

Journal of Chromatography, 376 (1986) 5–9
Biomedical Applications
Elsevier Science Publishers B.V., Amsterdam — Printed in The Netherlands

CHROMBIO. 2979

BIOSPECIFIC SORPTION, PRAGUE, 1910: EMIL STARKENSTEIN (1884–1942)

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SUMMARY

Emil Starckenstein's paper (1910) on the influence of chloride on the enzymatic activity of liver amylase has been considered generally as the first experimental demonstration of the biospecific adsorption of an enzyme on a solid substrate. Emil Starckenstein's life is also briefly mentioned.

Emil Starckenstein was born on December 18th, 1884, in Poběžovice (Ronsperg) near the western border of Bohemia, as a descendant of a Jewish family whose members had served the local community as physicians for several generations. In 1903–1909 he studied medicine at the Medical Faculty of the German (then Carlo-Ferdinandean) University in Prague, and he worked during his student years at the Institute of Pharmacology, under the supervision of Privat-Dozent Wilhelm Wiechowski.

Emil Starckenstein became a Volontär in 1906, a demonstrator in 1909 and then an "Assistent" at this Institute.

Some of the problems that he studied at the beginning of his scientific career were of a biochemical nature: inositol, inositol phosphate, glycogen and amylase.

His second paper from the series of studies on liver amylase (cf. ref. 1) was an article entitled "Über Fermentwirkung und deren Beeinflussung durch Neutralsalze" [2]. His lecture on this subject was delivered at the meeting of the "Wissenschaftliche Gesellschaft deutscher Ärzte in Böhmen" on February 25th, 1910, and the respective abstracts were published [3–5].

In review articles that cover the beginnings of biospecific sorption [6, 7] Starckenstein's student paper is mentioned as the first one describing biospecific adsorption. Starckenstein's approach to the problem of adsorption of an enzyme on a corpuscular substrate, results and their interpretation, as well as later stu-

dies referring to the problem of adsorption of amylase on starch, will be the subject of a complementary paper [8].

The research into glycogen and amylase was published by Starkenstein in seven full papers and a number of abstracts. He took interest in marine animals, especially Tunicates, and spent some time (in 1910, and again in 1912) in the Zoological Stations of Trieste* and Naples. The last paper [9] of the series was the second report on the influence of chlorides on the activity of amylase, but he did not elaborate further on the problem of enzyme sorption by the substrate.

His academic career (habilitation in 1913) was interrupted by the war. He served as commander of the Military Hospital for Infectious Diseases at Radom (Poland) and published studies on typhus. Since that time, he continued a lively interest in clinical pharmacology and therapeutic applications.

After the end of the war, Starkenstein returned to the Institute of Pharmacology and Pharmacognosy of the Medical Faculty of the German University in Prague where he became, in 1920, Professor Extraordinary and, in 1929, after the death of Wiechowski, Professor Ordinary and Head of the Institute. He served as Dean of the Faculty in 1931–1932.

His later work no longer centred on biochemistry [with the possible exception of a paper (ref. 10) on the importance of biochemical species-specific characters for evolutionary questions]. It is impossible, and indeed I am not capable of giving here a survey of his varied research activities. He wrote or co-authored more than twelve textbooks and monographs. An overview of his work is given in several biographical articles [11–14] to which we refer and of which the most recent is that by Senius [15]. The latter is accompanied by an extensive and carefully checked Bibliography comprising 243 entries; Mrs. Leena Pucci from the University Library of Tampere has assisted with its compilation.

Starkenstein was generally considered to be an authority on the pharmacology of iron. One aspect of his work had considerable practical importance and assured his Institute of financial assistance by the pharmaceutical industry in Germany (Bayer): rational designing and pharmaceutical evaluation of composite preparations, e.g. Vasano® for sea-sickness or the once-popular analgesic Veramon® (barbital and amidopyrin) [16]. Already, his habilitation lecture of 1913 [17] had the title “Über Arzneikombinationen”. According to J. Květina (quoted by Senius [15]), J.H. Gaddum, speaking in 1961, designated Starkenstein “as the most prominent continental pharmacologist between World War I and II”. Even Czechoslovakian pharmacology, which after the Second World War achieved a remarkable level due to the efforts by H. Rašková and her school, made use of the practical experience accumulated in Starkenstein’s institute via the skilled technician František Redlich (also born in 1884), who had worked at the Pharmacology Institute of the German University in Prague from 1902 to 1945 and later, in 1947–1958, was busy handing over his know-how to his younger colleagues in Prague’s pharmacology laboratories.

