Curriculum Vitae
Name **Carol Murphy** **Position** **Researcher B, Institute of Molecular Biology & Biotechnology, Department of Biomedical Research, IMBB-BR, Foundation for Research & Techology Hellas (FORTH), Ioannina, Greece**
Positions & Employment
2017- : Researcher B at IMBB-BR, Ioannina, Greece
2015-2017: Senior lecturer, School of Biosciences, University of Birmingham, UK
2003-2015: Researcher B at IMBB-BR, Ioannina, Greece
2001-2003: Researcher C at IMBB-BR, Ioannina, Greece
1997-2001: Researcher in Depart. Biol. Chem., University of Ioannina, Medical School
1996-1997: EU Senior Researcher award for research in University of Ioannina
1993-1996: Postdoctoral researcher at EMBL in the lab of Marino Zerial
1989-1993: Postdoctoral researcher at EMBL in the lab of Ulrich Ruther
1987-1989: Postdoctoral researcher with Frank Gannon, University of Galway, Ireland
Education
1983-1987: Ph.D. in Pharmacology. University of Helsinki & University College Dublin
1978-1982: B.Sc. (hons) Pharmacology, University College Dublin, Ireland
Administration
Establishment of hESC and hiPSC unit in University of Birmingham (UoB), UK (2015-2017)
Director of Birmingham Light Microscopy Facility, UoB, UK (2015-2017)
Imaging Lead for UoB, UK, IMPACT PhD studentship Program (2015-2017)
Lecturer and participating PI in The Wellcome Trust Doctoral Training, MIDAS (2015-2017)
Management Board Member and participating PI in COMPARE network
Participating PI in "The Midlands Integrative Biosciences Training Partnership" (MIBTP)
Establishment of hESC and hiPSC unit in IMBB-BR, Ioannina, Greece (2010- present)
Establishment/Head of super-resolution microscopy at IMBB-BR, Greece (2010-1018)
Reviewer for several international scientific journals, Editorial board member of Scientific Reports.
Teaching Activities
1997- present Supervisor of undergraduate, Masters and PhD theses in IMBB-BR
1997- present Supervisor of PhD students in Biotechnology, Interdepartmental postgraduate program (Medicine, Chemistry and Biological Applications and Technologies)
2015-2017 Undergraduate & Postgraduate Biosciences teaching in University of Birmingham
2015- 2017 Supervisor of undergraduate, Masters & PhD theses University of Birmingham
2015-present Teacher and Supervisor of Masters project students in the Master's Programme: Molecular Cell Biology and Biotechnology.
Research Grants
As Principal Investigator or work-package leader
1996-1997 Senior researcher award from the European Community: Amount 54,500 ECU.
2000-2002 FP5 ETN project. Membrane-cytoskeleton interactions in intracellular transport and cell morphogenesis. Coordinator: Marino Zerial. Responsible for the Ioannina group: Carol Murphy. Total budget: 1.470.000 €.
2004-2005 Human Networks, GSRT. Applications of light microscopy in biomedical research and diagnosis. Principal investigator: Ch. Boleti, Pasteur Institute, Athens. Responsible for the Ioannina group: Carol Murphy. Total budget: 180,000 €.
2006-2010 PENED 2003/03ED688, GRST. Investigation of the role of Rho GTPases in the regulation of the genomic and non-genomic responses of cells to cytokines. Coordinator: C. Stournaras, University of Crete, Responsible for the Ioannina group: Carol Murphy. Total budget: 180,000 €.
2006-2010 FP6 EU integrated project. EndoTrack LSH-2004-1.1.5-2: Tracking the Endocytic Routes of Polypeptide Growth Factor Receptor Complexes and their Modulatory Role on Signalling

