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Translational myology and mobility medicine at the Spring Padua Muscle Days, March 28-30, 2019–Euganei Hills and Padova, Italy

Ugo Carraro[1,2*]

[1]Department of Biomedical Sciences, Interdepartmental Research Centre of Myology (CIR-Myo), University of Padova, Italy

[2]A&C M-C Foundation for Translational Myology, Padova, Italy

Abstract

The Interdepartmental Research Centre of Myology (CIR-Myo), University of Padova, Italy, the A&C M-C Foundation for Translational Myology, Padova, Italy and PAGEpress, organized the 2019SpringPaduaMuscleDays: Translational Myology and Mobility Medicine, an International Conference held March 28-30, 2019 in Euganei Hills and Padova (Italy) with the help of an international team of Organizers, i.e., Helmut Kern, Jonathan C. Jarvis, Viviana Moresi, Marco Narici, Feliciano Protasi, Marco Sandri and Ugo Carraro. Presentations of Three Physiology Lectures and of the seven Sessions (I: Spinal Cord Neuromodulation and h-bFES in SC; II: Muscle epigenetics in aging and myopathies; III: Experimental approaches in animal models; IV: Face and Voice Rejuvenation; V: Muscle Imaging; VI: Official Meeting of the EU Center of Active Aging; VII: Early Rehabilitation after knee and hip replacement) were of very high levels and were following by constructive discussions. During the three days and evenings, Speakers and Attendees, in particular young attendees, had the chance to exchange further information and design potential collaborations. A half-century tradition of skeletal muscles studies, started with a research on fever, is thus continuing under the auspices of CIR-Myo, A&C M-C Foundation for Translational Myology, Padova, Italy and the European Journal of Translational Myology (EJTM). Furthermore, during the Meeting were also discussed the contents of an EJTM Special, that will be dedicated to Muscle Fascia, an under looked topic, which merits more attention. The abstracts of the 2019SpPMD, e-printed in the Myology News of EJTM 29, 2019 Volume, are excellent examples of translational research in Myology, Mobility and Medicine. Thanks to the high scientific profiles of the researchers and clinicians who are eager to present results at the PaduaMuscleDays, this was true for the past and it will be true in future events.

Myologists working in Padua (Italy) were able to continue a tradition of skeletal muscle studies started years ago with the aim to explain if skeletal muscle is responsible of fever by burning bacterial toxins [1]. This may sound very strange today, but known results on effects of cytokines and myokines on inflammation of nerves, muscles, joints and bones may attract new researchers [2]. Such a long term tradition evolved in the institution of the Interdepartmental Research Center of Myology of the University of Padova (CIR-Myo), in the organization of the PaduaMuscleDays (PMD), a series of International Conferences organized in Euganei Hills (Padova), Italy and in the publication of Basic and Applied Myology (BAM) (retitled from 2010 European Journal of Translational Myology - EJTM). This year an Ejtm Special Guest Edited by Carla Stecco and Raffaele De Caro will be dedicated to Muscle Fascia, an under looked topic that merits more attention. For many years the fasciae have been considered by anatomists only as a "white envelope for the muscles", that is generally removed in anatomical tables, to recognize muscle nerves and vessels. This is one of the reasons that different descriptions of the fasciae exist. On the other hand, in the last years the fasciae and their properties are becoming of central importance to clinicians practicing in various conventional and alternative therapies. The results from the worldwide research activities constitute a body of significant and important data, but this clinical interest is not supported by in-depth comprehension to how integrate the new knowledge about fasciae with the classical biomechanical models based on muscles, tendons and bones. To close this gap an Ejtm Special on "Muscle Fascia" will be published September 30, 2019. Its many aims are to point attention to several open questions: How fasciae and muscles interact during movement? Have the fascia a role in posture? How the various fasciae may appear under Colour Ultrasound, MRI, and CT scans? What is the percentage of elastic fibres within fasciae? Are innervation of fasciae playing a role in proprioception and in motor coordination? [3-23]. Answers to these questions will add to the many tools of the rehabilitation strategies [24].

