

GWENAEL LAYEC

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<https://sites.google.com/umass.edu/o2m-laboratory/home>

CURRENT POSITION

Assistant Professor
University of Massachusetts – Department of Kinesiology, School of Public Health and Health Sciences
Faculty Member Institute for Applied Life Sciences (IALS)
Amherst, Massachusetts

EDUCATION

Université de la Méditerranée, Marseille (France) - 2008

PhD in Human Movement Science, Physiology.

Areas of Specialization: muscle bioenergetics and magnetic resonance spectroscopy and imaging

Dissertation title: Combined investigation of muscle energetics in human: exercise standardisation and energy cost factors

Advisor: Dr. D. Bendahan

Université Montpellier I, Montpellier (France) – 2004

MS in Human Movement Science, Physiology.

Areas of Specialization: muscle metabolism and exercise physiology

PROFESSIONAL EXPERIENCE

2004/10-2008/12	PhD student, CRMBM, UMR CNRS 6612, Marseille, France
2009/9-2010/2	ATER (lecturer), University of Méditerranée, Marseille, France
2010/3-2013/10	Post-Doctoral Fellow, University of Utah, Salt Lake City, USA
2013/11-2015/6	Research Associate, University of Utah, Salt Lake City, USA
2015/7-2018/8	Assistant Professor, Internal Medicine, University of Utah Salt Lake City, USA
2016/11-2018/8	Adjunct Assistant Professor, Department of Nutrition and Integrative Physiology, University of Utah, Salt Lake City, USA
2017/9-2018/8	Adjunct Assistant Professor, Department of Radiology, University of Utah, Salt Lake City, USA

SCHOLARSHIPS, AWARDS AND PROFESSIONAL MEMBERSHIPS

2003-2004	M.S. supported by academic scholarship (Languedoc-Roussillon)
2009	Best Ph.D. Thesis, University of Méditerranée, Marseille,
2010	Educational Stipend, International Society for Magnetic Resonance in Medicine
2015	Best Presentation award, Mitochondrial Physiology workshop, Copenhagen, Denmark,
2016	New Investigator award, Environmental & Exercise Physiology (EEP) section of the American Physiological Society (APS)
2010 - 2012	Member, International Society of Magnetic Resonance in Medicine

Gwenael Layec, *curriculum vitae*

2011-2014,
2018-2019 Member, American College of Sports Medicine
2014-2015 Member, American Heart Association
2015-present Member, American Physiological Society

HIGHLIGHTED PUBLICATIONS (FROM 69, h-index 23)

Layec G, Haseler LJ, Hoff J, Richardson RS. Evidence that a higher ATP cost of muscular contraction contributes to the lower mechanical efficiency associated with COPD: preliminary findings. *American journal of physiology* 300(5):R1142-1147, 2011. PMID: PMC3293514.

Layec G, Hart CR, Trinity JD, Kwon OS, Rossman MJ, Broxterman RM, Le Fur Y, Jeong EK, Richardson RS. Oxygen delivery and the restoration of the muscle energetic balance following exercise: Implications for delayed muscle recovery in patients with COPD. *Am J Physiol Endocrinol Metab.* 2017 Mar 14;ajpendo.00462.2016. doi: 10.1152/ajpendo.00462.2016. [Epub ahead of print].

Selected for APSselect *For distinction in scholarship in the American Journal of Physiology - Endocrinology and Metabolism.*

Layec G, Hart CR, Trinity JD, Le Fur Y, Jeong EK, Richardson RS. Skeletal muscle work efficiency with age: the role of non-contractile processes. *Clin Sci (Lond).* 128(3):213-23. PMID: 25134525

Layec G, Trinity JD, Hart CR, Kim SE, Groot HJ, Le Fur Y, Sorensen JR, Jeong EK, Richardson RS. In vivo evidence of an age-related increase in ATP cost of contraction in the plantar flexor muscles. *Clin Sci (Lond).* 126(8):581-92, 2014. PMID: 24224517

Berg OK, Kwon OS, Hureau TJ, Clifton HL, Thurston TS, Le Fur Y, Jeong EK, Trinity JD, Richardson RS, Wang E, **Layec G**. Skeletal muscle mitochondrial adaptations to maximal strength training in older adults. *The journals of gerontology.* 2020. doi: 10.1093/gerona/glaa082. PubMed PMID: 32253421.