(EndoTrack). Coordinator: Marino Zerial. Responsible in Ioannina: Carol Murphy. Total budget: 10,864,508 €. IMBB-BR 697.192 €
2007-2013 National Strategic Reference Framework. NoisePlus. Mechanisms of Induced Pluripotency:From Transcriptional Noise to Stem Cell Therapies. Coordinator: D. Thanos. Responsible in Ioannina: Georgatos/Fotsis/**Murphy**/Christoforidis. Budget: 1.680.000 €. IMBB-BR 75.000 €
2011-2015 National Strategic Reference Framework (GSRT). StemCycle. Stem Cycle Variations: Comparing the Stem Cell and Cancer Cell Life Cycles. Coodinator: Zoi Lygerou. Responsible in Ioannina: C. Murphy. Budget: 600.000 €. IMBB-BR 88,500 €.
2011-2015 National Strategic Reference Framework (NSRF), (GSRT). "Remodeling Diabetic and Ischemic Retinal Vasculature Using Progenitor Stem Cells". Acronym: ReVaReSC. Postdoctoral Researcher: Eleni Bagli. Host Institute: FORTH/IMBB-BR. Scientific Responsible: C. Murphy, T. Fotsis. Budget: 150.000 €.
2015-2017 : Kripis I: Biology, Biophotonics, and Health: Modern technological approaches and applications in the filed of Biology, Photonics and Health. **Funding Source**: GSRT. Research program for the development of research institutes. Budget 6.000 €.
2015-2017 University of Birmingham. Role of trafficking and signalling in stem cells. £100.000
2016-2017 COMPARE award for super-resolution and lattice light sheet imaging £25,000.
2019-2021: Human Resource Development, Education and Lifetime Learning. ESPA 2014-2020 co-financing of Greece/European Union. Title: Creation of distinct types of Mural Cells by the differentiation of human pluripotent stem cells and their application in vascularised tissue constructs. Principal Investigator: Carol Murphy; Budget 45,500 €.
2020-2023: Unified Action of State Aid for Technology Research Development and Innovation "RESEARCH - CREATE – INNOVATE. ESPA. Title: Development of novel therapeutic strategies against Parkinsons disease. Coordinator: G. Garinis. Responsible in Ioannina: Murphy/Gkogkas. Budget: 1.000.000 €. IMBB-BR 200.000 €
As key collaborator and/or CO-PI
1998-2001 EPET II, GSRT (97EKBAN2-1.1-20). Early inhibition of sepsis: Development of intervention methods in the molecular mechanism of signal transduction. Coordinator: C. Roussos, Assistant coordinator and principal investigator of the Ioannina team: T. Fotsis. Budget: 880.411 €.
2001-2004 FP5 EC programme - QLK1-2000-00266. The role of dietary phytoestrogens in the prevention of breast and prostate cancer. Coordinator: Ian Rowland. Principal investigator of the University of Ioannina team: T. Fotsis. Budget: 2.660.430 €.
2001-2004 FP5 EC programme - QLG1-CT-2001-01032. Targeting of angiogenic TGFbeta signalling in cancer and cardiovascular diseases. Coordinator: T. Fotsis. Responsible for the Ioannina team: T. Fotsis. Budget: 1.571.728 €.
2003-2007 PENED 2001/01ΕΔ585, GSRT. Signal transduction and intracellular membrane trafficking in endothelial cell. Principal investigator: T. Fotsis. Budget: 132 062 €.
2005-2008 Ministry of Education (Pythagoras II program). The role of lipid rafts and caveolae in thrombosis and angiogenesis. Principal investigator: T. Fotsis. Budget: 50.000 €.
2006-2010 FP6 EC Integrated Project LSHM-CT-2006-018725. Pulmotension. Pulmonary Hypertension: Functional Genomics and Therapy of Lung Vascular Remodelling. Coordinator: W. Seeger. Responsible in Ioannina: S. Christoforidis. Budget: 11.400.00 €. IMBB-BR 240.045 €
2007-2013 National Strategic Reference Framework (NSRF), (GSRT). "Education and Lifelong Learning" program "Supporting Postdoctoral Researchers". Title: Bone Regeneration Using Keratin-Based Biomaterials And Mesenchymal Stem Cells. Scientific Responsible: T. Fotsis. Budget: 150.000 €.
2012-2015 National Strategic Reference Framework (NSRF), (GSRT). AdiSC. Title: Role and Mechanisms of Asymmetric Cell Division in Stem Cell Differentiation. Coordinator: Theodore Fotsis. Budget: 600.000 €
2013-2015 National Strategic Reference Framework (GSRT): POM "PIK3CA Oncogenic Mutations in Breast and Colon Cancers: Development of Targeted Anticancer Drugs and