This year the 2019Spring PaduaMuscleDays: Translational Myology and Mobility Medicine were held in Euganei Hills and Padova March 28-30, 2019. The backbone of the 2019SpPMD program is presented in Figure 1. The cryptic subtitle (Translational Myology and Mobility Medicine), may have attracted not only the core group of researchers that gathered year after year to Padova, but some new speakers filled the sessions. As to the concept of Mobility Medicine, it is worth stressing that Mobility can be a Medicine, but also that in too many diseases there is an impaired mobility that influence the patients' quality of life. The Thursday March 28, morning Session I (Spinal Cord Neuromodulation and hbFES in SCI, Kern H, Carraro U, Chairs) was opened by Claudia A. Angeli, Kentucky Spinal Cord Injury Research Center Louisville, KY, USA, who presented "Epidural Stimulation for the restoration of function following motor complete

Correspondence to: Ugo Carraro, Department of Biomedical Sciences, University of Padova, Italy, E-mail: ugo.carraro@unipd.it

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Figure 1. Leaflet of the 2019 Spring Padua Muscle Days

spinal cord injury", a new exciting development for thoracic-level SCI patients [23]. The Thursday March 28 afternoon Session II (Muscle epigenetics in aging and myopathies, Moresi V, Zampieri S, Chairs) saw Viviana Moresi as the first speaker, presenting "Lifestyle-related muscle epigenetic memory: mechanisms and biomedical relevance". The Thursday March 28 afternoon Session III (Experimental approaches in animal models, Jarvis JC and Mayr W, Chairs) was opened by the presentation "The ERG1a K^+ channel increases calpain activity in C2C12 myotubes and mouse skeletal muscle" by Amber Pond, Southern Illinois University, IL, USA. On Friday March 29, 2019 the second 2019SpPMD was held in the *Aula Emiciclo*, of the *Orto Botanico*, of the Padova University. Three Physiology Lectures, introduced by Marco Sandri, by Clay Armstrong, Penn University, Philadelphia, Pa, USA, Lars Larson, Karolinska, Stockholm, Sweden and Carlo Reggiani, University of Padova, Italy opened the Morning sessions. Whatever the names of physiology sub-specialization these speakers represented, they showed that quantitative evaluations of dynamic events of contraction machineries (action potential, E-C coupling, contractile

proteins and energy metabolism of muscle fibers) are prerequisites of solid results in Myology and Mobility Medicine. Then, followed the morning and afternoon Sessions of Friday, March 29, Session IV (Face and Voice Rejuvenation, Jarvis JC, Chair) and Session V (Muscle Imaging, Protasi F, Narici M, Chairs). The afternoon of Friday March 29, 2019 ended with the guided visit of the Historical Botanical Garden of the University of Padova. Founded in 1545 by the Venetian Republic, it is the world's oldest academic botanical garden that is still in its original location. The garden is known for its special collections and historical design. It was devoted to the growth of medicinal plants, that produced natural remedies, and to teach students to recognize genuine medicinal plants. An after-dinner Guided Visit to Posters ended this very long PaduaMuscleDay. Saturday March 30, 2019 the meeting was held once again in the Conference Hall of Hotel Augustus, Euganei Hills, (Padova), Italy. The morning session was dedicated to the Official Meeting of the EU Center of Active Aging (CAA), Helmut Kern, Dusan Hamar, Chairs, while the afternoon was dedicated to the Session: Early Rehabilitation after knee and hip replacement (Early Reha), Helmut Kern, Sascha Sajer, Chairs. A Round Table on contributions of basic scientists to CAA and Early Reha, Kern H, Chair, with Antonio Musarò, Feliciano Protasi, Marco Sandri, Sandra Zampieri, Giovanna Albertin, Andrea Porzionato, Nejc Sarabon and Ugo Carraro, closed the 2019Spring PaduaMuscleDays. As for the past PaduaMuscleDays [4-44], the abstracts of 2019SpPMD cover translational research involving physical, pharmacological and cellular strategies to maintain or recover structure and function of skeletal muscles, of the patients' mobility, and to treat many more medical problems. The researches attained the high level needed to attract support by Granting Agencies and approval by Ethical Committees as well as by Editors of high impact journals. Many of the abstracts' contents, indeed, are mature to be translated into clinical applications [45]. This often happened in the past [46-48], occurred during this year event [49-51], and will be true in future Padua Muscle Days.