Layec G, Bringard A, Le Fur Y, Micallef JP, Vilmen C, Perrey S, Cozzone PJ, and Bendahan D. Mitochondrial Coupling and Contractile Efficiency in Humans with High and Low V O₂ peaks. *Medicine and science in sports and exercise* 48: 811-821, 2016. PMC: 4976635

Layec G, Gifford JR, Trinity JD, Hart CR, Garten RS, Park SY, Le Fur Y, Jeong EK, Richardson RS. Accuracy and precision of quantitative 31P-MRS measurements of human skeletal muscle mitochondrial function. *Am J Physiol Endocrinol Metab.* 2016; 311(2):E358-366. PMID: PMC5005269.

Layec G, Haseler LJ, Trinity JD, Hart CR, Liu X, Le Fur Y, Jeong EK, Richardson RS. Mitochondrial function and increased convective O₂ transport: implications for the assessment of mitochondrial respiration in vivo. *J Appl Physiol* (1985). 115(6):803-11, 2013. PMID: PMC3764626.

Layec G, Bringard A, Le Fur Y, Vilmen C, Micallef JP, Perrey S, Cozzone PJ, Bendahan D. Comparative determination of energy production rates and mitochondrial function using different 31P MRS quantitative methods in sedentary and trained subjects. *NMR Biomed.* 24(4):425-38, 2011.

Layec G, Bringard A, Le Fur Y, Vilmen C, Micallef JP, Perrey S, Cozzone PJ, Bendahan D. Reproducibility assessment of metabolic variables characterizing muscle energetics in vivo: A 31P-MRS study. *Magn Reson Med.* 62(4):840-54, 2009.

Complete List of Published Work in MyBibliography:

<http://www.ncbi.nlm.nih.gov/sites/myncbi/gwenael.layec.1/bibliography/42720830/public/?sort=date&direction=ascending>

CHAPTER (1)

Layec, G., P.J. Cozzone., and D. Bendahan. Chapter 4, section 1:" A non invasive investigation of training-induced metabolic changes. *Exercise Physiology : from a cellular to an integrative approach.* Connes P, Hue O, Perrey S. Ed. IOS Press. 2010

OTHER (1)

Editorial Podcast in Clinical Science:

<https://soundcloud.com/portlandpress/gwenaellayecpodcast>

Ad Hoc REVIEWER

- **Scientific Journals**

Journal of Physiology, Clinical Science, Applied Physiology, Nutrition and Metabolism, Biochimica et Biophysica Acta, Journal of Applied Physiology, American Journal of Physiology, European Biophysics Letter, Acta Physiologica, Medecine Sport Science and Exercise, Plos One, NMR in biomedicine, Magnetic Resonance in Medicine, Magnetic Resonance Materials in Physics, Biology and Medicine, European Journal of Applied Physiology, European Respiratory Journal, Experimental Gerontology, Journal of the American Society of Nephrology, Journal of Cachexia, Sarcopenia and Muscle, Mitochondrion, Sports Medicine,

- **Research organization/Grants**

National French Agency for Research (ANR), Medical Research Council UK, British Heart Foundation, University of Verona, University of Nebraska, University of Vienna, University of Utah CCTS, University of Massachusetts Amherst FRG/HEG,