Diagnostics". Coordinator: A. Efstratiadis, GD-BRFAA. Responsible for the Ioannina team: T. Fotsis. Budget: 1.962.900 €. IMBB-BR 189.000 €
2016-2019 Co-PI on British Heart Foundation grant awarded to Victoria Heath £190,000
2016-2019 BBSRC Co-PI on project grant awarded to Mike Tomlinson £400,000
2016-2021 Participant in COMPARE award £10,000,000 for Receptor Clustering
2018-2021 Integrated Envirinomental Management (2.1); Title: *Promoting Silver tourism through valorization of MED-diet and wellbeing routes in the CBC area;* Acronym: Silver wellbeing Funding Source: Hellenic Ministry of Finance and Development & Tourism; Type of Grant: PA 2014-2020/Interreg Greece-Italy/2. Budget: 891.999,12 €. Principal Investigator for IMBB-BR*:* Theodore FOTSIS; Budget for IMBB-BR: 158.619,25 €
2020-2022 Programme: FORTH SYNERGY GRANT. Title: Modelling neurological disorders using graphene-based neurovascular organoids derived from pluripotent human cells. Funding Source: competitive FORTH Inter-Institutional Interdisciplinary award. Budget: 60,000 €. Co-ordinator: C. Gkogkas, IMBB-BR, FORTH, Ioannina. Co-PIs: C. Murphy, IMBB-BR, FORTH, Ioannina and G. Deligeorgis, IESL, FORTH, Heraklion, Crete.
Publication record
Number of scientific publications = **47.** Total citations: **4250.** H Factor **28. ORCHID ID:** 0000-0003-1353-8558. https://scholar.google.com/citations?hl=el&user=U0ioQy8AAAAJ.

Vrettos E, Karampelas T., Sayyad N, Kougioumtzi A, Syed N, Crook T, **Murphy C**, Tamvakopoulos C, Tzakos A: Development of programmable gemcitabine-GnRH pro-drugs bearing linker controllable "click" oxime bond tethers and preclinical evaluation against prostate cancer. ***Eur. J. Medicinal Chem***. 211(2021)113018.

Papadopoulos A, Chalmantzi V, Mikhaylichenko O, Hyvönen M, Stellas D, Kanhere A, Heath J, Cunningham DL, Fotsis T, **Murphy C**: Supporting data on combined transcriptomics and phosphoproteomic analysis of BMP4 signaling in human embryonic stem cells. ***Data in Brief*** 35 (2021) 106844.

Papadopoulos A, Chalmantzi V, Mikhaylichenko O, Hyvönen M, Stellas D, Kanhere A, Heath J, Cunningham DL, Fotsis T, **Murphy C**: Combined transcriptomics and phosphoproteomic analysis of BMP4 signaling in human embryonic stem cells. ***Stem Cell Res*** 50 (2021) 102133.

Markou M, Kouroupis D, Badounas F, Katsouras A, Kyrkou A, Fotsis T, **Murphy C***, Bagli E*. Tissue engineering using vascular organoids from human pluripotent stem cell derived mural cell phenotypes. ***Front Bioeng Biotechnol***, section Tissue Engineering and Regenerative Medicine. 8(2020) article 278, 1-20.* joint corresponding authors.

Basagiannis D, Zografou S, **Murphy C**, Fotsis T, Morbidelli L, Ziche M, Bleck C, Mercer J, Christoforidis S. VEGF induces signalling and angiogenesis by directing VEGFR2 internalisation via macropinocytosis. ***J. Cell Sci*** 129 (2016) 4091-4104.

