



Applied Engineering **in** Brussels

How the University Colleges of Brussels contribute to R&D



By InduTec



InduTec asbl - Technological Transfer Center

| 73, Av. Melbalaan | B-1070 Brussels | Belgium | Tél: +32 2 534 33 79 | Fax: +32 2 534 33 95 |
| www.indutec.be | info@indutec.be |



INDUTEC, the Technology Transfer Centre for your Innovation (www.indutec.be)

InduTec is a dynamic Technology Transfer Centre whose mission is to enhance the exchange of technology and innovation between companies and industrial engineering faculties in the Brussels Region. By monitoring projects from concept to implementation, *InduTec* offers promotional opportunities and state-of-the-art experience to those faculties, and enables companies to reap the benefits of a quality science 'business incubator'.

A company's technological knowledge base is the foundation on which internal product and process innovations are generated. However, technological knowledge is not accumulated solely through internal learning processes. Increasingly, companies are turning to external sources in the technology supply chain to acquire the technological know-how they need to introduce product and process innovations. Thus, the successful structuring and executing of partnerships with external "technology source" organizations, such as the Technology Transfer Centre - *InduTec*, is often critical to competitive success in technologically dynamic environments.

The research activities of the industrial engineering faculties in the Brussels Region are future-oriented and innovative. The industrial engineering faculties collaborate with industrial and economic actors in Belgium and abroad through

- contract research (industrial research projects, technical feasibility studies, pre-competitive development, ...)
- economic valorisation (transferring R&D results through existing or new companies)
- protection of intellectual property, licencing agreements, spin-off guidance, ...

It all passes through *InduTec*, that knows how and where to find the appropriate competencies in the industrial engineering faculties to respond to the requests of industry.

If you are looking for new partnerships in managing your technological innovation, do not hesitate to contact our Technology Transfer Centre.

INDUTEC

Phone : +32 2 534 33 79

Fax : +32 2 534 33 95

E-mail: info@indutec.be

Patrick Dysseleer
President InduTec

Anne-Marie van Oost
Managing Director InduTec



■ Areas of Expertise

■ Agro-food technologies	52
■ Biotechnological Sciences	62
■ Electronics & ICT	72
■ Industrial Technologies & Material Technologies	81
■ Medicine & Human Health, Electromedical Equipment ...	88
■ Physical Sciences & Measurements	95
■ Protecting Man & Environment	100
■ Rational use of Energy	104
■ Transport Technologies	107





Areas of Expertise



Medecine & Human Health, Electromedical Equipment

For more than 80 years the three research units located in the Institut Supérieur d'Ergothérapie et de Kinésithérapie Department (ISEK) have been active in Ergotherapy and Physiotherapy. Through national and international collaboration, experimental and applied research is undertaken in order to develop new methodologies and techniques to significantly improve diagnostic aids and patient management.

In addition, the other institutes have worked on the development of devices used in medical fields (basically diagnosis-support tools for both the professional and private communities) and on the development of IT platforms that provide better management of medical imaging.



The following research units are involved in Medicine and Human Health and Electromedical equipment

Anatomical Biomechanics and Morphology Unit,
HEPHS - ISEK

Lymphology and Phlebology Unit, HEPHS - ISEK

Environmental and Occupational Physiology Unit,
HEPHS - ISEK

Electromechanical Unit, EHB - IWT

Nuclear Physics and Radiation Laboratory, HEPHS - ISIB



RECENT RESEARCH PROJECTS

ANATOMICAL BIOMECHANICS & MORPHOLOGY

The Anatomical Biomechanics and Morphology Unit is involved in the study of biomechanics and functional morphology in order to achieve a more complete understanding of the vertebrate evolution.