INVITED LECTURES

Department/Division Conferences

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| 2007 | Layec G. <i>Noninvasive investigations of the metabolic effects and electromyographic changes in tissue oxygenation on muscle function</i> [<i>Explorations non invasives des effets métaboliques et électromyographiques des variations de l'oxygénation tissulaire sur la fonction musculaire</i>], Journée de la recherche clinique [Clinical Research Day], University of the Mediterranean, Marseille, France |
| 2009 | Layec G. Exploration non-invasive du métabolisme énergétique à l'exercice chez l'homme [Non-invasive exploration of energy metabolism in exercise in humans]. University of Montpellier, Montpellier, France |
| 2016 | Layec G. Metabolic abnormalities with COPD: is it only physical conditioning ? UVRL and ESS Department colloquium, University of Utah. |
| 2017 | Layec G. Physiological Factors Contributing to the Age-Related Decline in Walking Speed and Prospective Counter-Measures. Division of Geriatrics, University of Utah, |
| 2017 | Layec G & EK Jeong. Using Magnetic Resonance Spectroscopy to assess muscle oxygenation and metabolism in patients with COPD. Department of Radiology and Imaging Sciences. University of Utah |
| 2017 | Layec G. Is skeletal muscle metabolism and O ₂ availability impaired in patients with COPD? Insight from in vivo MR spectroscopy. Center for Diabetes and Metabolism. University of Utah. |
| 2017 | Layec G. Peripheral dysfunction and prospective treatment in patients with COPD. UMASS Amherst. |
| 2017 | Layec G. Peripheral dysfunction and BH4 treatment in patients with COPD. Virginia Commonwealth University. |
| 2018 | Layec G. Effects of an acute supplementation in tetrahydrobiopterin on peripheral vascular function and skeletal muscle metabolism in patients with COPD. Department of Pulmonary and Critical Care Medicine. University of Utah. |
| 2018 | Layec G. Peripheral dysfunction in patients with COPD: BH4 as a possible remedy?. Baystate Medical Center |

ORAL PRESENTATIONS

Meeting Presentations

International

- | | |
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| 2008 | Layec G. Effects of a prior high-intensity knee-extension exercise on muscle recruitment and energy cost: a combined local and global investigation. European Society for Magnetic Resonance in Medicine and Biology 25th Annual Scientific Meeting, Valencia, Spain |
| 2008 | Layec G. Does oxidative capacity affect energy cost? An in vivo MR |

- investigation of skeletal muscle energetics. European Society for Magnetic Resonance in Medicine and Biology 25th Annual Scientific Meeting, Valencia, Spain
- 2008 **Layec G.** Accurate work-rate measurements during in vivo MRS studies of human quadriceps exercising muscle. European Society for Magnetic Resonance in Medicine and Biology 25th Annual Scientific Meeting, Valencia, Spain
- 2009 **Layec G.** The effect of physical status on phosphocreatine and pulmonary oxygen consumption kinetics during exercise: a combined pulmonary gas exchange and ³¹P-MRS study. 14th Annual Congress of the European College of Sport Science - ECSS Oslo 2009, Oslo, Norway
- 2009 **Layec G.** Comparative determination of oxidative ATP production and energy cost using different methods in sedentary and trained subjects. European Society for Magnetic Resonance in Medicine and Biology 26th Annual Scientific Meeting, Antalya, Turkey
- 2015 **Layec G.** Validation of quantitative ³¹P-MRS measurements of human skeletal muscle mitochondrial function. Mitochondrial Physiology workshop, Copenhagen, Denmark. *Best Presentation award.*
- 2018 **Layec G.** Approaches to Lessen Fatigue in the Elderly. Symposium American College of Sports and Medicine (ACSM). Orlando, Florida, USA
- 2019 **Layec G.** Role of oxidative stress on peripheral dysfunction in patients with COPD. 2019 Sports Issues Forum and the 31st Seoul International Sport Conference in Commemoration of the Seoul Olympic Games . Seoul, South Korea.

National

- 2007 **Layec G.** A non-invasive and integrated approach of muscle function in humans [Une approche non invasive et intégrée de la fonction musculaire chez l'homme]. Young Researchers Colloquium, French Muscular Dystrophy Association [Colloque Jeunes chercheurs, Association Française contre les Myopathies], Evry, France
- 2008 **Layec G.** In vivo study of the effects of oxidative capacity of the energy cost and ATP production during intense exercise: combined analysis of SRM P31, surface electromyography and measurement of respiratory exchanges [Etude in vivo des effets de la capacité oxydative sur le coût énergétique et la production d'ATP au cours d'un exercice intense: analyse combinée par SRM du P31, électromyographie de surface et mesure des échanges respiratoires]. Congress of the Research Group on Applications of Magnetism in Medicine [Congrès du Groupe de Recherche sur les Applications du Magnétisme en Médecine (GRAMM)], Lyon, France
- 2009 **Layec G.** Does oxidative capacity affect energy cost? An in vivo MR investigation of skeletal muscle energetics. Congress of the French Society of Physiology [Congrès de la Société Française de Physiologie] (P2T), Marseille, France
- 2015 **Layec G.** Muscle efficiency during small muscle mass exercise across the lifespan. South Western American College of Sports and Medicine (SWACSM). Orange County, USA