Tsolis K, Bagli E, Kanaki K, Zografou S, Carpentier S, Bei E, Christoforidis S, Zervakis M, **Murphy C**, Fotsis T, Economou A. Proteome changes during transition from human embryonic to vascular progenitor cells. ***J Proteome Res*** 15 (2016) 1995-2007.

Kyrkou A, Stellas D, Syrrou M, Klinakis A, Fotsis T, **Murphy C**: Generation of human induced pluripotent stem cells in defined, feeder-free conditions. ***Stem Cell Res*****,** 17 (2016) 458-460.

Kouroupis D, Kyrkou A, Triantafyllidi E, Katsimpoulas M, Chalepakis G, Goussia A, Georgoulis A, **Murphy C**, Fotsis T: Generation of stem cell-based bioartificial anterior cruciate ligament (ACL) grafts for effective ACL rupture repair. ***Stem Cell Res*** 17 (2016) 448-457.

Karali E, Bellou S, Stellas D, Klinakis A, **Murphy C**, Fotsis T: VEGF signaling, mTOR complexes, and the endoplasmic reticulum: Towards a role of metabolic sensing in the regulation of angiogenesis. **Mol and Cell Oncol**. 1:3, e964024, DOI: 10.4161/23723548.2014.964024 (2014).

Karali E, Bellou S, Stellas D, Klinakis A, **Murphy C**, Fotsis T: ER mediates induction of endothelial cell survival and angiogenesis by VEGF: PLCg via mTORC1 activates ATF6 and PERK. ***Mol. Cell*** 54 (2014) 559-72.

Kostaras E, Pedersen NM, Stenmark H, Fotsis T, **Murphy C**: SARA and RNF11 at the crossroads of EGFR signalling and trafficking. ***Methods Enzymol*** 535 (2014) 225-47.

Bellou S, Pentheroudakis G, **Murphy C,** Fotsis T: Anti-angiogenesis in cancer therapy: Hercules and Hydra. ***Cancer Lett***. 338 (2013) 291-28.

Kyrkou A, Soufi M, Bahtz R, Ferguson C, Bai M, Parton RG, Hoffmann I, Zerial M, Fotsis T, **Murphy C**: RhoD participates in the regulation of cell-cycle progression and centrosome duplication. ***Oncogene*** 2013, 32:1831-1842.

Kyrkou A, Soufi M, Bahtz R, Ferguson C, Bai M, Parton RG, Hoffmann I, Zerial M, Fotsis T, **Murphy C**: The RhoD to centrosomal duplication. ***Small GTPases*** 2013, 4.

Kostaras E, Sflomos G, Pedersen NM, Stenmark H, Fotsis T, **Murphy C**: SARA and RNF11 interact with each other and ESCRT-0 core proteins and regulate degradative EGFR trafficking. ***Oncogene*** 32 (2013) 5220-32.

Bellou S, Karali E, Bagli E, Al-Maharik N, Morbidelli L, Ziche M, Adlercreutz H, **Murphy C**, Fotsis T: The isoflavone metabolite 6-methoxyequol inhibits angiogenesis and suppresses tumor growth. ***Mol Cancer*** 2012, 11:35.

Sflomos G, Kostaras E, Panopoulou E, Pappas N, Kyrkou A, Politou AS, Fotsis T, **Murphy C**: ERBIN is a new SARA-interacting protein: competition between SARA and SMAD2 and SMAD3 for binding to ERBIN. ***J Cell Sci*** 2011, 124:3209-3222.

Bellou S, Hink MA, Bagli E, Panopoulou E, Bastiaens PI, **Murphy C**, Fotsis T: VEGF autoregulates its proliferative and migratory ERK1/2 and p38 cascades by enhancing the expression of DUSP1 and DUSP5 phosphatases in endothelial cells. ***Am J Physiol Cell Physiol*** 2009, 297:C1477-1489.

Kardassis D, **Murphy C**, Fotsis T, Moustakas A, Stournaras C: Control of transforming growth factor beta signal transduction by small GTPases. ***FEBS J*** 2009, 276:2947-2965.