Research activities:

- Studies of the mechanical behaviour of the pelvic floor (especially of pelvic straits before and after muscular pre-stressing). Studies include anatomical description, clinical implications, mechanical and dynamic modelling (in particular of the levator ani muscle). These studies are of great importance in helping people affected by incontinency but also in improving the understanding of the mechanics of the pelvic floor
- Modelling the biomechanics of arterial and venous flows. The venous and arterial functions were analysed during pressure variations inside the abdominal girth. The dicrotic wave (diastolic) was also analysed during postural variations and bodily activities
- A clinical study of the consequences of episiotomy. The study evaluated the anatomical variations of the pudendal nerve in order to detect pain, lesions etc. and to research new physiotherapy techniques for coping with pain
- Numerical modelling of anatomical structures in order to understand the functioning of a lesion
- Analysis and assessment of the biomechanical and anatomical evolution of bipedalism
- Software and hardware developments allowing analysis of human dimensions

LYMPHOLOGY & PHLEBOLOGY

The Lymphology and Phlebology Unit is involved in the study of the lymphatic system, its pathology and its role in the immune system.

Research activities:

- A study of the physiology of lymphatic oedemas using NMR imaging (MRI). Digital images of lymphatic vessels were compared with histological views to increase the understanding of the lymphatic system in the human body and to improve diagnostic aids and patient management
- Analysis of in vivo human imaging and correlation with the images observed after injection of lymphatics in piglets
- A study of the cardiac function (haemodynamic and cardio-pulmonary parameters) in cardiac patients using pressotherapy techniques, multilayer bandages and manual lymphatic drainage

ENVIRONMENTAL & OCCUPATIONAL PHYSIOLOGY

The main objective of the Environmental and Occupational Physiology Unit is to better understand the human body under normal and extreme occupational activities and in stressful situations, in order to improve human capabilities in such situations.

Several physiological parameters are measured on site using electromyography, evoked potential measurements, echo- and echocardiography, vibration and respiratory analysis, metabolic cost evaluation of human activity, (environmental) stress analysis, fatigue etc.

RESEARCH ACTIVITIES

- A study of the Diffusing capacity of the Lung for Carbon Monoxide (DLCO), the Functional Residual Capacity (FRC) and the Flow Mediated Dilation (FMD) in young smokers, passive smokers and non smokers.
- Evolution of respiratory noises (turbulence) during mucus-clearing sessions in mucoviscidosis patients.
- A physiological parameters study in extreme environments like microgravity, confined environments (in collaboration with aerospace agencies), hyper- and hypobaric situations, hot and cold environments etc.
- Physiological parameter studies of airline pilots exposed to radiation (in collaboration with the Nuclear Physics and Radiation Laboratory)
- Physiological parameter studies of extreme athletes (like apnoea divers and extreme triathletes)
- Stress level analysis of airline pilots, school children and working professionals

MISCELLANEOUS RESEARCH PROJECTS

ABDOFBF - *Abdo-biofeedback, active supervision of patients with low back pain*

Abstract: The project aims to develop a method to allow the active supervision of patients with low back pain. This will be achieved by studying the functioning of the stabilising muscles of the trunk using a biofeedback device. The biofeedback technique involves improving and assisting the conscious perception of muscular activity and related biological signals amongst low back pain patients by means of visual, tactile and/or auditory information systems. The development of a biofeedback method and device should help the patient to recover their best lumbar stabilization.

Scientists: C.Jouret (IESP2A), D.Bragard (IESP2A).

Partners: DTI - M^r Peters.

Technological Domain & Keywords: medical engineering, low back pain, kinesitherapy, biofeedback.

Medical dosimetry in brachytherapy

Abstract: A dosimetric analysis of several radioactive sources used in endovascular brachytherapy to combat the phenomena of restenosis. Application of the Monte Carlo simulation.

Scientists: F.Tondeur (ISIB), I.Gérardy (ISIB).

Partners: Saint-Jean Clinic Hospital, Polytechnic University of Valencia, Novoste s.a.

Technological Domain & Keywords: endovascular brachytherapy, radiation, dosimetry, restenosis.

