BIOGRAPHICAL SKETCH

NAME	POSITION TITLE
Ellison-Hughes, Georgina May	Professor of Regenerative Muscle Physiology, King's College London

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, and include postdoctoral training.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
Liverpool JM University, UK	BSc	2000	Physiology
Liverpool JM University, UK	PhD	2004	Myocyte death & regeneration
New York Medical College, NY, USA	Post-doc	2003-2005	Cardiac regeneration
Mount Sinai School of Medicine, NYC, USA	Post-doc	2005-2007	Cardiac regeneration

A. Personal Statement

My research programme focuses on rejuvenating the regenerative capacity of striated (skeletal and cardiac) muscle, particularly preventing and treating the loss of muscle mass associated with ageing and/or disease. In particular, my research has been at the forefront of adult-derived cardiac stem/progenitor cells and has made a seminal contribution in the paradigm shifting work to establish the adult heart as a self-renewing organ with regenerative capacity. My work has been focused on the activation of the endogenous regenerative capacity of the damaged heart and skeletal muscle. Approaches include exercise training and the administration of growth factors or stem cells known to stimulate endogenous regenerative and repair processes. Through being a member of the UNESCO Executive committee 'Anti-Aging and Disease Prevention', I have recently contributed to understanding the role of transplanting mesenchymal stem/stromal cells (MSCs) as a treatment for COVID-19 pneumonia and ARDS. Considering the level of cardiac and vascular damage seen with severe COVID-19, and as a result of the cytokine storm, we are particularly interested in the role of MSC therapy in attenuating this damage and the repair of the heart and vasculature.

B. Positions and Honors

Positions and Employment

2005-2007 **American Heart Association Post-doctoral Fellowship**, Cardiovascular Institute, Mount Sinai School of Medicine, New York City, USA.
2008-2012 **Marie Curie EU FP7 International Re-Integration Grant and Fellowship**
2007-2013 **Lecturer/Senior Lecturer/Reader** in Stem Cell & Regenerative Biology and Physiology, Liverpool JM University, Liverpool, UK.
2013-2019 **Senior Lecturer/Reader** in Physiology, King's College London, UK.
2017- **Deputy Director,** Centre for Human & Applied Physiological Sciences, School of Basic and Medical Biosciences, Faculty of Life Sciences & Medicine, King's College London.
2018- **School Academic Lead for Development, Diversity & Inclusion,** School of Basic and Medical Biosciences, Faculty of Life Sciences & Medicine, King's College London.
2019- **Professor** of Regenerative Muscle Physiology, King's College London, UK.

Other Experience and Professional Memberships

2001- Member of the Physiological Society
2005- Member of the American Heart Association
2007- Member of the British Society for Cardiovascular Research
2007- Member of the International Society for Stem Cell Research
2010 - European Society of Cardiology, Basic Science, Cell Biology Working group

2011	Member of Scientific and Organizing committee for European College of Sports Science (ECSS) Annual Congress, Echo Arena/Convention centre, Liverpool, UK. 2500 delegates.
2010-2015	Executive Board member of CARE-MI consortium, Collaborative Project - Large Scale Integrating Project. HEALTH-2009-1.4-3: FP7-HEALTH-2009-single-stage.
2011	Organiser of CARE-MI consortium Scientific Progress Annual conference, Hilton Hotel, Liverpool, UK. Chair of organising committee. 60 delegates from 14 EU countries
2014-	Editorial Board member BMC Molecular and Cell Biology
2015-	Editorial Board member Scientific Reports
2017-	Member of the Society of Biology
2018-	Editorial Board member Frontiers in Pharmacology - Cardiovascular and Smooth Muscle Pharmacology.
2016-2020	Scientific advisory board member to project REMAIN, Investigators: Profs. Eva Van Rooj, Steven Chamuleau, Patricia Dankers. The Netherlands Heart Foundation.
2019-	Member of UNESCO Executive committee 'Anti-Aging and Disease Prevention'. Launched in Beijing, China, Dec 2019
2020	TEDx Speaker. What becomes of the broken heartened: Rejuvenating hearts. https://youtu.be/MFjkw13A0-4

Honors and prizes

2003	British Federation of Women Graduates, Scholarship for Academic Excellence.
2005	European College of Sports Sciences Young Investigator of the Year.
2007	Travel fellowship, International Society for Stem Cell Research.
2007	Honored as Best of British Early Career Researchers, House of Commons, UK.
2017	Fellow of Royal Society of Biology.

