Professor Emeritus Setsuro Ebashi

Date of Birth: 31 August 1922

Nationality: Japan

Position: Chairman of the Section II, The Japan Academy
Professor Emeritus, University of Tokyo
Professor Emeritus, National Institute for Physiological Sciences

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Education and Career:

1944	Graduated from Faculty of Medicine, University of Tokyo
1954	Doctor of Medical, Sciences (Ph.D.), University of Tokyo
1959-1983	Professor of Pharmacology, University of Tokyo
1978-	Member, The Japan Academy
1983-86	Professor, National Institute for Physiological Sciences
1983	Professor Emeritus, University of Tokyo
1985-91	Director-General, National Institute for Physiological Sciences
1991-93	President, Okazaki National Research Institutes
1993	Professor Emeritus, National Institute for Physiological Sciences
1995-	Chairman of the Section II, The Japan Academy

Awards and Distinctions:

1965	Prize of Yamaji Science-promoting Foundation
1968	Asahi Prize (issued by Asahi Newspaper Publ. Co.)
1972	Imperial Prize of the Japan Academy
1975	Order of Cultural Merit (Bunka-Kunsho)
1977	Foreign Member of the Royal Society, London
1979	Croonian Lecture at the Royal Society, London
1986	Peter Harris Award
1995	Grand Cordon of the Order of the Sacred Treasure
1996	Foreign Associate of National Academy of Sciences

Academic Achievements:

In 1951 Dr. Setsuro Ebashi embarked on his research that would lead to the discovery of a "relaxing factor" — one which, in the presence of ATP (adenosine triphosphate), relaxes glycerinated muscles in rabbits. In 1955, using an actomyosin superprecipitation assay, he found this factor to exist in a particle with ATPase of Mg activate. At the time, however, his theory was not readily accepted, because it was generally held that a "solubility factor" existed. In 1959, Dr. Ebashi was able to demonstrate that the particulate strongly takes up calcium ions from the medium, in the presence of ATP, and consists of a fragmented sarcoplasmic reticulum. This constituted a pioneer discovery with regard to the calcium pump of the sarcoplasmic reticulum.

It was known that ATP-induced contraction occurs in a pure actin/myosin system regardless of whether calcium ions are present or not. What Dr. Ebashi was able to show is that for contraction to occur in a crude actomyosin-ATP system it requires a small quantity of calcium ions on the order of 10^{-6} M. When the calcium ion count is less than 10^{-7} M, relaxation occurs in the system. Proposing that relaxation is caused by some factor other than the actin/myosin effect, Dr. Ebashi proceeded with his research and in 1965 discovered a new protein named troponin. With a binding value of 10^{6}, troponin has a strong affinity to calcium. One molecule of troponin binds with one molecule of actin-bound tropomyosin. In 1966, he demonstrated that, in myofibril tropomyosin, troponin binds on the actin filament at an interval of 40nm. This he did by showing that one molecule of tropomyosin with a length of 40nm binds with one molecule of troponin. It was his idea that when calcium binds with troponin it acts, through the tropomyosin, to affect the actin filament, initiating an interaction with the myosin.

In the process of troponin purification, Dr. Ebashi succeeded in 1965 in isolating α-actinin. This was the first actin-binding protein to be discovered that exists in cells other than those of the muscles, and it forms the cytoskeleton by bundling into a fasciculus of actin filaments.

By 1971 it was demonstrated through a series of experiments led by various scientists that troponin comprises three components (C, I, T). It was Dr. Ebashi who succeeded in isolating troponin T that binds with tropomyosin. Later in 1970, Dr. Shiro Kakiuchi of Japan and Dr. W. Y. Cheung of the US discovered separately a protein resembling troponin C which is regarded as an activating factor of phosphodiesterase. This is calmodulin, the calcium receptor protein that can be found widely in cells other than those of muscles. Troponin can be regarded as the isoform of the specific calmodulin found in striated muscles (i.e., skeletal muscle, cardiac muscle). Calcium signalings through various media (e.g., calmodulin, Inositol 1.4.5-triphosphate, and C-kinase.) within the cell are now recognized to be intracellular metabolic regulatory systems. Since the 1970s, Dr. Ebashi has continued his research on the mechanisms of calcium regulation of actin and myosin in smooth muscles.

It is widely known today that the calcium ion plays a major role in motor regulation of not only muscle cells but of all cells. The prolific contributions of Dr. Ebashi to the field of muscle research have led to a greater understanding of the molecular mechanisms that regulate muscle contraction-relaxation. The achievements of Dr. Ebashi have thus contributed immensely to progress achieved in animal physiology and biology in general.

Dr. Ebashi's record of accomplishments has received world-wide appraisal and his work introduced in the 1968 review "Calcium ion and muscle contraction" (Progr. Biophys. Mol. Biol.) has been quoted over 1500 times. He has been elected to several prestigious academies such as the Japan Academy, Royal Society of London, National Academy of Sciences, USA, and has received recognition for his continued international efforts to contribute to the advancement of science.