Flow mediated dilation

Abstract: The development of software tools for the assessment of physiological cardiovascular health using medical echography imaging. Research will be based on the objective and non-invasive Flow Mediated Dilation (FMD) calculation. This implies the measurement of endothelial reactivity by echography (plethysmography) before and after arterial ischemy. Images are then processed to achieve the FMD calculation. This non-invasive method should replace the difficult and often expensive analysis performed currently.

Scientists: C. Balestra (ISEK), G. Szczezny (Flomedi).

Partners: I.S.E.K., I.S.I.B.

Technological Domain and keywords: applied physiology, diagnostic aid, software, echography, plethysmography, FMD.

RTQA- medical imaging in radiotherapy

Abstract: The development of a platform for the storage, distribution and visualization of radiological data and images (Telemis-Medical platform). The aim is to improve the exchange of information amongst radiotherapists at a number of institutions, thereby improving the treatment of patients.

Scientists: C. De Muylder (IPL), R. Demeure (CERDECAM).

Partners: Cliniques Universitaires S^t-Luc (UCL), Telemis s.a.

Technological Domain and keywords: cancerology, DICOM, medical imaging processing, medical sciences technologies, IT platform.



Areas of Expertise



Medicine & Human Health, Electromedical Equipment

Cardview - medical imaging in cardiology

Abstract: Extending the current Telemis-Medical platform (storage, distribution and visualization of radiological images) to the field of Cardiology. This project addresses the specific everyday requirements of cardiologists:

- An efficient visual tool for dynamic medical images such as angiographies, echographies etc.
 - Diagnostic aid tools allowing the quantification of pathologies
 - Visual solutions specifically for surgical operating rooms
- Prototypes have been developed and validated.

Scientists: C. De Muylder (IPL), R. Demeure (CERDECAM).

Partners: U.C.L.

Technological Domain and keywords: cardiology, DICOM, medical imaging processing, IT platform.

SHEETFEEDER - high speed automated scanning system

Abstract: The sheetfeeder forms part of the Telemammography project in the Brussels region. The objective is to achieve the automation of digital x-rays and transmission of the computed x-rays to dedicated PACS/RIS medical servers via a high speed digital network (IRISNET). This tool will allow the digital archiving of old argentic formats (mammograms, thorax, medical scanner etc.).

Scientists: A. Van Steendam (EhB), E. D'Hollander (EhB).

Technological domain and keywords: argentic, CAMarchi, x-rays, mammography, Sinar Xcatch, optical density, DICOM.





SPECIALIST EQUIPMENT

This equipment forms part of the ISEK laboratories and is dedicated to the assessment of human physiology:

- Cardioventilatory assessment at rest and until VO2max
- Magnetic Resonance, arterial stiffness, cardiovascular imaging
- Multi-frequency and segmental Bioelectrical Impedance Analyser
- Neurological, cardiological and physiological monitoring: ECG (electrocardiogram), EMG (electromyogram) and EEG (electroencephalogram). Portable and stand-alone ultrasound devices (echographs)
- Pulmonary assessment (TPV, VC, DLCO, NO etc.)
- Sealed chamber for simulation of extreme environmental conditions
- Several portable data acquisition systems for physiological data

PUBLICATIONS

C. Balestra, F-J. Cronjé, P. Germonpre, A. Marroni. "PFO and the Diver - Patency of cardiac foramen ovale, a risk factor for dysbaric disorders". *Best Publishing Company, 2007.*

C. Balestra and P. Germonpre. "Commentary on viewpoint Heliox, Nitrox and trimix diving, hyperbaric oxygen treatment and a flaw in Henry's law". *J. Appl. Physiology, 2007, 102, 1720.*

O. Leduc, E. Fumière, L. Brognard, F. Wilputte, A. Stenhouse, A. Leduc and C. Delcour. "Imagery of the lymphatic system by means of echography and magnetic resonance." *Eur. J. Lymph. And rel. Probl. Vol. 15 N°43. 2005.*