C. Contributions to Science (from a total of 61 peer-reviewed publications).
Total impact factor 430; *h*-index 32; total citations 3320; average citation/item 56 (Scopus).

1. Scalise M, Torella M, Marino F, Ravo M, Giurato G, Vicinanza C, Cianflone E, Mancuso T, Aquila I, Salerno L, Nassa G, Agosti V, De Angelis A, Urbanek K, Veltri P, Paolino D, Mastroroberto P, De Feo M, Viglietto G, Weisz A, Nadal-Ginard B, **Ellison-Hughes GM**, Torella D. (2020) Atrial Myxomas Arise From Multipotent Cardiac Stem Cells. *European Heart Journal*. 41:4332-4345. *Corresponding author.*
2. Zikuan Leng, Rongjia Zhu, Wei Hou, Yingmei Feng, Yanlei Yang, Qin Han, Guangliang Shan, Fanyan Meng, Dongshu Du, Shihua Wang, Junfen Fan, Wenjing Wang, Luchan Deng, Hongbo Shi, Hongjun Li, Zhongjie Hu, Fengchun Zhang, Jinming Gao, Hongjian Liu, Xiaoxia Li, Yangyang Zhao, Kan Yin, Xijing He, Zhengchao Gao, Yibin Wang, Bo Yang, Ronghua Jin, Ilia Stambler, Lee Wei Lim, Huanxing Su, Alexey Moskalev, Antonio Cano, Sasanka Chakrabarti, Kyung-Jin Min, **Georgina Ellison-Hughes,** Calogero Caruso, Kunlin Jin, Robert Chunhua Zhao. (2020) Transplantation of ACE2- Mesenchymal Stem Cells Improves the Outcome of Patients with COVID-19 Pneumonia. *Aging and Disease*.11: 216-228. Impact factor: 5.4; Citations: 294; Field weighted citation impact: 271.70. *This was the first clinical study published where 1 million/kg/BW of mesenchymal stem cells (MSCs) were intravenously transplanted into seven COVID-19 pneumonia patients. Before the transplantation, all patients had pneumonia with symptoms of high fever, weakness, shortness of breath and low oxygen saturation. All symptoms had disappeared by two to four days after the transplantation. This was not the case in the 3 placebo control patients. Among the MSC-treated patients, one severe and two common patients were able to make a recovery and be discharged 10 days after treatment. The study found improvement was particularly dramatic for an elderly male patient in a severe critical condition, where results showed the MSCs modulated the cytokine storm.*
3. Aquila I, Cianflone E, Scalise M, Marino F, Mancuso T, Filardo A, Smith AJ, Cappetta D, De Angelis A, Urbanek K, Isidori AM, Torella M, Agosti V, Viglietto G, Nadal-Ginard B, **Ellison-Hughes GM**, Torella D.(2019) c-kit Haploinsufficiency impairs adult cardiac stem cell growth, myogenicity and myocardial regeneration. *Cell Death Dis*. 10:436. doi: 10.1038/s41419-019-1655-5. Corresponding author.
4. Lewis-McDougall FC, Ruchaya PJ, Domenjo-Vila E, Teoh TS, Prata L, Cottle BJ, Clark JE, Punjabi PP, Awad W, Torella D, Tchkonia T, Kirkland J, **Ellison-Hughes GM**. (2019) Aged-senescent cells contribute to

impaired heart regeneration. *Aging Cell*. 18: e12931.DOI: 10.1111/acel.12931. Corresponding author. Impact factor 7.6; Citations: 49; Field weighted citation impact: 9.34. *We show for the first time that cardiac stem/progenitor cells (CPCs) isolated from failing human hearts develop a senescent phenotype, including a SASP, with age (>70 years). In fact, by the time a person is 75 years of age, approximately 50% of their CPCs are senescent. This means that the ability of CPCs to repair the damaged or injured heart declines with age]. Unlike healthy, proliferative human CPCs, senescent CPCs failed to restore cardiac function or contribute to cardiac repair following injection into the infarcted mouse myocardium. Moreover, eliminating senescent cells in aged (~27 months) mice using D+Q senolytics rejuvenated the heart's regenerative potential, with CPC activation, new cardiomyocyte formation and improved cardiac function.*

