Endocrine Cancer Group and Birmingham Thyroid Group

Director: Professor Chris McCabe

Research Overview

The Institute of Metabolism & Systems Research (IMSR) brings together interdisciplinary world experts under the collective mission of innovating systems science in metabolism, maternal health and endocrinology. Our end goal is to contribute advances to medicine and healthcare to improve health and wellbeing globally. Our research is grouped into four complementary themes:

- Metabolism
- Endocrinology
- Maternal and Reproductive Health
- Systems Modelling and Quantitative Biomedicine

Within the Endocrinology theme, the **Endocrine Cancer Group** and the **Birmingham Thyroid Group** work on diverse mechanisms of endocrine cancers, particularly via thyroid and breast tumour models. Specifically, research currently focuses on proto-oncogenes in thyroid and breast tumours, mechanisms of aneuploidy and genetic instability, and the action of the sodium iodide symporter NIS in thyroid and breast tumours.

Over the past 20 years the McCabe group has pioneered multiple mechanistic insights into the aetiology of thyroid and breast cancer (see publications). The goal remains to unite basic, translational and clinical science, with fundamental insights driving clinical understanding. The McCabe group currently holds funding from numerous funders including the Medical Research Council, NIHR and the Department of Defense. We enjoy wide and fruitful links to other groups around the world.

Technologies

Our scientists employ all elements of the translational cascade, with a combination of in vitro and in vivo models, human in vivo physiology, in vivo imaging approaches, experimental medicine studies and clinical trials. IMSR investigators drive core components of the Centre of Membrane Proteins and Receptors (COMPARE).

We utilise unique technology platforms for our frontier-pushing research:

- Confocal in vivo imaging
- Mouse metabolic phenotyping
- Phenome Centre Birmingham
- Metabolic Tracer Analysis Core (MTAC)
- Henry Wellcome Biomolecular NMR Facility
- Human in vivo physiology
- Etc

Our research further benefits from the Next Generation Sequencing Core Facility and the Centre for Computational Biology, with major server capacity by the University of Birmingham BlueBEAR core.

Research Group

Members of the McCabe group include a Consultant Clinician, a Clinical Lecturer, an MRC Senior Research Fellow, 4 PhD students, and an MRC technician. Chris McCabe is Deputy Director of the IMSR and Theme Lead for Endocrinology. Chris was until recently Chair of the Wellcome Trust Basic Science Interview Committee, as well as being co-opted onto the Wellcome Clinical Committee. He served on the Health Research Board of Ireland, and was Chair of the Science Committee, and previously the Programme Committee, for the Society for Endocrinology. He is an Associate Editor of Endocrine Related Cancer, and a member of multiple national and international committees including the International Congress for Endocrinology POC and the Science Committee of the European Society for Endocrinology. He is the current Chair of the American Thyroid Association POC.

Key Publications

Read ML, Brookes K, Thornton C, Fletcher AL, Alshahrani M, Khan R, Nieto H, de Souza PB, Webster JRM, Alderwick LJ, Boelaert K, Smith VE, **McCabe CJ**. 2021. New mechanisms of radioiodide uptake revealed via a novel high throughput drug screening approach in thyroid cancer. *Cell Chem Biol* (In Press)

Nieto HR, Thornton CEM, Brookes K, de Menezes AN, Fletcher A, Alshahrani M, Kocbiyik M, Sharma N, Boelaert K, Cazier JB, Mehanna H, Smith VE, Read ML, McCabe CJ. 2021. Recurrence of Papillary Thyroid Cancer: A Systematic Appraisal of Risk Factors. JCEM (In Press)

Fletcher A., Read M.L., Thornton C.E.M., Larner D.P., Poole V.L., Brookes K., Nieto H.R., Alshahrani M., Thompson R.J., Lavery G.G., Landa I., Fagin J.A., Campbell M.J., Boelaert K., Turnell A.S., Smith V.E. and **McCabe C.J**. 2020. Strategically targeting novel sodium iodide symporter interactors to enhance radioiodine uptake. *Cancer Research* 80(1):102-115

Dhillon-Smith RK…[14 authors]… **McCabe CJ**….. Coomarasamy A. 2019. Levothyroxine in Preconception Women with Thyroid Peroxidase Antibodies. *New England Journal of Medicine* 380(14):1316-1325

Rebecca J Thompson, Alice Fletcher, Katie Brookes, Hannah Nieto, Mohammed Alshahrani, Jonathan W Mueller, Nicholas HF Fine, David J Hodson, Kristien Boelaert, Martin L Read, Vicki E Smith, **McCabe CJ**. 2019. Dimerisation of the sodium/iodide symporter (NIS). *Thyroid* 29 (10), 1485-1498

B Torlinska, L Nichols, MA Mohammed, **CJ McCabe** and K Boelaert. 2019. Patients treated for hyperthyroidism are at increased risk of becoming obese: findings from a large prospective secondary care cohort. *Thyroid* 29 (10), 1380-1389

Read ML, Modasia M, Fletcher A, Thompson RJ, Baker K, Rae PC, Nieto HR, Poole VL, Campbell MJ, Boelaert K, Turnell AS, Smith VE, Mehanna H and **McCabe CJ**. 2018. PTTG and PBF functionally interact with p53 and predict overall survival in head and neck cancer. *Cancer Research* 78(20):5863-5876

Read ML, Fong JCW, Imruetaicharoenchoke W, Modasia B, Nieto H, Bacon A, Mallick U, Hackshaw A, Watkinson JC, Boelaert K, Smith VE, Turnell AS and **McCabe CJ**. 2017. High tumoural expression of PBF and PTTG modulates the DNA damage response and is associated with poor survival in thyroid cancer. *Oncogene* 36(37):5296-5308

Imruetaicharoenchoke W, Watkins RJ, Modasia B, Poole VL, Nieto HR, Sharma N, Fletcher A, Thompson R, Boelaert K, Read ML, Smith VE, **McCabe CJ**. 2017. Functional consequences of the first reported mutations of the proto-oncogene PTTG1IP/PBF. *Endocrine Related Cancer* 24(9):459-474 [*Editor's Choice Highlighted Publication; Top Downloaded Article]*

Watkins RJ, Imruetaicharoenchoke W, Read ML, Sharma N, Poole VL, Gentillin E, Bansal S, Bosseboeuf E, Fletcher R, Nieto HR, Mallick U, Hackshaw A, Mehanna H, Boelaert K, Smith VE, **McCabe CJ**. 2016. Pro-invasive effect of proto-oncogene PBF is modulated by an interaction with cortactin. *J Clin Endocrinol Metab* 101(12):4551-4563

Smith JA, Read ML, Hoffman J, Brown R, Bradshaw B, Campbell C, Cole T, Dieguez-Navas J, Eatock F, GundaraJS, Lian E, McMullan DJ, Smith VE, Stewart S, Trembath RC, Sidhu S, Togneri FS, Wake NC, Wallis Y, Watkinson JC, Maher ER, **McCabe CJ**, Woodward ER. 2016. Germline ESR2 Mutation Predisposes to Medullary Thyroid Carcinoma and Causes Up-Regulation of RET Expression. *Human Molecular Genetics* 25(9):1836-45