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Bettex-Galland M & Lüscher E F. Thrombosthenin—a contractile protein from thrombocytes. Its extraction from human blood platelets and some of its properties. *Biochim. Biophys. Acta* 49:536-47, 1961.
[Theodor Kocher Inst., Univ. Berne, and Blood Transfusion Serv., Swiss Red Cross, Berne, Switzerland]

Blood platelets are responsible for the retractility of the blood clot. Thrombosthenin, an actomyosin-like protein, was isolated from human blood platelets in sufficient amounts to allow the study of its physical and biochemical properties. [The *SCI*® indicates that this paper has been cited in over 220 publications since 1961]

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In 1958 I went to work with the well-known biochemist, E.F. Lüscher, who was engaged in blood platelet research. We worked mainly on human blood platelets at the Swiss Red Cross laboratories, where blood fractions were prepared. I was asked to investigate clot retraction and its causes. With the thought in mind that nature sometimes uses analogous systems to obtain similar results, I was able to extract a protein whose precipitate contracts upon addition of ATP, or "superprecipitates," as Szent-Gyorgyi called this phenomenon.[1] We immediately sent a short communication to *Nature*, in which it was published in 1959.[2] My husband gave this protein the Greek name of thrombosthenin, i.e., clotted blood strength. Thrombosthenin accounts for some 15 percent of the platelet's total proteins. It is a complex formed by thrombosthenin-A, or actin-like, and thrombosthenin-M, or myosin-like, components. This complex dissociates in solution upon addition of ATP, with a corresponding drop in viscosity. It is, like muscle actomyosin, an ATPase, and this activity is bound to the thrombosthenin-M part.[3] At the request of J.T. Edsall, the properties of thrombosthenin were reviewed in 1965.[4] Later on, using electron microscopic techniques, we were able to show that thrombosthenin-A polymerizes in thin filaments and that thrombosthenin-M forms spindle-shaped needles, both proteins being recognizable in the superprecipitates by negative contrast with uranyl-acetate directly on the grids or, after fixation, on thin sections. The two proteins could also be detected inside the platelets.[5] We then purified thrombosthenin-A in its monomer form by gel electrophoresis. With such an extract on my lap, I flew to Copenhagen, where I repolymerized the protein, so that Behnke could decorate its filaments with heavy meromyosin extracted from rabbit striated muscle.[6]

Lüscher and I received, in 1965, the highest Swiss award, the Otto-Naegeli prize, for these findings.

I think that our results have been frequently quoted because thrombosthenin is a contractile protein of nonmuscular origin that can actually be extracted and purified in quantities sufficient for testing further properties, for example, to study how contractile proteins are anchored in the membrane in order to be able to promote cell motility.

1. **Szent-Gyorgyi A.** *Chemistry of muscular contraction* New York Academic Press, 1951. 162 p
2. **Bettex-Galland M & Lüscher E F.** Extraction of an actomyosin-like protein from human thrombocytes *Nature* 184:276-7, 1959 (Cited 155 times)
3. **Bettex-Galland M, Portzehl H & Lüscher E F.** Dissoziation des Thrombosthenins in seine zwei Komponenten Untersuchung ihrer Adenosintriphosphatase-Aktivität *Helv Chim Acta* 46 1595-8, 1963
4. **Bettex-Galland M & Lüscher E F.** Thrombosthenin, the contractile protein from blood platelets and its relation to the other contractile proteins *Advan Prot Chem* 20 1-35, 1965 (Cited 170 times)
5. **Bettex-Galland M, Lüscher E F & Weibel E R.** Thrombosthenin Electron microscopical studies on its localization in human blood platelets and some properties of its subunits *Thromb Diath Haemorrh* 22 431-49, 1969 (Cited 50 times)
6. **Bettex-Galland M, Probst E & Behnke O.** Complex formation with heavy meromyosin of the isolated actin-like component of thrombosthenin, the contractile protein of blood platelets *J Mol Biol* 68 533-5, 1972