5. Lewis FC, Cottle BJ, Shone V, Marazzi G, Sassoon D, Tseng CCS, Dankers PYW, Chamuleau SAJ, Nadal-Ginard B. **Ellison-Hughes GM**. (2017). Transplantation of Allogeneic PW1pos/Pax7neg Interstitial Cells (PICs) Enhance Endogenous Repair of Injured Porcine Skeletal Muscle. *JACC: Basic to Translational Science*.2:717-736. DOI: 10.1016/j.jacbts.2017.08.002. Corresponding author. *In a pre-clinical skeletal muscle injury model applicable to humans, we showed that paracrine factors secreted by transplanted allogeneic PICs stimulate endogenous progenitor cell activation and differentiation, leading to accelerated and improved myofiber regeneration and microvessel formation.*
6. Vicinanza C, Aquila I, Scalise M, Cristiano F, Marino F, Cianflone E, Mancuso T, Marotta P, Sacco W, Lewis FC, Couch L, Shone V, Gritti G, Torella A, Smith AJ, Terracciano CMN, Britti D, Veltri P, Indolfi C, Nadal-Ginard B, **Ellison-Hughes GM**, Torella D. (2017) Adult Cardiac Stem Cells are Multipotent and Robustly Myogenic: c-kit Expression is Necessary but not Sufficient for their Identification. *Cell Death & Differentiation*, 24:2101-2116. doi: 10.1038/cdd.2017.130. Corresponding author. Impact factor 8; Citations: 67; Field weighted citation impact: 4.86. *This paper addresses the controversy of the significance and role of c-kit positive cells in the adult mammalian heart. We showed that among the cardiac c-kit positive cell cohort only a very small fraction has the phenotype and the differentiation/regenerative potential characteristics of true multipotent cardiac stem cells.*
7. Smith AJ, Lewis FC, Aquila I, Waring CD, Nocera A, Agosti V, Nadal-Ginard B, Torella D, **Ellison GM**. (2014) Isolation and characterization of resident endogenous c-Kit(+) cardiac stem cells from the adult mouse and rat heart. *Nat Protoc*. 9: 1662-1681. doi: 10.1038/nprot.2014.113. Corresponding author. Impact factor 11; Citations: 76; Field weighted citation impact: 3.57. *This paper describes our isolation and characterisation protocols for endogenous cardiac stem/progenitor cells isolated from the whole mouse and rat heart.*
8. Koudstaal S, Bastings MM, Feyen DA, Waring CD, van Slochteren FJ, Dankers PY, Torella D, Sluijter JP, Nadal-Ginard B, Doevendans PA, **Ellison GM**, Chamuleau SA. (2014) Sustained delivery of insulin-like growth factor-1/hepatocyte growth factor stimulates endogenous cardiac repair in the chronic infarcted pig heart. *J Cardiovasc Transl Res*. 7: 232-241. doi: 10.1007/s12265-013-9518-4.
9. **Ellison GM**, Vicinanza C, Smith AJ, Aquila I, Leone A, Waring CD, Henning BJ, Stirparo GG, Papait R, Scarfo M, Agosti V, Viglietto G, Condorelli G, Indolfi C, Ottolenghi S, Torella D & Nadal-Ginard B (2013). Adult c-kitpos Cardiac Stem Cells Are Necessary and Sufficient for Functional Cardiac Regeneration and Repair. *Cell*, 154: 827-842. doi: 10.1016/j.cell.2013.07.039. Impact factor 36; Citations: 360; Field weighted citation impact: 16.99. *We show in a wear-and-tear injury model that is in the presence of a patent coronary circulation, endogenous cardiac stem/progenitor cells have intrinsic regenerative capacity and are necessary and sufficient for myocardial regeneration.*
10. Waring C, Vicinanza C, Papalamprou A, Smith AJ, Purushothaman S, Goldspink DF, Nadal-Ginard B, Torella D and **Ellison GM**. (2014) The Adult Heart Responds to Increased Workload with Physiologic Hypertrophy, Cardiac Stem Cell Activation and New Myocyte Formation. *European Heart Journal*, Online advance publication doi:10.1093/eurheartj/ehs338. In Print 2014, 35:2722-2731. Corresponding author. Impact factor 23; Citations: 94; Field weighted citation impact: 5.05. *This paper showed for the first time that regular and vigorous exercise stimulates the dormant endogenous cardiac stem/progenitor cells in the heart, triggering the formation of new heart muscle cells and vasculature*
11. Torella D, Iaconetti C, Catalucci D, **Ellison GM**, Leone A, Waring CD, Bochicchio A, Vicinanza C, Aquila I, Curcio A, Condorelli G, Indolfi C. (2011) MicroRNA-133 controls vascular smooth muscle cell phenotypic switch in vitro and vascular remodeling in vivo. *Circ Res*. 30;109(8):880-93. doi:10.1161/ CIRCRESAHA. 111.240150.

