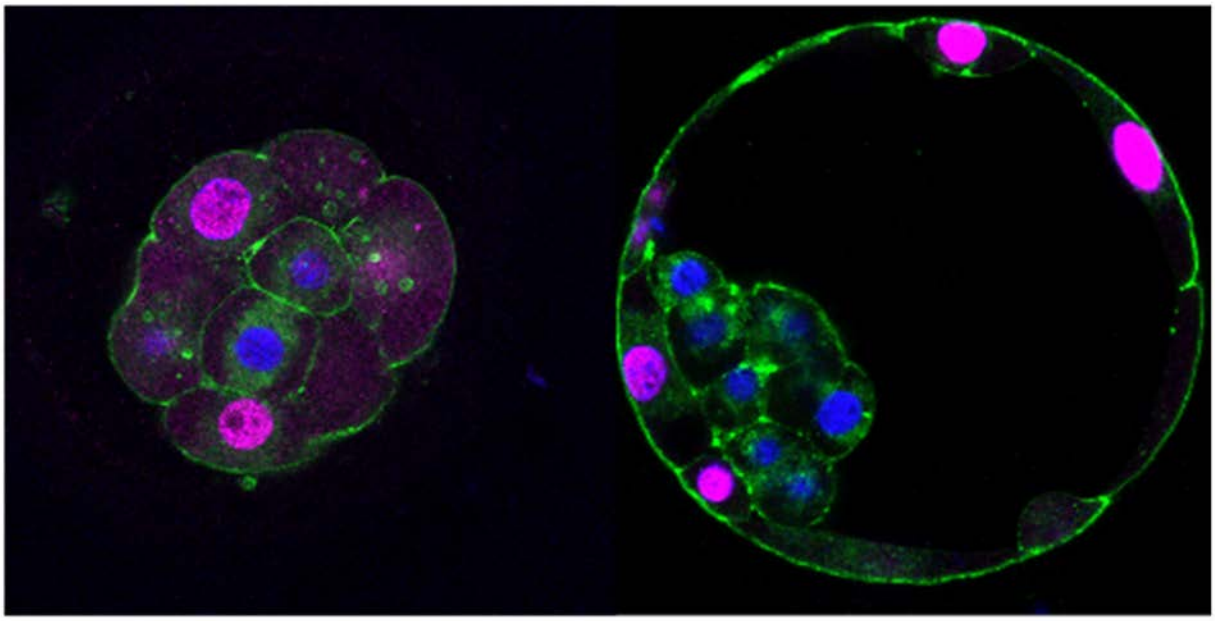


Yung et al (2019). **Noncanonical mitochondrial unfolded protein response impairs placental oxidative phosphorylation in early-onset preeclampsia**. *PNAS* 116(36): 18,109-18,118.

Trophectoderm initiation.

Kathy Niakan's laboratory uncovered the molecular mechanisms that initiate the first cell fate decision in human development, which is the specification of trophectoderm cells. They showed that differential apico-basal polarity drives the first lineage differentiation event in humans. The initiation of this program is in turn regulated by differential Hippo signalling and downstream expression of the GATA3 transcription factor. Their comparative embryology analysis informs a mechanistic model of early lineage specification in human preimplantation embryos and indicates an evolutionary conserved mechanism of trophectoderm cell initiation within mammals. The study has potential clinical impact given that the timing of this decision coincides with the stage when most human embryos arrest and that the quality of trophectoderm cells is an important determinant of success in fertility treatment.

