Abstract - Effects of maternal exercise on fetal akinesia-impaired bone and joint development

Mechanical forces exerted by fetal movement during development influence skeletal morphogenesis. Thus, fetal akinesia (insufficient movement), caused by low amniotic fluid volume, breech position or impaired muscle development, can cause skeletal disorders such as hip dysplasia, arthrogryposis, and impaired bone development. We found that maternal exercise (via wheel-running) rescued both bone and joint development in “muscle-less limb” (Spd) mice and that bioreactor-based mechanical loading of explanted Spd limbs rescued key aspects of limb development, directly implicating mechanical cues. To enable development of maternal exercise-based interventions for fetal akinesia, we need to know how maternal exercise rescues akinesia-impaired bone and joint development. Therefore, the goals of this application are to determine the cells that respond to maternal exercise to rescue akinesia-impaired development and to define the underlying signaling mechanisms. This will provide new insights into fetal akinesia and potentially identify maternal exercise as a therapeutic intervention.

Public Health Relevance Statement

Project Narrative This US-Ireland Research and Development (R&D) Partnership Programme project aims to determine the effects of maternal exercise on fetal akinesia-impaired skeletal development and to define the cellular and molecular mechanisms.