Loring Rowell 博士（ワシントン大学医学部教授）招待講演

運動時における動脈圧受容器反射とそのリセッティングの重要性

西保　岳*

Invitation Lecture: Importance of Arterial Baroreflexes and their "Resetting" in Exercise

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Rowell博士は、運動生理学において、特に循環・体温調節の世界的権威で、American Journal of Physiology の Editor を長年にわたって続けられてきました。いくつかの単著および Handbook of Physiology の編者としても有名です。この度、来日する機会に恵まれ下記タイトルの特別 DC（博士課程）セミナーを栗原基金からの援助もあり 11 月 19 日に開催することができました。運動中の循環調節の主要なメカニズムは何なのか、また動脈圧反射の役割はどのようなものなのか、について話をしていただきました。本学および他大学の教官、本学大学院生、学群生ら約 40 名が参加して、有意義な 90 分間でした。

以下は、事前に提出されていた講演の概要です。

Before the 1960's circulatory control by arterial baroreceptors during exercise was considered essential. A presumed fall in blood pressure (BP) at exercise onset was thought to explain the rise in heart rate (HR) and BP via the baroreflex. But the rise in BP above the resting BP could only be explained by either a fall in baroreflex *sensitivity* or *upwar "gresetting"* of the reflex.

Later baroreflex sensitivity in exercise was tested by measuring heart-interval (or HR) responses to pressor drug injection, with the conclusion that exercise reduced baroreflex sensitivity. This was incorrect because only the HR portion of the reflex was examined. The problem is addressed by discussing current concepts of baroreflex gain (sensitivity), stimulus response curves, "set-point" (operating point) and "resetting."

The next step was to examine both arms of the baroreflex (HR and vascular resistance) by direct, quantitative activation of the reflex in order to construct reflex *stimulus response* curves to test for *resetting*. The resetting hypothesis was supported as an explanation for the rise in HR and BP, but this raised questions about: 1) how resetting occurs; 2) its role as the *exercise stimulus* and 3) how *cardiovascular drift* could occur. These issues will be discussed.

経　歴

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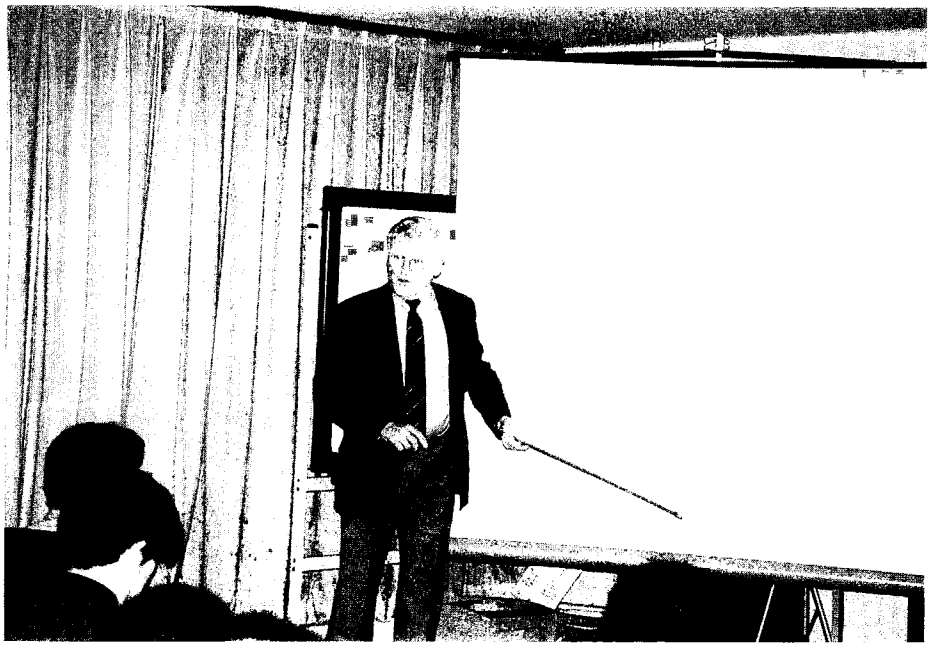

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RESEARCH AND PROFESSIONAL EXPERIENCE

1963 - 64 Research Instructor, Medicine, University of Washington School of Medicine
1964 - 71 Director, Cardiology Research Laboratory, Assistant Director, Postgraduate Cardiology, Training, Medicine, University of Washington School of Medicine
1964 - 68 Research Assistant Professor, Medicine, University of Washington School of Medicine
1968 - 69 Research Associate Professor, Medicine, University of Washington School of Medicine
1970 - 72 Associate Professor, Physiology & Biophysics and Medicine, University of Washington School of Medicine
1972 - 97 Professor, Physiology & Biophysics and Medicine, University of Washington School of Medicine
1972 - 97 Adjunct Professor, Department of Medicine (Cardiology), University of Washington
1973 - 97 Research Affiliate, Regional Primate Research Oenter, University of Washington School of Medicine
1978 - 79 Fulbright Scholar, University of Copenhagen, Denmark
1997 - Professor Emeritus, Physiology & Biophysics, University of Washington School of Medicine