12. **Ellison GM**, Torella D, Dellegrottaglie S, Perez-Martinez C, Perez de Prado A, Vicinanza C, Purushothaman S, Galuppo V, Iaconetti C, Waring CD, Smith A, Torella M, Cuellas Ramon C, Gonzalo-Orden JM, Agosti V, Indolfi C, Galiñanes M, Fernandez-Vazquez F, Nadal-Ginard B. (2011) Endogenous cardiac stem cell activation by insulin-like growth factor-1/hepatocyte growth factor intracoronary injection fosters survival and regeneration of the infarcted pig heart. *J Am Coll Cardiol*. 58(9):977-86. doi: 10.1016/ j.jacc.2011.05.013. *This paper was my post-doc work and shows in a pre-clinical porcine heart model relevant to human disease, the myocardial regenerative effects of intracoronary administration of IGF-1 and HGF.*

Complete List of Published Work on my PURE page

D. Additional Information: Research Support and/or Scholastic Performance

Current grant support:

2019-2021 Confidence in Collaboration in Advanced Therapies Award, King's Health Partners. *Elucidating the therapeutic potential of PW1/Peg3pos/Pax7neg skeletal muscle-derived interstitial progenitor cells (PICs)*. £100,068. Role: PI.

2019-2022 BHF Project Grant. *Mesenchymal stromal cell apoptosis is required to resolve inflammation and promote tissue repair after myocardial infarction*. £256,461. Role: co-PI.

2018-2023 Wellcome Trust Multi-user Equipment Grant. *Cellular and sub-cellular sampling using laser capture microdissection to understand disease mechanisms.* £198,139. Role: Co-PI.

2017-2021 Medical Research Council Doctoral Training Programme. *In vivo tracking of human cardiac progenitor cells following acute myocardial infarction.* £76,416. PhD student – Ben Grimsdell. Role: PhD supervisor.

2020-2024 H2020-MSCA-ITN-2019 Marie Skłodowska-Curie Innovative Training Networks. *RENOIR: REcreating the ideal Niche: environmental control Of cell Identity in Regenerating and diseased muscles*. £254,664. Role: PI.

2020-2022 Heart Research UK. *Targeting cellular senescence as a therapy to rejuvenate the reparative activity of human cardiomyocytes*. £126,440. Role: PI.

2020-2021 King's Together Fund Strategic Award. *Targeting senescence to prevent, alleviate or delay multiple chronic age-related diseases.* £100,976. Role: PI.

Selection of completed grant support:

2017-2019 Medical Research Council Research Grant. *Defining the biology of human cardiac stem/progenitor cells for their use as an allogeneic cell therapeutic agent for myocardial repair and regeneration.* £242,59. Role: PI.

2014-2017 BBSRC research grant. *Mechanisms underlying the transdifferentiation of human muscle fibroblasts into adipocytes.* £387,446. Role: co-I.

2014-2017 BHF Project Grant. *Ageing and senescence of endogenous cardiac stem cells (eCSCs) determines myocardial regenerative potential.* £192,298. Role: PI.

2010-2015 FP7 Collaborative Project - Large Scale. HEALTH-2009-1.4-3: FP7-HEALTH-2009. *CARE-MI: Activation of endogenous cells as an approach to regenerative medicine.* €1.1m. Role: PI.

2010-2015 FP7 Collaborative Project - Large Scale. HEALTH-2009-1.4-3: FP7-HEALTH-2009. *Endostem: Activation of vasculature associated stem cells and muscle stem cells for the repair and maintenance of muscle tissue.* €560,000. Role: PI.