Murphy C: Endo-fin-ally a SARA for BMP receptors. ***J Cell Sci*** 2007, 120:1153-1155.

Fyhrquist P, Mwasumbi L, Vuorela P, Vuorela H, Hiltunen R, **Murphy C**, Adlercreutz H: Preliminary antiproliferative effects of some species of Terminalia, Combretum and Pteleopsis collected in Tanzania on some human cancer cell lines. ***Fitoterapia*** 2006, 77:358-366.

Papanikolaou A, Papafotika A, **Murphy C**, Papamarcaki T, Tsolas O, Drab M, Kurzchalia TV, Kasper M, Christoforidis S: Cholesterol-dependent lipid assemblies regulate the activity of the ecto-nucleotidase CD39. ***J Biol Chem*** 2005, 280:26406-26414.

Panopoulou E, **Murphy C**, Rasmussen H, Bagli E, Rofstad EK, Fotsis T: Activin A suppresses neuroblastoma xenograft tumor growth via antimitotic and antiangiogenic mechanisms. ***Cancer Res*** 2005, 65:1877-1886.

Bagli E, Stefaniotou M, Morbidelli L, Ziche M, Psillas K, **Murphy C**, Fotsis T: Luteolin inhibits vascular endothelial growth factor-induced angiogenesis; inhibition of endothelial cell survival and proliferation by targeting phosphatidylinositol 3'-kinase activity. ***Cancer Res*** 2004, 64:7936-7946.

Bagli E., Xagorari A., Papetropoulos A, Murphy C, Fotsis T: Angiogenesis in inflammation. Autoimmunity reviews 2004 3 Suppl 1:S26.

Panopoulou E, Gillooly DJ, Wrana JL, Zerial M, Stenmark H, **Murphy C***, Fotsis T*: Early endosomal regulation of Smad-dependent signalling in endothelial cells. ***J Biol Chem*** 2002, 277:18046-18052. * joint last authors.

Karetsou Z, Kretsovali A, **Murphy C**, Tsolas O, Papamarcaki T: Prothymosin alpha interacts with the CREB-binding protein and potentiates transcription. ***EMBO Rep*** 2002, 3:361-366.

Hatzi E, **Murphy C**, Zoephel A, Rasmussen H, Morbidelli L, Ahorn H, Kunisada K, Tontsch U, Klenk M, Yamauchi-Takihara K, et al.: N-myc oncogene overexpression down-regulates IL-6; evidence that IL-6 inhibits angiogenesis and suppresses neuroblastoma tumor growth. ***Oncogene*** 2002, 21:3552-3561.

Hatzi E, **Murphy C**, Zoephel A, Ahorn H, Tontsch U, Bamberger AM, Yamauchi-Takihara K, Schweigerer L, Fotsis T: N-myc oncogene overexpression down-regulates leukemia inhibitory factor in neuroblastoma. ***Eur J Biochem*** 2002, 269:3732-3741.

Murphy C, Saffrich R, Olivo-Marin JC, Giner A, Ansorge W, Fotsis T, Zerial M: Dual function of rhoD in vesicular movement and cell motility. ***Eur J Cell Biol*** 2001, 80:391-398.

Hatzi E, Breit S, Zoephel A, Ashman K, Tontsch U, Ahorn H, **Murphy C**, Schweigerer L, Fotsis T: MYCN oncogene and angiogenesis: down-regulation of endothelial growth inhibitors in human neuroblastoma cells. Purification, structural, and functional characterization. ***Adv Exp Med Biol*** 2000, 476:239-248.

Pappas P, Stephanou P, Sotiropoulou M, **Murphy C**, Salminen L, Marselos M: Effects of tamoxifen and toremifene on ALDH1 and ALDH3 in human retinal pigment epithelial cells and rat liver. ***Adv Exp Med Biol*** 1999, 463:151-158.