Professor Kathy Niakan



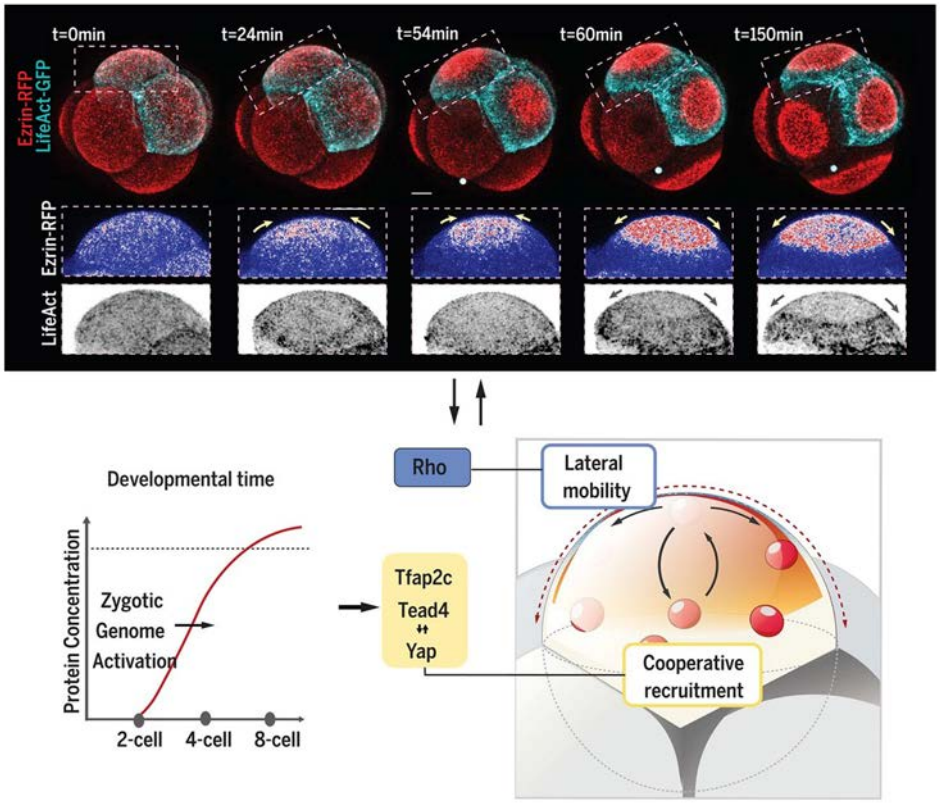
Gerri et al (2020). **Initiation of a conserved trophectoderm program in human, cow and mouse embryos**. *Nature* 587, 443–447. https://doi.org/10.1038/s41586-020-2759-x

Placental stress.

Magdalena Zernicka-Goetz's laboratory have demonstrated the role of three molecular regulators, Tfap2c, Tead4 and RhoA, in regulating the establishment of cell polarity in the early mouse embryo. These factors are sufficient to advance the timing of cell polarisation in early mouse embryogenesis which in turn regulates cell fate specification and morphogenesis, leading to the initiation of trophectoderm differentiation. This work was led by Meng Zhu with help from CTR PhD student Charlotte Handford.

Professor Magdalena Zernicka-Goetz

Professor of Mammalian Development and Stem Cell Biology



Zhu et al (2020). **Developmental clock and mechanism of de novo polarization of the mouse embryo**. *Science*, 370, 6,522. doi:10.1126/science.abd2703

Making connections

Cambridge Reproduction SRI

The CTR is now an integral part of the Reproduction Strategic Research Initiative.

Cambridge's biggest strength is its unrivalled breadth of expertise across the humanities, social sciences and biomedical sciences. In particular, there are hubs of research excellence in physiology (the CTR), sociology (ReproSoc), historical fertility and demographics (CAMPOP), history of reproduction (HPS), developmental and post-natal programming of metabolic disease (Institute of Metabolic Science, MRC Epidemiology Unit and Obstetrics & Gynaecology), and germline and epigenetics research (Genetics, Gurdon Institute and Babraham Institute). Although other institutions nationally and internationally approach the study of reproduction from some of these angles, none has the strength in breadth that the SRI can offer.

The SRI is currently focused on research organised around three grand challenges: the future of reproduction; maternal and fetal mortality; and inheritance, development and environment. By approaching reproduction collectively and across disciplines, it offer fresh perspectives on broad issues ranging from global policies to those which affect individuals, families and populations.

Graham Burton and Ashley Moffett were invited to participate in a 'Pregnancy Think-Tank' at the Burroughs-Wellcome Fund (BWF) in November 2019. The aim was to explore and propose potential avenues to capitalise on new concepts and technologies in relation to complications of pregnancy, and to help shape the BWF's funding in this area. A paper summarising the discussions has recently been published:

Sadovsky et al (2020). **Advancing Human Health in the Decade Ahead: Pregnancy as a Key Window for Discovery: A Burroughs Wellcome Fund Pregnancy Think-Tank**. *American Journal of Obstetrics and Gynecology*, 223, 3: 312-321.

CTR Bioinformatics Facility

The CTR bioinformatics facility was initiated in May 2016. We have established analysis pipelines on in-house servers as well as the Universities high performance computer cluster. We have developed best practices for performing bioinformatics analysis to ensure openness and reproducibility.

