

Developmental Genomics and Skeletal Research

Cheah Song Eng Kathryn

The ability to walk and run is usually taken for granted but skeletal disorders such as crippling deformities, back pain and osteoarthritis are becoming increasingly common as people live longer. Degenerative disorders of the joints or back are the most common causes of severe long-term pain and physical disability, causing suffering and pain for hundreds of millions of people. Low back pain affects 60–80% of the ageing population world-wide and is the most frequent cause of limitation of activity in the young and middle aged and the leading reason why people seek medical treatment. Degenerative low back disorders are the third most common reason for surgical procedures and the second leading cause of sick leave. This has significant economic and human impact. In Hong Kong in 2000 over 300,000 workdays were lost through these disorders and \$200 million paid in workers compensation.

So far skeletal diseases have received less attention from research than their economic importance warrants. But this deficiency is set to change with the establishment of the United Nations and WHO endorsed Bone and Joint Decade 2000-2010. Many of these disorders are due to the combined effects of mutations in many genes and interactions of those genes and their products, usually proteins, with environmental factors. This has made it difficult to study the underlying pathology. Key issues in skeletal biology are how longitudinal growth of cartilage and bone is regulated; how stress such as the presence of improperly folded proteins within cells affect skeletal growth and maintenance and contribute to disorders; what genetic factors impact on predisposition for degenerative skeletal disorders?

Building on multidisciplinary and synergistic interactions, track record and a history of collaboration, a team of scientists and clinicians from HKU, HKUST and PolyU, with collaborative contributions from international leaders in the field have gathered together to establish an Area of Excellence (AoE) programme “*Developmental Genomics and Skeletal Research*” to address these key issues. Empowered by genetic information and cutting-edge technologies spawned by the genome projects and transgenic mouse technology, the AoE team will focus on identifying genes and understanding their roles in development, growth, maintenance and degeneration of our skeletal structure through life. Particular attention is made to the mechanisms that lead to abnormalities and degeneration of cartilage and bone, to skeletal malformation caused by unfolded proteins and to the identification of genetic factors predisposing to degenerative intervertebral disc disease (DDD). The AoE will become a premier centre of research excellence in the genomic biology of skeletal growth and maintenance producing high quality publications and patentable discoveries with the long term aim to to develop strategies and therapies for skeletal tissue reconstitution. The

characterization of mutations predisposing to DDD will lead to better diagnosis and treatment, ultimately benefiting society through a healthier workforce. The impact of the discoveries made in the AoE extends beyond DDD and is applicable to other common skeletal disorders such as osteoarthritis. It will contribute to pharmaceutical R&D and biotechnology in Hong Kong by providing trained staff, drug targets, animal models, genetic tests and valuable genomic data and technologies.