McBride HM, Rybin V, **Murphy C**, Giner A, Teasdale R, Zerial M: Oligomeric complexes link Rab5 effectors with NSF and drive membrane fusion via interactions between EEA1 and syntaxin 13. ***Cell*** 1999, 98:377-386.

Zacchi P, Stenmark H, Parton RG, Orioli D, Lim F, Giner A, Mellman I, Zerial M, **Murphy C**: Rab17 regulates membrane trafficking through apical recycling endosomes in polarized epithelial cells. ***J Cell Biol*** 1998, 140:1039-1053.

Simonsen A, Lippe R, Christoforidis S, Gaullier JM, Brech A, Callaghan J, Toh BH, **Murphy C**, Zerial M, Stenmark H: EEA1 links PI(3)K function to Rab5 regulation of endosome fusion. ***Nature*** 1998, 394:494-498.

Murphy C, Zacchi P, Parton RG, Zerial M, Lim F: HSV infection of polarized epithelial cells on filter supports: implications for transport assays and protein localization. ***Eur J Cell Biol*** 1997, 72:278-281.

Zuniga Mejia Borja A, **Murphy C**, Zeller R: AltFGF-2, a novel ER-associated FGF-2 protein isoform: its embryonic distribution and functional analysis during neural tube development. ***Dev Biol*** 1996, 180:680-692.

Murphy C, Saffrich R, Grummt M, Gournier H, Rybin V, Rubino M, Auvinen P, Lutcke A, Parton RG, Zerial M: Endosome dynamics regulated by a Rho protein. ***Nature*** 1996, 384:427-432.

Kretschmer C, **Murphy C**, Biesinger B, Beckers J, Fickenscher H, Kirchner T, Fleckenstein B, Ruther U: A Herpes saimiri oncogene causing peripheral T-cell lymphoma in transgenic mice. ***Oncogene*** 1996, 12:1609-1616.

Murphy C, Zerial M: Expression of Rab proteins during mouse embryonic development. ***Methods Enzymol*** 1995, 257:324-332.

Murphy C, Beckers J, Ruther U: Regulation of the human C-reactive protein gene in transgenic mice. ***J Biol Chem*** 1995, 270:704-708.

Murphy C, Kretschmer C, Biesinger B, Beckers J, Jung J, Desrosiers RC, Muller-Hermelink HK, Fleckenstein BW, Ruther U: Epithelial tumours induced by a herpesvirus oncogene in transgenic mice. ***Oncogene*** 1994, 9:221-226.

Lutcke A, Parton RG, **Murphy C**, Olkkonen VM, Dupree P, Valencia A, Simons K, Zerial M: Cloning and subcellular localization of novel rab proteins reveals polarized and cell type-specific expression. ***J Cell Sci*** 1994, 107 (Pt 12):3437-3448.

Fotsis T, **Murphy C**, Gannon F: Nucleotide sequence of the bovine insulin-like growth factor 1 (IGF-1) and its IGF-1A precursor. ***Nucleic Acids Res*** 1990, 18:676.

Murphy C, Fotsis T, Pantzar P, Adlercreutz H, Martin F: Analysis of tamoxifen and its metabolites in human plasma by gas chromatography-mass spectrometry (GC-MS) using selected ion monitoring (SIM). ***J Steroid Biochem Mol Biol*** 1987, 26:547-555.

Murphy C, Fotsis T, Pantzar P, Adlercreutz H, Martin F: Analysis of tamoxifen, N-desmethyltamoxifen and 4-hydroxytamoxifen levels in cytosol and KCl-nuclear extracts of breast tumours from tamoxifen treated patients by gas chromatography-mass spectrometry (GC-MS) using selected ion monitoring (SIM). ***J Steroid Biochem Mol Biol*** 1987, 28:609-618.

Murphy C, Fotsis T, Adlercreutz H, Martin F: Analysis of tamoxifen and 4-hydroxytamoxifen levels in immature rat uterine cytoplasm and KCl-nuclear extracts by gas chromatography-mass spectrometry (GC-MS) using selected ion monitoring (SIM). ***J Steroid Biochem Mol Biol*** 1987, 28:289-299.

