



**Canadian Arthritis Network  
International Partnership Initiative**

**International Research & Training Program  
LABORATORY/CLINIC PROFILE**

**Contact information of the principal investigator**

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**Please indicate if you are member or affiliate of one or more of the following  
International Partnership Initiative organizations:**

- AO Foundation – Biotechnology Advisory Board, Switzerland
- Arthritis Foundation, USA
- Arthritis Research Campaign, UK
- Canadian Arthritis Network, Canada
- Japan Society for the Promotion of Science, Japan
- Nuffield Foundation Oliver Bird Rheumatism Program, UK

**International Research & Training Program Opportunity**

**Please indicate which of the following international opportunities would be  
available at your laboratory/clinic.**

- Training Elective Rotation
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- Research Mini-sabbatical
- 
- Industry Training Rotation



**The International Research & Training Program will be available for trainee elective rotations and investigator mini-sabbaticals that commence on or before March 31, 2009. If you have any preferences regarding the dates when you can host an international trainee or investigator, please indicate this below.**

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| <b>Visit Length</b> (please indicate start and end dates if known): |  |
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**Please provide ten key words and a brief description of the research currently being conducted in your laboratory/clinic, including descriptions of any specialized equipment, methods or technologies employed at your facility.**

**10 key words**

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| <ol style="list-style-type: none"><li>1. Tissue engineering</li><li>2. Anterior cruciate ligament substitute</li><li>3. Natural collagen scaffold</li><li>4. Cell and tissue culture skills and facilities</li><li>5. Molecular biology skills and facilities</li><li>6. Electron, time-laps, and confocal microscopy</li><li>7. Animal model: goat knee joint</li><li>8. Animal orthopedic surgery skills and facilities</li><li>9.</li><li>10.</li></ol> |
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**Brief description (up to ½ page)**

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| <p>Our laboratory is involved in tissue-engineering, a new field of expertise aiming at producing reconstructed human tissues in vitro for fundamental and clinical applications. We have developed the anterior cruciate ligament (ACL) of the knee joint. The rupture of an ACL is a frequent trauma, particularly during the practice of various sports such as ski, snowboard, soccer or hockey. Several mechanisms can lead to ACL rupture. Currently, the options for ACL replacement involve morbidity and several complications that often justify a surgical revision. Thus, a new type of ACL substitute would be useful, notably a ligament that could get integrated permanently in the knee joint.</p> <p>We use bones, collagen and autologous cells to engineer an ACL substitute. Our animal experimentation is performed on the caprine model. After only 30 days post-grafting in the knee joint of a goat, the vascular network is formed and the tissue-engineered ACL is in a phase of matrix remodeling. Other convincing observations showed the therapeutical potential of our technology. At 6 months post-implantation, the ACL substitute is innervated. After a year, fibrocartilage was regenerated and the Sharpey's fibers were in formation, making the links between the ligament and its bone insertion sites. This powerful regenerative capacity of the graft post-implantation was confirmed by electron microscopy analyses. The diameter of the neosynthesized collagen fibers is comparable to the diameter of those found in a native ACL. This was also seen for the first time in an ACL substitute entirely produced in vitro! Our ACL substitute is a unique and promising alternative for torn ACL replacement.</p> |
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We also work on the development of recombinant proteins, including human collagen. We believe that the training that we can offer involves a multidisciplinary approach and complementary skills in molecular and cell biology.

**Key publications** (maximum 5 publications)

**Goulet F**, Rancourt D, Cloutier R, Tremblay P, Belzil A-M, Lamontagne J, Bouchard M, Tremblay J, Stevens L-M, Labrosse J, Langelier E, McKee MD. Torn ACL: a new bioengineered substitute brought from the laboratory to the knee joint. *Applied Bionics Biomech.* 1(2): 115-121, 2004.

Hart D.A., Shrive N.G., **Goulet F**. Tissue engineering of ACL replacements. *Sports Medicine Arthroscopy Reviews.* 13: 170-176, 2005.

**Goulet F**, Germain L., Poole A.R. & Auger F.A. Tendons and ligaments. *In "Principles of Tissue Engineering" (3<sup>rd</sup> Ed.)*.(R. Lanza, R. Langer and J.Vacanti, Eds). Academic Press Ltd, San Diego, 2007 (In press).