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Ethical publication statement

Author confirms that he has read the Journal's position on issues involved in ethical publication and affirms that this report is consistent with those guidelines.

References

1. Carraro U (2017) From BAM to BEM, a personal journey through EJTM and PaduaMuscleDays. *Biol Eng Med* 2: 1-2.
2. Gabellini D, Musarò A (2017) Report and Abstracts of the 14th Meeting of IIM, the Interuniversity Institute of Myology, - Assisi (Italy), October 12-15, 2017. *Eur J Transl Myol* 27: 185-224.
3. Schleip R Jäger H, Klingler W (2012) What is 'fascia'? A review of different terminologies. *J Bodyw Mov Ther* 16: 496-502.
4. Adstrum S (2014) Fascial eponyms may help elucidate terminological and nomenclatural development. *J Bodyw Mov Ther* 19: 516-525.
5. Langevin HM, Fox JR, Koptiuch C, Badger GJ, Greenan Naumann AC, et al. (2011) Reduced thoracolumbar fascia shear strain in human chronic low back pain. *BMC Musculoskelet Disord* 12: 203. [Crossref]
6. Taguchi T, Yasui M, Kubo A, Abe M, Kiyama H, et al. (2013) Nociception originating from the crural fascia in rats. *Pain* 154: 1103-1114. [Crossref]
7. Schilder A, Magerl W, Hoheisel U, Thomas K, Rolf-Detlef T, et al. (2016) Electrical high-frequency stimulation of the human thoracolumbar fascia evokes long-term potentiation-like pain amplification. *Pain* 157: 2309-2317.
8. Wilke J, Schleip R, Yucesoy CA, Banzer W (2018) Not merely a protective packing organ? A review of fascia and its force transmission capacity. *J Appl Physiol* 124: 234-244.
9. Carraro U, Edmunds KJ, Gargiulo P (2015) 3D False Color Computed Tomography for Diagnosis and Follow-Up of Permanent Denervated Human Muscles Submitted to Home-Based Functional Electrical Stimulation. *Eur J Transl Myol* 25: 5133. [Crossref]
10. Edmunds K, Gíslason M, Sigurðsson S, Guðnason V, Harris T, et al. (2018) Advanced quantitative methods in correlating sarcopenic muscle degeneration with lower extremity function biometrics and comorbidities. *PLoS One* 13: e0193241.
11. Vahed LK, Arianpur A, Gharedaghi M, Rezaei H (2018) Ultrasound as a diagnostic tool in the investigation of patients with carpal tunnel syndrome. *Eur J Transl Myol* 28: 193-197.
12. Fede C, Angelini A, Stern R, Macchi V, Porzionato, et al. (2018) Quantification of hyaluronan in human fasciae: variations with function and anatomical site. *J Anat* 233: 552-556.
13. Benetazzo L, Bizzego A, De Caro R, Frigo G, Guidolin D, et al. (2011) 3D reconstruction of the crural and thoracolumbar fasciae. *Surg Radiol Anat* 33: 855-862.
14. Stecco C, Gagey O, Belloni A, Pozzuoli A, Porzionato A, et al. (2007) Anatomy of the deep fascia of the upper limb. Second part: study of innervation. *Morphologie* 91: 38-43. [Crossref]
15. Corey SM, Vizzard MA, Badger GJ, Langevin HM, et al. (2011) Sensory innervation of the nonspecialized connective tissues in the low back of the rat. *Cells Tissues Organs* 194: 521-530. [Crossref]
16. Hoheisel U, Rosner J, Mense S (2015) Innervation changes induced by inflammation of the rat lumbar fascia. *Neuroscience* 300: 351-359.
17. Lau WY, Blazevich AJ, Newton MJ, Xuan Wu SS, Nasoka K, et al. (2014) Changes in electrical pain threshold of fascia and muscle after initial and secondary bouts of elbow flexor eccentric exercise. *Eur J Appl Physiol* 115: 959-968.
18. Giuriati W, Ravara B, Porzionato A, Albertin G, Stecco C, et al. (2018) Muscle spindles of the rat sternomastoid muscle. *Eur J Transl Myol* 28: 376-385.
19. Masiero S, Carraro U (2018) Rehabilitation Medicine for Elderly Patients. Practical Issues in Geriatrics. Springer International Publishing AG, part of Springer Nature.
20. Taylor MJ, Fornusek C, Ruys AJ (2018) The duty cycle in Functional Electrical Stimulation research. Part II: Duty cycle multiplicity and domain reporting. *Eur J Transl Myol* 28: 323-336.
21. Taylor MJ, Fornusek C, Ruys AJ (2018) Reporting for Duty: The duty cycle in Functional Electrical Stimulation research. Part I: Critical commentaries of the literature. *Eur J Transl Myol* 28: 313-322.
22. Laursen CB, Nielsen JF, Andersen OK, Spaich EG (2016) Feasibility of Using Lokomat Combined with Functional Electrical Stimulation for the Rehabilitation of Foot Drop. *Eur J Transl Myol* 26: 286-273.
23. Angeli CA, Boakye M, Morton RA, Vogt J, Benton K, et al. (2018) Recovery of Over-Ground Walking after Chronic Motor Complete Spinal Cord Injury. *N Eng J Med* 379: 1244-1250.
24. Stecco C, De Caro R (2019) 2019 Ejtm Special on Muscle Fascia. *Eur J Transl Myol* 29: 8060.
25. Power GA, Dalton BH, Gilmore KJ, Allen MD, Doherty TJ, et al. (2017) Maintaining Motor Units into Old Age: Running the Final Common Pathway. *Eur J Transl Myol* 27: 71-73.
26. Coletti D, Adamo S, Moresi V (2017) Of Faeces and Sweat. How Much a Mouse is Willing to Run: Having a Hard Time Measuring Spontaneous Physical Activity in Different Mouse Sub-Strains. *Eur J Transl Myol* 27: 67-70.
27. Pigna E, Greco E, Morozzi G, Grottelli S, Rotini A, et al. (2017) Denervation does not Induce Muscle Atrophy Through Oxidative Stress. *Eur J Transl Myol* 27: 43-50.
28. Coste CA, Mayr W, Bijak M, Masuro A, Carraro U, et al. (2016) FES in Europe and Beyond: Current Translational Research. *Eur J Transl Myol* 26: 6369.
29. Scicchitano BM, Sica G, Musarò A (2016) Stem Cells and Tissue Niche: Two Faces of the Same Coin of Muscle Regeneration. *Eur J Transl Myol* 26: 333-338.
30. Lavorato M, Gupta PK, Hopkins PM, Franzini-Armstrong C (2016) Skeletal Muscle Microalterations in Patients Carrying Malignant Hyperthermia-Related Mutations of the e-c Coupling Machinery. *Eur J Transl Myol* 26: 323-332.
31. Carotenuto F, Coletti D, Di Nardo P, Teodori (2016) Lα-Linolenic Acid Reduces TNF-Induced Apoptosis in C2C12 Myoblasts by Regulating Expression of Apoptotic Proteins. *Eur J Transl Myol* 26: 317-322.