The core now consists of two postdoctoral researchers and Head of Facility. The bioinformatics team has been involved in many high-profile studies in the CTR as well as publishing bioinformatics guides for computational workflows and the analysis of methylation sequencing data. Dr Russell Hamilton, the Head of the CTR Bioinformatics Facility, is also a senior research associate in the Department of Genetics, where he is developing an independent research programme in the role of local nucleic acid structures in regions under epigenetic control.

Dr Russell Hamilton

Senior Research Associate and head of CTR Bioinformatics Facility

CTR Biobank

The principal objective of the CTR Tissue Bank is to facilitate the research of members of the CTR allowing us to take a more interdisciplinary approach to research, looking at reproduction from both the maternal and fetal angles in an integrated fashion. It also allows us to maximise the use of samples donated. The CTR Tissue Biobank facilitates this approach by allowing us to bring together both non-pregnant and pregnant maternal endometrial samples from the womb and placental samples at different stages of gestation. Samples in the Bank are available to all members of the CTR.

Performance

Income

- £7.46m endowment from which we draw approximately £300,000 per year in interest that goes into a spendable trust fund
- Spendable fund is now £2.21m

The CTR has averaged £1.2m spending per year over the past few years. The CTR currently supports the following:

NGFs	6
PhD students	8
Bioinformaticians	3
Part-time administrator	1
CTR chief research technician	1
Senior technician based in the Moffett and Turco labs	1
Senior postdocs based in the Burton lab	2

4 CTR-funded PhDs completed in 2019-20

Iva Filipovic is pursuing a postdoctoral fellowship at the Karolinska Institute, and has been awarded a Cancerfonden postdoctoral fellowship investigating tissue-resident innate lymphocytes in cholangiocarcinoma, an aggressive cancer of the bile ducts.

Nadia Capatina is pursuing graduate clinical medicine at the University of Cambridge.

Wen Tong is pursuing graduate clinical medicine at Imperial College London.

Lorenzo Orietti is pursuing a Master's in Business Administration in Milan.

Grant highlights

Value of all grants awarded to CTR PIs in 2019: **£7.4m**

Value of all grants awarded to CTR PIs in 2020: **£12.4m**

Awards received:

wellcome trust

Investigator Award: Gordon Smith and Steve Charnock-Jones

The evaluation and development of novel diagnostic methods to understand and prevent placentally related complications of human pregnancy (2020–2024)

Collaborative Award: Wolf Reik, Jenny Nichols and Ben Simons

Molecular mechanisms of cell fate decisions in gastrulation and early organogenesis (2020–2025)

Collaborative Award: Azim Surani, Kathy Niakan, Wolf Reik, Peter Rugg-Gunn and Gavin Kelsey

Human Developmental Biology Initiative (2019–2024)

erc
European Research Council
Established by the European Commission

ERC Starting Grant: Margherita Turco

Human Placental Development and the Uterine Microenvironment (2020–2025)

Medical Research Council

Mechanistic Nutrition Links Collaborative Grant: Amanda Sferruzzi-Perri (among others)

OPTIMISE: Optimal preconception nutrition to offset inflammation and non-communicable disease risk in pregnant women and their children (2020–2025)

MRC Industry Collaboration Agreement (MICA): Dino Giussani (co-applicant with Professor Lees)

A non-invasive ultrasound-guided high intensity focused ultrasound system for placental and fetal vascular ablation (2019–2022)

European Training Network Collaborative Grant: Anne Ferguson-Smith (among others)

DohART-NET – Periconceptional Programming of Health Training Network (2019–2023)

CHAN ZUCKERBERG INITIATIVE

Chan Zuckerberg Initiative: Roser Vento-Tormo

To study the effects of Covid-19 on trophoblast using single-cell sequencing (2020)

NIH

National Institutes of Health (NIH) Director's Pioneer Award and Research Project Grant (RO1): Magdalena Zernicka-Goetz

Placental models to support embryogenesis in vitro (2020–2024)

Temporal programme for cell fate specification in the mouse embryo (2020–2024)

Prizes and awards

Members of the CTR continue to receive markers of esteem. Here, we provide some highlights.

Professor Anne Ferguson-Smith was awarded the 2019 Feldberg Prize in recognition of her outstanding scientific contributions. The Feldberg Foundation promotes scientific contact between German and English scientists in experimental medical research, especially in physiology, pharmacology and related topics, primarily through scientific exchange lectures. Anne was recently appointed Interim Pro-Vice Chancellor for Research.

