



ROSSIGNOL, SERGE

Honorary Member, CANADA

M.D., Ph.D.

Date and place of birth: 1942, Montreal, Canada

Dr. Serge Rossignol is full professor in the Department of Physiology at the Université de Montréal. He is Canada Research Chair on the Spinal Cord and is part of the Multidisciplinary Team in Locomotion Rehabilitation (CIHR's regenerative medicine and nanomedicine).

Summary of research activities: locomotion in cats. My work has shown that adult cats (as well as rats and mice) can walk with their hind limbs after complete spinalization. Pharmacological studies have also shown the potential of certain neurotransmitter agonists and antagonists to trigger or modulate the locomotor pattern after either complete or partial spinalization. I studied the segmented organization of the locomotor network after complete and partial lesions with or without spinal cord electrical stimulation. The work showed the importance of mid-lumbar segments L3-L4 in the expression of spinal and decerebrate locomotion. Studies involving microstimulation, recording and the lesions of the reticulospinal system demonstrated the importance of this system when it comes to locomotor control. Stimulation of the reticulate induces important phase-dependent responses in several muscles of the limbs. After lesion of the reticulo-spinal pathways, the cats exhibit deficits in coordination and weight support but are able to walk voluntarily on four limbs. Some of the deficits can be counteracted with pharmacotherapy. I also studied the cutaneous and proprioceptive reflexes in the front and hind limbs, during locomotion. After lesion of the flexor and extensor nerves of the ankle, I observed a remarkable compensatory capacity of the spinal cord itself. Recently, we were able to demonstrate the spinal cat's capacity for adaptation following cutaneous denervation of the hind paws. We are continuing the study of plasticity after central and peripheral nerve lesions.

Studied diseases: my work mostly concentrates on spinal cord injury in animal models but also studies it in humans.

Selected publications: A. Frigon and S. Rossignol. *Experiments and Models of Sensorimotor Interactions During Locomotion*. Biol Cybern. 95:607-627, 2006. A. Frigon and S. Rossignol. *Functional Plasticity Following Spinal Cord Lesions*. Prog.Brain Res. 157 (16):231-260, 2006. S. Rossignol, R. Dubuc, and J. P. Gossard. *Dynamic Sensorimotor Interactions in Locomotion*. Physiol Rev 86 (1):89-154, 2006. S. Rossignol. *Plasticity of Connections Underlying Locomotor Recovery after Central and/ or Peripheral Lesions in the Adult Mammals*. Phil Trans.R.Soc.B 361:1647-1671, 2006. J. Cohen-Adad, H. Benali, R. D. Hoge, and S. Rossignol. *In vivo DTI of the Healthy and Injured Cat Spinal Cord at High Spatial and Angular Resolution*. NeuroImage, 2008. G. Barrière, H. Leblond, J. Provencher, and S. Rossignol. *Prominent Role of the Spinal Central Pattern Generator in the Recovery of Locomotion after Partial Spinal Cord Injuries*. J.Neurosci., 2008. D. Barthélemy, H. Leblond, and S. Rossignol. *Characteristics and Mechanisms of Spinal Locomotion Induced by Intraspinal Microstimulation and Dorsal Root Stimulation*. J.Neurophysiol. 97:1986-2000, 2007. S. Rossignol, M. Schwab, M. Schwartz, and M. G. Fehlings. *Spinal Cord Injury: Time to Move?* J.Neurosci. 27:11782-11792, 2007. H. Leblond, D. Orsal,

and S. Rossignol. *Treadmill Locomotion in Normal and Spinal Mice*. 35th Congress of the International Union of Physiological Sciences (IUPS) San Diego, CA. March 31 - April 5, 2005, 2005. (Abstract). S. Rossignol. *Neural Control of Stereotypic Limb Movements*. In: Handbook of Physiology, Section 12. Exercise: Regulation and Integration of Multiple Systems, edited by L. B. Rowell and J. T. Sheperd, New York: Oxford University Press, 1996, p. 173-216.

References: http://www.cenum.umontreal.ca/membres/2_titulaires/en_rossignol_s.html

<http://www.physiologie.umontreal.ca/enseignementrecherche/repertoire-des-professeurs-themes-de-recherche/serge-rossignol/>