Honors

Established Investigatorship of the American Heart Association, 1966 - 71
Fulbright Scholar, University of Copenhagen, 1978-79
Edward F. Adolph Distinguished Lectureship, Experimental Biology 95, 1995
Sir. R. Douglas Wright Lecturer for 1996, High Blood Pressure Research Council of Australia
Robert M. Berne Distinguished Lectureship, Experimental Biology 97, 1997
Honor Award, American College of Sports Medicine, 1997
A. David Bruce Dill Historical Lecturer, ACSM, 1999
Carl J. Wiggers Award, American Physiological

Society, 2002

Selected Publications (1986 -)

1. King, R.B., Bassingthwaighte, J.B., Hales, J.R.S. and *Rowell L.B.*. Stability of heterogeneity of myocardial blood flow in normal awake baboons. Circ. Res.57: 285-295, 1986.
2. *Rowell L.B.*, Sheriff, D.D., Wyss, C.R. and Scher, A.M. The nature of the exercise stimulus. Acta Physiol. Scand. 128: (Supp. 556) 7-1 4, 1986.
3. *Rowell L.B.* and Blackmon, J.R. Adrenergic activityduring rest and exercise in hypoxemic humans. In: Alfred Benzon Symposium No. 23 Adrenergic Physiol. and Pathophysiology. Copenhagen: Munksgaard, 1986.
4. Henriksen, O. and *Rowell L.B.* Lack of effect of moderate hypoxemia on human postural reflexes to skeletal muscle. Acta Physiologica Scandinavica 127:171-175, 1986.
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9. *Rowell L.B.*, Brengelmann, G.L. and Freund, P.R. Unaltered norepinephrine: heart rate relationship in exercise with exogenous heat. J. Appl. Physiol. 62: 646-650, 1987.
10. *Rowell L.B.* Muscle circulation in exercise: metabolic vasodilation versus reflex vasodilation versus reflex vasoconstriction. In: Vasodilatation, VascularSmooth Muscle. Peptides. Autonomic Nerves and Endothelium. P.M. Vanhoutte, (Ed.), New York: Raven Press, pp. 339-343, 1 988. Form Pa e 6 Pa e PHS 398 Rev. 5/95
11. *Rowell L.B.* and Blackmon, J.R. Human cardiovascular adjustments to acute hypoxemia. ClinicalPhysiol. 7: 349-376, 1987.
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13. Rowell L.B. and Blackmon, J.R. Venomotor responses during central and local; hypoxia. American J. Physiol. 255 (Heart and Circulatory Physio/. 24): H760-H764, 1988.
14. *Rowell L.B.* and Sheriff, D.D. Are muscle "chemoreflexes" functionally important? News in Physiological Sciences 3: 250-253, 1988.
15. *Rowell L.B.*, Johnson, D.G., Ohase, P.B., Comess, K.A. and Seals, D.R. Hypoxemia raises muscle sympathetic activity but not norepinephrine in resting humans. J. App. Physiol. 66: 1736-1743, 1989.
16. Strange, S., *Rowell L.B.*, Ohristensen, N.J. and Saltin, B. Cardiovascular responses to carotid sinus baroreceptor stimulation during moderate to severe exercise in man. Acta Physiologica Scandinavica 138: 145-13, 1990.
17. *Rowell L.B.* and Blackmon, J.R. Hypotension induced by central hypovolemia and hypoxemia. ClinicalPhysiol. 9: 269-277, 1989.
18. Sheriff, D.D., O'Leary, D.S., Scher, A.M. and *Rowell L.B.* Baroreflex attenuates pressor response to graded muscle ischemia in exercising dogs. American J. of Physiology258 (Heart and Circulatoly Physiology27): H305-H310, 1990.
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20. *Rowell L.B.* and Blackmon, J.R. Hypotension induced by central hypovolemia and hypoxemia. Clinical Physiology 9: 269-277, 1989.
21. *Rowell L.B.* and O'Leary, D.S. Reflex control of the circulation during exercise: Ohemoreflexes and mechanoreflexes. Brief Review. J. Applied Physio/. 69: 407-418 , 1990.

22. *Rowell L.B.* and Seals, D.R. Sympathetic activity during graded central hypovolemia in hypoxemic humans. American J. Physiol. (Heart and Circulato/y Physiol.) 28: HI 1 97-HI 206, 1990.
23. O'Leary, D.S., *Rowell L.B.* and Scher, A.M. Baroreflex-induced vasoconstriction in active skeletal muscle of conscious dogs. Am. J. Physiol. 260 (Heart cir. Physiol. 29): H37-H41 , 1991 .
24. *Rowell L.B* Control of the circulation during exercise. In: Reflex Control ofthe Circulation, J.P. Gilmore and l.H. Zucker, (Eds.) CRC Press, Boca Raton, FL, 795-828, 1991 .
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33. *Rowell L.B.* and Shepherd, J.T. Editors: Handbook of Physiology Section 12. Exercise: Regulation and Integration of Multip/e Systems, American Physiology Society and Oxford University Press, New York, 1996.
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36. Papelier, Y., Escourrow, P., Helloco, F., and *Rowell L.B.* Muscle chemoreflex alters carotid sinus baroreflex response in humans. J. Appl. Physiol. 82: 577-583, 1997.
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