Graham Burton received the Anne McLaren Distinguished Scientist Award from the Society of Reproduction and Fertility in January 2020. This award acknowledges the work of premier scientists that have made major scientific contributions to the field of reproductive biology. Graham presented a lecture, 'Placentation: The platform for life-long health'.

Graham was also awarded the Joan Hunt Senior Award for 2020 from the International Federation of Placenta Associations (IFPA). The IFPA Senior Award represents the highest distinction of the international placental research community, and recognises those who have led placental research groups for a substantial period of time and made a significant contribution to our understanding of placental functions.

Professor Dino Giussani was the 2020 recipient of The Physiological Society's GL Brown Prize Lecture. The GL Brown Prize Lecture series is aimed at an early career audience to stimulate an interest in physiology. The national awardee is invited to give six enthusing lectures at selected universities around the country. Dino said 'It was a delightful surprise and a huge honour to be the recipient of The Physiological Society GL Brown Prize Lecture Series for 2020. I very much look forward to interactions with many students aspiring to be physiologists during the delivery of the lectures over the next few months, albeit online.'

Dr Vicente Pérez-Garcia, a CTR NGF, was awarded the Sir Michael Berridge Prize from the Babraham Institute for 2019. The Prize recognises Vicente's outstanding contribution to the paper, 'Placental defects are highly prevalent in embryonic lethal mouse mutants' published in *Nature* in 2018. The judges highlighted the impact the research has had in the field of developmental biology.

Dr Jorge Lopez-Tello, a postdoc in Amanda Sferruzzi-Perri's group, received the Postdoctoral Prize 2019 from the Society of Reproduction and Fertility for his presentation, 'Aberrant Igf2-H19 expression in the placental endocrine zone increases the susceptibility of the mother to poor metabolic health'.

Professor Wolf Reik is a Web of Science and Thomson Reuters Highly Cited Researcher (2019, 2020) from the Web of Science, having achieved an H-index of over 100. He is now Acting Director of the Babraham Institute.

CTR visitor **Giulia Avellino** was selected for the Society for Reproductive Investigation President's Plenary Award for her abstract, 'Placental Central Carbon Metabolism Links Polyamines to Histone Acetylation'. These awards recognise the four highest-ranked abstracts chosen for presentation at the President's New Investigator Plenary Session. Giulia started a PhD at the CTR in October 2020.

Kate Williams was awarded the Stewart Rhind Science Writing prize from the Society of Reproduction and Fertility for her essay, 'Ethicolegal Aspects of Reproductive Science: Adapting the 14-day rule for embryo research to encompass evolving technologies'. This prize is for undergraduates, and Kate's essay was an adaptation of her Part II dissertation supervised by Martin Johnson.

Dr Amanda Sferruzzi-Perri was awarded the Hans Sigrist Prize from the Hans Sigrist Foundation at the University of Bern in Switzerland. The prize recognises a top mid-career academic researcher/scientist working in the prize field, who has already done groundbreaking research and who shows promise of more. This year's prize field was 'Maternal–fetal communication during pregnancy'.

Professor Magdalena Zernicka-Goetz was named Chih-Ye Professor of State Key Laboratory of Stem Cell and Reproductive Biology, Institute of Zoology, Chinese Academy of Sciences and is among Prospect Magazine's top 10 world thinkers in 2020 in recognition for her work on the development of embryo-like structures and pioneering approaches to study human embryos in vitro shortly after implantation. She was awarded the NIH Director's Pioneer Award in 2020 in recognition of her research.

Although predating 2019, it is worth recognising the importance of our CTR colleague **Professor Azim Surani**, who was awarded the Gairdner International Award (the Canadian Nobel) in 2018 in recognition of his pioneering and innovative work on genomic imprinting and epigenetics. Azim is a Wellcome Trust Senior Investigator Award holder.

In total, seven CTR PIs are Wellcome Investigator Award Holders and one holds a Senior Research Fellowship. CTR NGFs have gone on to hold Royal Society Dorothy Hodgkin and Wellcome Sir Henry Dale Fellowships.

