

## 1. Institution

Centre for Human Reproductive Science (ChRS), Birmingham Women's Hospital  
Reproductive Biology and Genetics, School of Clinical and Experimental Medicine, Uni. of Birmingham

## 2. Principal investigator and contact person

Dr Jackson C Kirkman-Brown  
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## 3. Key personnel

| NAME   | EMAIL | RESEARCH AREA DETAILS   |
|--|-------|---|
| Dr David Smith                                 |       | Fluid mechanics in biological systems including human reproduction. Flagellar beat capture and analysis     |
| Thomas Connolly                                |       | Human sperm-female tract interaction and $[Ca^{2+}]_i$ signaling  |
| Joao Correia                                   |       | Novel olfactory receptors on human sperm  |
| Rebecca Frettsome                              |       | Sperm modulation by the human oocyte and its vestments  |
| Mr Arri Coomarasamy                            |       | Senior Lecturer in OBGYN. Fertility and infertility treatments in humans including systematic reviews.      |
| Dr Linda Lefievre                              |       | Sperm protein biochemistry including proteomic characterisation of the human gametes and sperm capacitation |
| Hermes Gadhela<br>(& Dr Eamonn Gaffney)        |       | Mathematical modeling of human sperm motility, modulation in physiological systems.                         |
| Dr Yuchun Gu                                   |       | Electrophysiological characterization of the human sperm  |
| Graham Fews / Fiona<br>MacDonald / Val Davison |       | Genetic analysis of the human preimplantation embryo  |
| Graham Fews                                    |       | Aneuploidy in human spermatozoa   |
| Dr W Chris Ford                                |       | Metabolism and energy systems for human sperm motility  |

## 4. Research profile

The research group aim to characterise factors affecting gametes and fertilisation success in the human with as-close-as-possible relevance to real physiology. The Birmingham Group: developed the World's first over-the-counter CE marked home sperm test – Fertell; changed the paradigm of oocyte recognition by revealing the human zona was made up of four not three ZP proteins; and mathematically explained why sperm swim close to surfaces.

## 5. Key technologies and tools

Microscopy and imaging technologies, including high-speed 64 bit systems, fluorescence, deconvolution, laser uncaging etc etc..

$[Ca^{2+}]_i$  signaling experiments in hundreds or even thousands of individual cells, which can be freely motile sperm

Supercomputer processing and modelling of fluid mechanics

Proteomic analysis of cells or fluids involved in human reproduction

HFEA licensed for experiments around fertilisation of human oocytes, hESC derivation and pre-implantation genetic studies of embryos.

Advanced sperm function assays

## 6. Selected publications (max. 5)

Smith DJ, Gaffney EA, Gadêlha H, Kapur N, Kirkman-Brown JC. (2009) Bend propagation in the flagella of migrating human sperm, and its modulation by viscosity. *Cell Motil Cytoskeleton*. 66(4):220-36. PMID: 19243024

Lefièvre L, et al. (2007) Human spermatozoa contain multiple targets for protein S-nitrosylation: an alternative mechanism of the modulation of sperm function by nitric oxide? *Proteomics*. 7(17):3066-84. PMID: 17683036

Harper CV, Barratt CL, Publicover SJ, Kirkman-Brown JC. (2006) Kinetics of the progesterone-induced acrosome reaction and its relation to intracellular calcium responses in individual human spermatozoa. *Biol Reprod*. 75(6):933-9. PMID: 16957023

Conner SJ, et al. (2005) Cracking the egg: increased complexity in the zona pellucida. *Hum Reprod*. 20(5):1148-52. PMID: 15760956

Lefièvre L\*, Conner SJ\*, et al. (2004) Four zona pellucida glycoproteins are expressed in the human. *Human Reprod.*, 19(7): 1580-6. PMID: 15142998

\* These authors contributed equally to this work.