

Photonic energy as an alternative to drugs (in common conditions that have no alternative treatments)

Project Title	Using photobiomodulation to ameliorate symptoms (of neurodegenerative disease, knee osteoarthritis or cancer treatment-related side effects)
Project duration:	Various projects of differing lengths available, mostly of one-year duration or longer.
Availability	Various starting dates after January 2021
Description:	<p>Photobiomodulation (PBM) therapy (light therapy) is a safe, non-invasive, non-pharmacological method of treating / preventing symptoms such as pain and fatigue, promoting healing and reducing inflammation. Photonic energy stimulates mitochondrial activity (mitochondria are the powerhouse of cells) (see, for example, Serrage et al 2019; https://doi.org/10.1002/jbio.201800411).</p> <p>Depending on the targeted cells, different effects have been identified.</p> <p>There are five projects currently in various stages of development at Mater:</p> <p>a) A pilot RCT of PBM as pre-conditioning and post-operative application for reducing pain and improving recovery after total knee replacement surgery. See: https://doi.org/10.1089/photob.2019.4751</p> <p>A feasibility study conducted in 2019 demonstrated that pain was markedly reduced and recovery markedly enhanced using the novel light patch system applied by participants in the home setting. This project would be suitable for a part-time MPhil student over 2 years, or a full-time PhD student. An ethics application is well-advanced. Grant funding is being pursued. The student would gain experience across the full range of research-related activities including ethics/governance, research implementation, data collection and analysis, report/manuscript writing.</p> <p>b) A single-site, prospective, randomised, placebo-controlled, interventional study (with within-trial cost-effectiveness analysis). You will implement self-administered PBM in patients with haematological cancers receiving chemotherapy and/or radiotherapy, and who are at risk of developing oral mucositis (OM) which is a common side effect of cancer treatment. We aim to prevent OM (thus reduce pain, improve quality of life and prevent unnecessary costs associated with severe grade OM) in at least one-third of patients who consent to be involved in this study and who receive PBM. (For example, see:</p>

<https://iopscience.iop.org/article/10.1088/2040-8986/19/1/013003/pdf>). You will compare outcomes and costs of care between groups of consenting participants who will receive usual standard of care plus either self-administered active PBM or self-administered sham PBM. This project would be suitable for a part-time MPhil over 2 years, or a full-time PhD student. An ethics application is well-advanced. Grant funding is being pursued. The student would gain experience across the full range of research-related activities including ethics/governance, research implementation, data collection and analysis, report/manuscript writing.

- c) A prospective, randomised, interventional placebo-controlled, pilot study which will recruit forty individuals with the diagnosis of Inflammatory Bowel Disease (IBD) and apply weekly PBM or sham PBM and measure fatigue, depression and pain in IBD. This novel application is based on evidence of the benefit of PBM for each of fatigue, depression, inflammatory biomarkers and pain separately. (For example, see: <https://pubmed.ncbi.nlm.nih.gov/28070154/>). This project would be suitable for a part-time MPhil over 2 years, or a full-time PhD student. An ethics application is well-advanced. The student would gain experience across the full range of research-related activities including ethics/governance, research implementation, data collection and analysis, report/manuscript writing.
- d) A case control study of the efficacy and safety of transcranial PBM in frail elderly patients admitted to hospital with acute delirium. PBM has been found to be beneficial in managing neurodegenerative symptoms in people with Alzheimer's disease, and Parkinson's disease; and symptoms of depression. (For example, see: <https://doi.org/10.1016/j.bcp.2013.06.012>). You will develop the ethics and hospital governance applications, and implement the research, collect and analyse the data, and write a report/manuscript describing the outcomes. This project would be suitable for a full-time Honours or MPhil research student over 1 year.
- e) A prospective, randomised, interventional placebo-controlled, pilot study which will recruit forty individuals with Parkinson's disease (PD), and apply 3x/week PBM or sham PBM and measure a suite of psychological, physical, quality of life, inflammatory and microbiome indicators. (For example, see: <https://doi.org/10.1016/j.bcp.2013.06.012>). A series of proof-of-concept studies has been conducted since 2017 (as yet not published), demonstrating that both motor and non-motor symptoms of PD can be improved using PBM applied to the abdomen, neck and head. This project would be suitable for a full-time PhD student. Ethics applications would be based on existing approvals. Grant funding is being pursued. The student would gain experience across the full range of research-related activities including ethics/governance, research implementation, data collection and analysis, report/manuscript writing.

Expected outcomes and deliverables:	See each study above.
Suitable for:	See each study above.
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