Appendix

Publications July 2019–December 2020

Irving Aye

Aye, Irving LMH; Aiken, Catherine E; Charnock-Jones, D Stephen; Smith, Gordon CS (2020). **Placental energy metabolism in health and disease—significance of development and implications for preeclampsia**. *American journal of obstetrics and gynecology*, ISSN: 0002-9378, 1097-6868. doi:10.1016/j.ajog.2020.11.005

Thorsten Boroviak

Connor R and Boroviak T (2020). **Origin and function of the yolk sac in primate embryogenesis**. *Nature Communications*. https://doi.org/10.1038/s41467-020-17575-w

Graham Burton

Lorenzon, Aline R; Moreli, Jusciele Brogin; de Macedo Melo, Rafaela; Namba, Felipe Yukio; Staff, Anne Cathrine; Yung, Hong Wa; Burton, Graham J; Bevilacqua, Estela Stromal (2020). **Cell-Derived Factor (SDF) 2 and the Endoplasmic Reticulum Stress Response of Trophoblast Cells in Gestational Diabetes Mellitus and In Vitro Hyperglycaemic Condition**. *Current Vascular Pharmacology* 19(2): 201-209. ISSN: 15701611. doi:10.2174/1570161118666200606222123

Riley E Thompson 1, 2, Aime K Johnson 3, Pouya Dini 4, Margherita Y Turco 5, Tulio M Prado 1, Christopher Premanandan 6, Graham J Burton 5, Barry A Ball 4, Brian K Whitlock 1, and Budhan S Pukazhenthi 2 (2020). **Hormone-responsive organoids from domestic mare and endangered Przewalski's horse endometrium**. *Society for Reproduction and Fertility* 160(6). https://doi.org/10.1530/REP-20-0266

Thomas JR, Appios A, Zhao X, Dutkiewicz R, Donde M, Lee CYC, Naidu P, Lee C, Cerveira J, Liu B, Ginhoux F, Burton G, Hamilton RS, Moffett A, Sharkey A, McGovern N (2020). **Phenotypic and functional characterization of first-trimester human placental macrophages, Hofbauer cells**. *Journal of Experimental Medicine* 218(1): e20200891.

Sheridan, Megan A; Fernando, Ridma C; Gardner, Lucy; Hollinshead, Michael S; Burton, Graham J; Moffett, Ashley; Turco, Margherita Y (2020). **Establishment and differentiation of long-term trophoblast organoid cultures from the human placenta**. *Nature Protocols* 15(10): 3,441-3,463. ISSN: 1754-2189, 1750-2799; doi:10.1038/s41596-020-0381-x

Sadovsky, Yoel; Mesiano, Sam; Burton, Graham J; Lampl, Michelle; Murray, Jeffrey C; Freathy, Rachel M; Mahadevan-Jansen, Anita; Moffett, Ashley; Price, Nathan D; Wise, Paul H; Wildman, Derek E; Snyderman, Ralph; Paneth, Nigel; Capra, John Anthony; Nobrega, Marcelo A; Barak, Yaacov; Muglia, Louis J (2020). **Advancing human health in the decade ahead: pregnancy as a key window for discovery**. *American Journal of Obstetrics and Gynecology* 223(3): 312-321. ISSN: 0002-9378, 1097-6868; doi:10.1016/j.ajog.2020.06.031

Jauniaux, Eric; Zosmer, Nurit; Subramanian, Devi; Shaikh, Hizbullah; Burton, Graham J (2020). **Ultrasound-histopathologic features of the utero-placental interface in placenta accreta spectrum**. *Placenta* 97: 58-64. ISSN: 0143-4004; doi:10.1016/j.placenta.2020.05.011

Abbas, Yassen; Brunel, Lucia G; Hollinshead, Michael S; Fernando, Ridma C; Gardner, Lucy; Duncan, Imogen; Moffett, Ashley; Best, Serena; Turco, Margherita Y; Burton, Graham J; Cameron, Ruth E (2020). **Generation of a three-dimensional collagen scaffold-based model of the human endometrium**. *Interface Focus* 10(2), 20190079. ISSN: 2042-8898, 2042-8901; doi:10.1098/rsfs.2019.0079

Jauniaux E, Hussein AH, Zosmer N, Elbarmelgy RM, MD, Elbarmelgy RA, Shaikh H and Burton GJ (2020). **A new methodologic approach for clinico-pathologic correlations in invasive placenta previa accreta**. *American Journal of Obstetrics and Gynecology*, 222, 379.e1-11

Jauniaux E, Moffett A and Burton GJ (2020). **Placental Implantation Disorders**. *Obstetrics and Gynecology Clinics of North America*, 7, 117-132

Lorenzon-Ojea AR, Yung HW, Burton GJ and Bevilacqua E (2020). **The potential contribution of stromal cell-derived factor 2 (SDF2) in endoplasmic reticulum stress response in severe preeclampsia and labor-onset**. *Biochimica et Biophysica Acta. Molecular Basis of Disease*, 1866, 165386