32. Mosole S, Carraro U, Kern H, Loefler S, Zampieri S, et al. (2016) Use it or Lose it: Tonic Activity of Slow Motoneurons Promotes Their Survival and Preferentially Increases Slow Fiber-Type Groupings in Muscles of Old Lifelong Recreational Sportsmen. *Eur J Transl Myol* 26: 339-346.

33. Edmunds KJ, Gíslason MK, Arnadottir ID, Marcante A, Piccione F, et al. (2016) Quantitative Computed Tomography and Image Analysis for Advanced Muscle Assessment. *Eur J Transl Myol* 26: 6015. [Crossref]

34. Coletti D, Daou N, Hassani M, Li Z, Parlakian A, et al. (2016) Serum Response Factor in Muscle Tissues: From Development to Ageing. *Eur J Transl Myol* 26: 6008. [Crossref]

35. Hiroux C, Vandoorne T, Koppo K, De Smet S, Hespel P, et al. (2016) Physical Activity Counteracts Tumor Cell Growth in Colon Carcinoma C26-Injected Muscles: An Interim Report. *Eur J Transl Myol* 26: 5958. [Crossref]

36. Tramonti C, Rossi B, Chisari C (2016) Extensive Functional Evaluations to Monitor Aerobic Training in Becker Muscular Dystrophy: A Case Report. *Eur J Transl Myol* 26: 5873. [Crossref]

37. Riuzzi F, Beccafico S, Sagheddu R, Chiappalupi S, Giambanco I, et al. (2016) S100B protein in skeletal muscle regeneration: regulation of myoblast and macrophage functions. *Eur J Transl Myol* 26: 5830.

