BioAge : The biomechanics of aging and its role in the protection of vehicle occupants
FINAL PUBLISHABLE SUMMARY

Note: the name of the laboratory has changed from 'Laboratoire de Biomécanique' to 'Institut de Biomécanique Humaine Georges Charpak'. Therefore, the acronym AM-LBM used in the IIF proposal is replaced with IBHGC.

Summary description of the project objectives

The older adult population is the fastest growing segment in many OECD countries (Organisation for Economic Co-operation and Development) where one in every four persons will be aged 65 or over by 2030. Simultaneously, the aging population needs safe transportation to maintain mobility; however, current safety strategies developed to protect the youngest adult vehicle occupants have showed limited success to effectively protect the elderly population. The fragility of the older car occupants is of primary concern: elderly occupants sustain greater injuries for a given crash severity, and the chest injuries are disproportionally important compared to the younger population. Research to improve the protection of the elderlies is however limited because of the lack of tools such as crash-test dummies and computational human body models to develop restraint systems tailored to the aging occupants. Therefore, the goal of BioAge was to advance the knowledge of the biomechanics of aging by characterizing how morphological and mechanical changes that occur in the ribcage as a result of aging lead to an increase in the number of rib fractures in the elderly population. Five activities were conducted in parallel:

- Development of an experimental test apparatus at the IBHGC to perform multidirectional compression tests of the thorax,
- Analysis of the variations in the ribcage geometry that occur with aging based on the analysis of volunteers X-ray images available in the IBHGC database, and creation of a fully 3D parametric model for the rib, to assess how each geometrical and material parameters contribute to the rib mechanical response,
- Contribution to the development of a long-term plan at the IBHGC and ENSAM that includes research activities linked to active safety systems and training/education in biomechanics and ergonomics,
- Mentoring of undergraduate, graduate and PhD students,
- Imitation of collaborative projects with the automotive industry in the area of active safety and the development of human body surrogates with physiological responses to impact.

Although not all the scientific objectives could be reached, BioAge was successfully implemented at the IBHGC, and new collaborations and research topics arose as a result of the fellowship.

The research leading to these results has received funding from the People Programme (Marie Curie Actions) of the European Union's Seventh Framework Programme (FP7/2007-2013) under REA grant agreement n° 622905