Burton GJ, Cindrova-Davies T and Turco MY (2020). **Histotrophic nutrition and the placental–endometrial dialogue during human early pregnancy**. *Placenta* Epub ahead of print. doi:10.1016/j.placenta.2020.02.008

Tunster SJ, Watson ED, Fowden AL and Burton GJ (2020). **Placental glycogen stores and fetal growth: insights from genetic mouse models**. *Reproduction*, Epub ahead of print. PMID: 32191912

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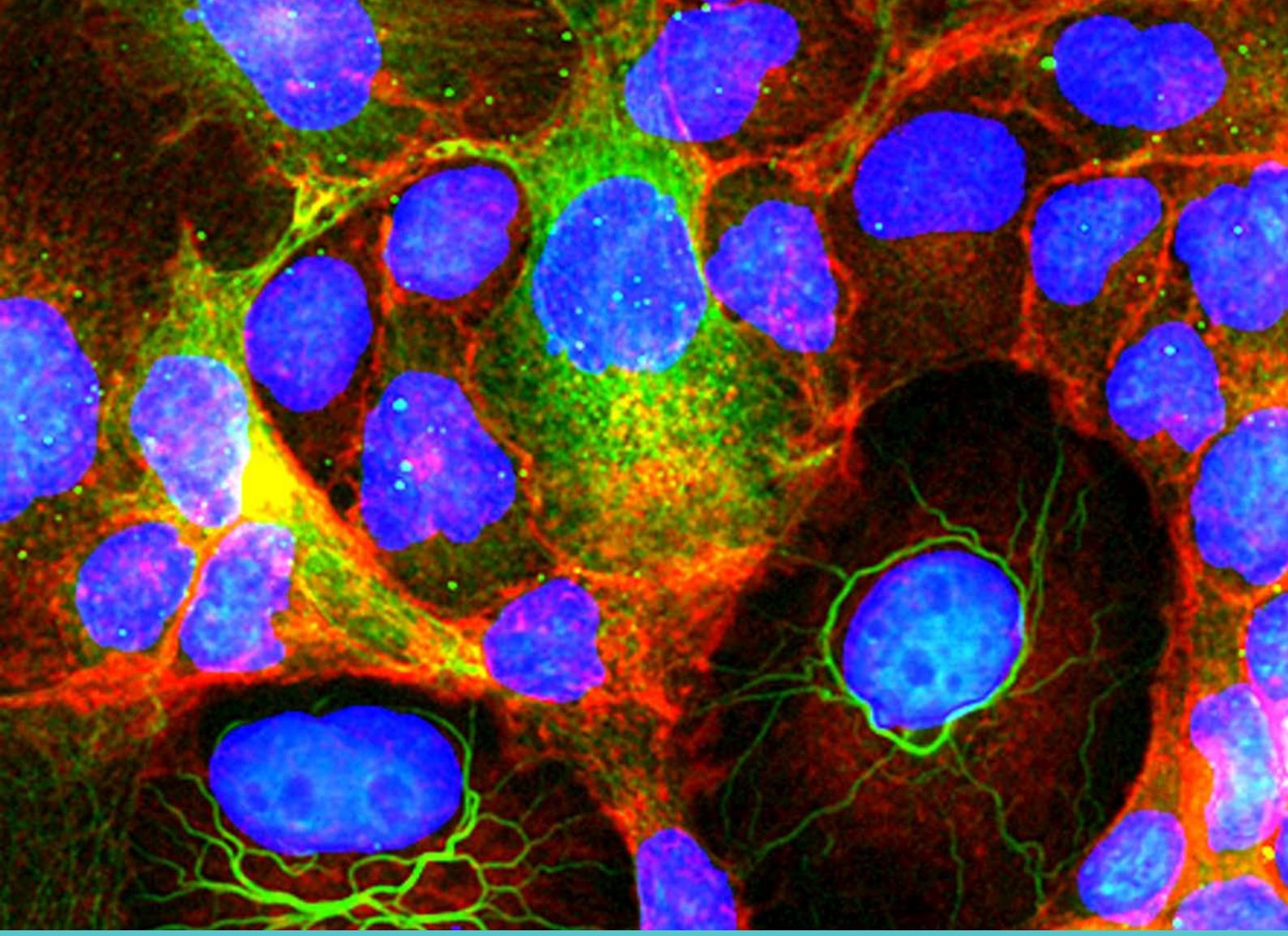

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