TEACHING EXPERIENCE

- 2005: Biostatistics for undergraduate and master students, Université de la Méditerranée, Marseille
- 2006: Biostatistics for master students, Université de la Méditerranée, Marseille
- 2009: Biostatistics for master students, Université de la Méditerranée, Marseille
- 2009: Biostatistics for undergraduate students, Université de la Méditerranée, Marseille
- 2009: Human Bioenergetics for undergraduate students, Université de la Méditerranée, Marseille
- 2009: Cardiovascular physiology for undergraduate students, Université de la Méditerranée, Marseille

- 2019-present: Exercise Physiology, KIN 470, UMASS Amherst
- 2019-present: Advanced Exercise Physiology, KIN 597, UMASS Amherst
- 2019-present: Guest Lecture, introduction to Magnetic Resonance Imaging and Spectroscopy, *Techniques for Perfusion imaging*,

RESEARCH SUPPORT

Active Research Support

R00 4R00HL125756 Layec (PI) 09/01/18 - 08/30/2021
 NIH - National Heart, Lung and Blood Institute
 Nitric oxide coupling and BH4 availability roles in muscle dysfunction with COPD

R01 Lei Zhang (PI) 10/01/16 - 09/30/2021
 NIH – National Institute of Biomedical Imaging and Bioengineering
 Stress-rest calf muscle perfusion: a functional diagnostic test for peripheral arterial disease (PAD)
 Role: Co-Investigator

Seed development grant Layec (PI) 07/01/20 - 03/31/2021
 University of Massachusetts Amherst – Institute for Applied Life Sciences
 Physical rehabilitation of COVID-19 survivors by heat therapy
 Role: Principal Investigator

Pending Research Support

W81XWH-20-C-0031 Betty Crosby (PI) 05/01/21-04/30/2023
 The Henry M. Jackson Foundation for the Advancement of Military Medicine, Inc. (HJF)
 Characterizing physiological factors associated with muscle fatigue
 Role: Co-Investigator

Past Research Support

K99 HL125756-02 Layec (PI) 09/01/15 - 08/30/2018 (1 year no cost extension)
 NIH - National Heart, Lung and Blood Institute
 Nitric oxide coupling and BH4 availability roles in muscle dysfunction with COPD

Young Clinical Scientist Award Donato (PI) 01/01/19 - 06/30/2020
 Flight Attendant Medical Research Institute
 Role of Nitric oxide coupling in peripheral dysfunction with COPD
 Role: Consultant

Young Clinical Scientist Award Layec (PI) 07/01/15 - 12/31/2018
 Flight Attendant Medical Research Institute
 Role of Nitric oxide coupling in peripheral dysfunction with COPD

Seed development grant Layec (PI) 03/01/16 - 02/28/2017
 University of Utah – Diabetes and Metabolism Center
 Novel multinuclear MRS evaluation of human skeletal muscle mitochondrial function

Seed grant Richardson (PI) 06/01/2010 - 12/31/2010
 “Understanding skeletal muscle limited rehabilitation in Chronic Obstructive Pulmonary Disease”
 UCAIR and Brain Institute
 Role: Co-Investigator

Doctoral Fellowship Layec 01/01/2006 - 06/30/2009

Oxygen availability and the corresponding modulation of muscle energetics and electrical activity: A combined investigation using ^{31}P Magnetic resonance spectroscopy, gas exchange measurements, near infrared spectroscopy and surface electromyography
AFM (Association Francaise contre les Myopathies)

Doctoral support Layec

6/01/2005 - 12/31/2005

Oxygen availability and the corresponding modulation of muscle energetics and electrical activity: A combined investigation using ^{31}P Magnetic resonance spectroscopy, gas exchange measurements, near infrared spectroscopy and surface electromyography
ADEREM