F. Wilputte, M. Renard, J-Ph. Venner, J. Strapart, O. Leduc, A. Leduc, P. Klein. "Hemodynamic response to multilayered bandages dressed on a lower limb of patients with heart failure". *The Eur J.of Lymph. and Rel. Probl. 2005, 15 (45) p. 1-4.*

J-P. Belgrado, P. Bourgeois, C. Brack, O. Leduc, A. Leduc. "Electromyostimulation combined with intermittent pneumatic compression". *The Eur J.of Lymph. and Rel. Probl. 2005, 15 (45) p. 17-22.*

E. Fumiere, O. Leduc, J. Montenot, R. Demeure, F. Wilputte, A. Leduc and C. Delcour C. "MR Imaging, Proton MR Spectroscopy and Ultrasonographic Findings in Chronic Lymphedema". *The Eur. J. Lymph. And rel. Probl. vol.17 n° 52 - page. 1-6, 2007.*

E. Fumière , O. Leduc , S. Fourcade , C. Becker, C. Garbar, R. Demeure, F. Wilputte, A. Leduc and C. Delcour. "Imaging, Proton MR Spectroscopy, Ultrasonographic, Histologic Findings in patients with Chronic Lymphedema". *Lymphology , Dec.2007.*

O. Leduc. "Revalidation du patient opéré du cancer du sein". *Consensus européen. Document édité par la fondation contre le cancer. Octobre 2007.*



Areas of Expertise



Medecine & Human Health, Electromedical Equipment

- O. Leduc. "Revalidation du patient opéré du cancer du sein". *Consensus européen. Revue de Kinésithérapie : Kiné Varia News. N°378. Décembre 2007.*
- C. Balestra, P. Germonpre, J-R. Poortmans and A. Marroni. "Serum erythropoietin levels in healthy humans after a short period of normobaric and hyperbaric oxygen breathing: the "normobaric oxygen paradox". *J Appl Physiol*, 2006, **100**, 512-518.
- C. Balestra, P. Germonpre, F. Virgili, T. Snoeck, S. Theunissen, G. Szczesny, P. Lafere, C. Marabotti, G. Catapano, D. Franchi, D. Cialoni, R. Bedini and A. Marroni. "Post Immersion Flow Mediated Dilation: Comparison between Scuba and Apnoea Divers". *European Journal of Underwater and Hyperbaric Medicine*, 2006, **7**, 51-52.
- C. Marabotti, R. Bedini, C. Balestra, A. Scalzini, A. Belardinelli, D. Passera, D. Cialoni, S. Theunissen, G. Szczesny and G. Catapano. "Anatomical and Functional Cardiac Changes During Scuba Diving: an Underwater Echographic Study". *European Journal of Underwater and Hyperbaric Medicine*, 2006, **7**, 62.
- B. Parlak, M. Egi, E. Bertan, S.A Yidin, P. Germonpre, C. Balestra and A. Marroni. "Automated Bubble Counting in Transoesophageal Echocardiography images to diagnose PFO". *European Journal of Underwater and Hyperbaric Medicine*, 2006, **7**, 62-63.
- G. Szczesny, C. Balestra, P. Germonpre, T. Snoeck, P. Lafere, S. Theunissen, and A. Marroni. "Computer Assisted Evaluation of Flow Mediated Dilation". *European Journal of Underwater and Hyperbaric Medicine*, 2006, **7**, 50-51.
- T. Snoeck, E. Chassagne, P. Emonts, S. Probyn and C. Balestra. "Contribution à la compréhension de l'action du muscle obturatorius internus sur la distance inter spina ischidica". *Proceeding of XII colloque de la société de biométrie humaine - 2006 - Biométrie et anthropologie "La bipédie" - Paris 15/16/17 novembre - XIII colloque de la société de biométrie humaine*, 2006.
- J-P. Clarys, S. Probyn, T. Snoeck, E. Catterlyse and P. Van Roy. "The contribution of the axillary arch to the overhead kinesiology of the shoulder". *Book of abstract of the Xth international symposium Biomechanics and medicine in swimming - Portuguese Journal of Sport Science, Suppl 1*, 2006.
- S. Probyn, J-P. Clarys, T. Snoeck and P. Van Roy. "Le canal de Guyon: Topographie, contradictions et variations Guyon's canal: Topography, contradictions and variations". *Biométrie humaine et anthropologie*, 2006, **24**, 115 -120.
- J-P. Clarys, T. Snoeck, S. Probyn, E. Catterlyse and P. Van Roy. "L'influence d'un arc axillaire (de Langer) sur la conduite de la mobilité de la sangle scapulaire". *Biométrie humaine et anthropologie*, 2006, **24**, 29 - 4.
- M. Caufriez, D. Fernandez, M. Lemort, B. Bouchant and T. Snoeck. "Contribution to the anatomical-morphological study of the pelvic floor in the asymptomatic female: the use of MRI imaging". *Arch Esp Urol*. 2006.
- M. Caufriez, D. Fernandez, M. Lemort, B. Bouchant and T. Snoeck. "Efectos de un programa de entrenamiento estructurado de gymnasia hipopresiva sobre la estática vertebral y dorsolumbar". *Fisioterapia*, 2006, **28**, 205 -215.