Starkenstein’s broad outlook is documented by a number of studies devoted to the history of culture and of medicine and pharmacy. As early as 1911, he

*Incidentally, C.F. Cori’s father was the Director of the Trieste station.

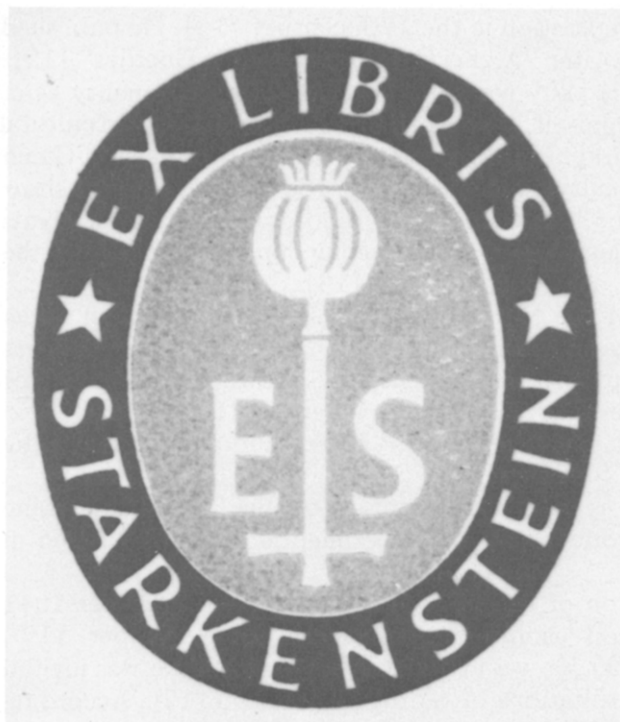


Fig. 1. Two ex-libris designed for E. Starkenstein, the second by Robert Herrmann (1928). From the collection of the Institute for the History of Pharmacy, Charles University Faculty of Pharmacy, Hradec Králové, courtesy of Dr. V. Rusek. Photograph by T. Holeček.

wrote about the art of drug preparation in the 17th century [18]. He published an article about his favourite writer "Arznei and Gift im Leben Goethes" [19]. His last historical study (1937) [20] was devoted to another personality who, like Goethe and Starkenstein himself, had many profound scientific and cultural interests, namely Jan Ev. Purkyně. Starkenstein was free of the anti-Czech chauvinism of some of his Faculty colleagues [12]. His ex-libris (Fig. 1) show poppy-heads and remind us of his collection of old books on medical plants [21] and his collection of illustrations of the genus *Papaver* throughout the ages which, unfortunately, has not been published [13].

Owing to demonstrations of the Nazi students (following the Munich agreement of September 1938) against him, because of his Jewish origin, he was compelled to apply for exemption from his lecturing duties. The textbook of 1938 [23] was the last one he wrote in Prague. When, in 1939, the "Reichs-deutsche Universität" was set up in Prague, he retired and emigrated to The Netherlands.

He became active in the research laboratories of the "Amsterdamsche Chininefabriek", where he produced eleven experimental papers published in 1939–1942 [13, 15].

After the German occupation of Holland, he was arrested in October 1941 and died in the concentration camp of Mauthausen on November 11th, 1942. Another version says that he was arrested in Berlin where he was invited by the administration for consultations on a drug preparation [12]. According to Junkmann [11], he spent some time in the prisons and camps of Amsterdam, Scheveningen, Cleve, Prague and Terezín (according to Koerting [24] "Malá pevnost", a prison for political detainees). This might suggest that he was held for interrogation and that his arrest, in addition to his Jewish origin, was motivated by his democratic and humanitarian attitudes. According to Matoušek and Kok [13], Starkenstein's spirit remained unbroken up to the end and he held lectures for his fellow prisoners at Mauthausen. Matoušek and Kok [13] quoted, when referring to the end of Starkenstein's life: "Jedoch der schrecklichste der Schrecken, das ist der Mensch in seinem Wahn".

CONCLUSION

Starkenstein's student paper of 1910, which initiated the study of biospecific sorption [2], belongs among the rare examples of works of a novice author, which entered into the history of science. His further activity as experimental pharmacologist, teacher, humanist and man of varied cultural interests won him great authority and wide admiration.

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