Research Interests:

http://www.imbb.forth.gr/imbb-people/index.php/en/fotsis-murphy-laboratory
https://www.imbb.forth.gr/en/research-en/biomedical-research/item/90-carol-murphy

Basic Research:

Research in the Murphy lab is focussed on investigating the role of the endocytic pathway in growth factor signaling. Receptors utilise the endocytic compartment to tune the duration, amplitude and specificity of the signalling process. Effector proteins localised along various endocytic pathways fine-tune specificity and downstream signalling responses. Following ligand binding, ligand/receptor complexes can be internalised via clathrin mediated endocytosis, caveolae, macropinocytosis, the APPL, the non-clathrin and non-caveolar pathway, the FEME pathway and others. Cargo entering via various endocytic routes is transported to a series of intracellular compartments, such as early endosomes, from where it signals or is recycled to the cell surface or is directed to degradative compartments thereby effecting the signaling outcome. Therefore, the endocytic route chosen by a receptor/ligand complex will ultimately determine the final response of the ligand/receptor complex.

Most of the work in this field has been carried out in differentiated cells. Indeed, to date we have focused our work on endocytic trafficking of members of the TGFb/Activin A family and VEGF, due to their involvement in angiogenesis, carcinogenesis and development, in mature differentiated endothelial cells. In the last few years we initiated a new line of research investigating the role of endocytic trafficking in the differentiation of hESCs/hiPSCs. We are especially interested in understanding the role of endocytic trafficking during pluripotency and differentiation and our results show that indeed trafficking pathways differ between stem and differentiated cells (kostopoulou et al., in preparation).

Translational Research:

We use human embryonic stem cells and human induced pluripotent stem cells for translational targets related to tumour angiogenesis and regenerative medicine. We have set in place systems which

allow us to differentiate stem cells to endothelial and mural cells (Markou et al., **Front Bioeng Biotechnol**, 8(2020)278) in defined culture conditions – thus allowing us to perform signalling, trafficking experiments, transcriptomics and proteomics/phosphoproteomics (Tsolis et al., **J Proteome Research** 15 (2016) 1995-2007), and construct vascularised organoids for regenerative applications. We have also invested considerable time and effort in optimizing genomic editing of the stem cells to allow us to delete/modify/substitute/tag genes to investigate their function*. Furthermore, we have established the use of patterned surfaces to generate gastruloids which enable us to follow many aspects of germ layer patterning and alterations in endocytic trafficking which occur as the cells transition from pluripotency to differentiation**. In addition, we are interested in the differentiation of pluripotent stem cells to Mesenchymal Stem Cells (MSCs) for use in regenerative medicine to generate ligament and bone. We have set up all assays required for this area of investigation (Kouroupis et al. **Stem Cell Research** 17 (2016) 448-457). Finally, a new research direction for our group is the investigation of the interaction of vascular endothelial cells and neural cells during differentiation and vascular alterations in neurodegenerative diseases including Autism. This project is in collaboration with Christos Gkogkas and involves generating vascularised brain organoids from control and Autism ihPSCs.

*Papadopoulos A., K.A., Chira P., Tschari E., Chavrier, P., Fotsis T and Murphy, C, *The Role of Arf6 in Human Embryonic Stem Cell Signaling.* IUBMB/IUPAB/IUPS Joint Advanced School, Spetses island, Greece "Receptors and signaling", 2016.

*Papadopoulos A., K.A., Chira P., Tschari E., Chavrier, P., Fotsis T and Murphy, C, *The Role of ARF6 in Human Embryonic Stem Cell Signalling.* EMBO Conference: Advances in Stem Cells and Regenerative Medicine, EMBL Heidelberg, Germany, 2017.

** Chalmantzi V., S.C., Kavatzikidou P., Ranella A ., Stratakis E., Murphy C., Fotsis T., *Human Embryonic Stem Cells Cultured on Micropatterned Silicon Surfaces.* EMBO meeting: Nuclear Function and cell fate choice, Kyllini, Greece, 2016.