Areas of Expertise



Medecine & Human Health, Electromedical Equipment

L. Brognard, C. Delcour, E. Fumière, A. Leduc, O. Leduc, A. Stenhouse and F. Wilputte. "Imagery of the lymphatic system by means of echography and magnetic resonance". *Eur. J. of Lymph. and rel*, 2005.

B. Bouichant, S. Probyn, T. Snoeck, M. Lemort and J-P. Clarys. "Etude morphologique du muscle élévateur de l'anus chez la femme asymptomatique". *Biométrie humaine et anthropologie*, 2006, **24**, 3-4.

P. Germonpre, P. Hastir, P. Dendale, A. Marroni, A. Nguyen and C. Balestra. "Evidence for increasing patency of the foramen ovale in divers". *Am J. Cardiol*, 2005, **95**, 912-915.

S. Nammour, J. Rocca, K. Keiani, C. Balestra, T. Snoeck, L. Powell and J-V. Reck. "Pulpal and periodontal temperature rise during KTP laser use as a root planing complement in vitro". *Photomed Laser Surg*, 2005, **23**, 10-14.

C. Balestra, A. Marroni, R. Cali Corleo, P. Germonpre, M. Pieri and C. Bonuccelli. "Lessons Drawn from the in field experience". *The European Committee for Hyperbaric Medicine Collection, Best Publishing, Flagstaff (USA)*, 2005, **2**, 4-107; 104-128.

T. Snoeck, A-J. Delobel, O. Leduc, F. Wilputte, C. Balestra, S. Probyn and J-P. Clarys. "Contribution à la compréhension des mécanismes de compression vasculaire chez les sujets présentant un arc axillaire de Langer". *Proceedings of XII colloque de la société de biométrie humaine - Biométrie et anthropologie - Biométrie et variabilité humaines*, Paris 16/17/18 novembre 2005.

P. Germonpre, C. Balestra, B. Farkas, G. Vandenhoven and A. Marroni. "How a newly identified medical condition may impact fitness to dive criteria". *The European Committee for Hyperbaric Medicine Collection, Best Publishing, Flagstaff (USA)*, 2005, **2**, 4-25, 24-35.

T. Snoeck, P. Emonts, M. Ezquier, C. Balestra and M. Lemort. "A propos de la palpation du muscle ptérygoïdien latéral - Analyse des rapports par IRM". *LE KENI (Périodique de liaison et d'information de l'AMISEK) - Trimestriel N° 74 - 2005*.

C. Balestra, E. Chassagne, P. Emonts, S. Probyn and T. Snoeck. "Contribution à la compréhension de l'action du muscle obturatorius internus sur la distance inter spina ischidica". *LE KENI (Périodique de liaison et d'information de l'AMISEK) - Trimestriel N° 79 - 2006*.