38. Barber L, Scicchitano BM, Musaro A (2015) Molecular and Cellular Mechanisms of Muscle Aging and Sarcopenia and Effects of Electrical Stimulation in Seniors. *Eur J Transl Myol* 25: 5227. [Crossref]

39. Gabrielli E, Fulle S, Fanò-Illic G, Pietrangelo T (2015) Analysis of Training Load and Competition During the PhD Course of a 3000-m Steeplechase Female Master Athlete: An Autobiography. *Eur J Transl Myol* 25: 5184. [Crossref]

40. Gargiulo P, Helgason T, Ramon C, Jonsson H, Carraro U, et al. (2014) CT and MRI Assessment and Characterization Using Segmentation and 3D Modeling Techniques: Applications to Muscle, Bone and Brain. *Eur J Transl Myol* 24: 3298. [Crossref]

41. Ortolan P, Zanato R, Coran A, Beltrame V, Stramare R, et al. (2015) Role of Radiologic Imaging in Genetic and Acquired Neuromuscular Disorders. *Eur J Transl Myol* 25: 5014. [Crossref]

42. Ravara B, Gobbo V, Carraro U, Gelbmann L, Pribyl J, et al. (2015) Functional Electrical Stimulation as a Safe and Effective Treatment for Equine Epaxial Muscle Spasms: Clinical Evaluations and Histochemical Morphometry of Mitochondria in Muscle Biopsies. *Eur J Transl Myol* 25: 4910. [Crossref]

43. Franzini-Armstrong C (2015) Electron Microscopy: From 2D to 3D Images with Special Reference to Muscle. *Eur J Transl Myol* 25: 4836. [Crossref]

44. Costa A, Rossi E, Scicchitano BM, Coletti D, Moresi V, et al. (2014) Neurohypophyseal Hormones: Novel Actors of Striated Muscle Development and Homeostasis. *Eur J Transl Myol* 24: 3790. [Crossref]

45. Veneziani S, Doria C, Falciati L, Castelli CC, Illic GF, et al. (2014) Return to Competition in a Chronic Low Back Pain Runner: Beyond a Therapeutic Exercise Approach, a Case Report. *Eur J Transl Myol* 24: 2221. [Crossref]

46. Carraro U (2019) Collection of the Abstracts of the 2019Sp PMD: Translational Myology and Mobility Medicine. *Eur J Transl Myol* 29: 8155.

47. Azevedo-Coste C, Vergeron V, Berkelmans R, Fachin Martins E, Fornusek C, et al. (2017) Comparison of strategies and performance of functional electrical stimulation cycling in spinal cord injury pilots for competition in the first ever CYBATHLON. *Eur J Transl Myol* 27: 251-254.

48. Kern H, Hofer C, Löfler S, Zampieri S, Gargiulo P, et al. (2017) Atrophy, ultra-structural disorders, severe atrophy and degeneration of denervated human muscle in SCI and Aging. Implications for their recovery by Functional Electrical Stimulation, updated 2017. *Neurol Res* 39: 660-666.

49. Kern H, Carraro U, Adami N, Biral D, Hofer C, et al. (2010) Home-based functional electrical stimulation rescues permanently denervated muscles in paraplegic patients with complete lower motor neuron lesion. *Neurorehabil Neural Repair* 24: 709-721.

50. Carraro U (2019) 2019 Spring Padua Muscle Days: Translational Myology and Mobility Medicine. *Eur J Transl Myol* 29: 8105.

51. Carraro U (2019) Collection of the Abstracts of the 2019Sp PMD: Translational Myology and Mobility Medicine. *Eur J Transl Myol* 29: 8155.