Testing joint shape, form, function and loading in zebrafish and their relationship to human population studies

Supervisory team:
Main supervisor: Prof Chrissy Hammond (University of Bristol)
Second supervisor: Dr Emma Blain (Cardiff University)
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Collaborators: Prof Jon Tobias (University of Bristol), Prof Emily Rayfield (University of Bristol)

Host institution: University of Bristol

Project description:
Joint conditions such as osteoarthritis, intervertebral disc disease and idiopathic back pain will affect a majority of people at some point in life. We know that genes, mechanics and lifestyle all play a role in joint conditions yet we still don't completely understand when and why they first arise and what governs pathogenesis. Using human population studies the student will identify genes that are associated with altered joint shape, then using bioinformatics approaches will prioritise a number of them for study in vivo. Then, using zebrafish as an animal model, with their excellent in vivo dynamic imaging possibilities, the student will genetically and/or pharmaceutically manipulate the genes of interest. The student will test effects on joint cell behaviour using fluorescent transgenic reporters for chondrocytes (cartilage cells), osteoblasts (bone forming cells), connective tissues (tendons and ligaments), synovial cells, and immune cells. They will test effects on joint form using confocal, lightsheet, multiphoton microscopy and micro computed tomography and synchrotron powered computed tomography. They will also test joint function using in vivo assays and computational modelling. In doing so they will uncover the molecular mechanisms through which these genetic changes control cellular behaviour and identify points for intervention and whether there are ways to rescue joint phenotypes throughout the lifespan of the animal. The supervisory team all run friendly, open and inclusive groups, in which all team members are valued.

This project is highly interdisciplinary, working with supportive co-supervisors and collaborators who are experts in their fields. The project will equip the student with a highly desirable skill set that should benefit them in their future career.

Our aim as the SWBio DTP is to support students from a range of backgrounds and circumstances. Where needed, we will work with you to take into consideration reasonable project adaptations (for example to support caring responsibilities, disabilities, other significant personal circumstances) as well as flexible working and part-time study requests, to enable greater access to a PhD. All our supervisors support us with this aim, so please feel comfortable in discussing further with the listed PhD project supervisor to see what is feasible.