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**DR. EDMUND F. BIERNACKI:  
LIFE AND CONTRIBUTION TO THE DISCOVERY OF  
ERYTHROCYTE SEDIMENTATION RATE**



Edmund Faustyn Biernacki (1866–1911)  
(Reproduced from *Krytyka Lekarska* 1897, vol.1, no 11, p. 362)

The majority of laboratory tests, before they have been introduced to clinical practice has been preceded by a number of observations and discoveries of related pathophysiological phenomena. These observations have been carried out by several investigators throughout centuries, and it is almost impossible to claim the discovery of a certain laboratory test to a single scientist. The above described statement applies to the erythrocyte sedimentation rate (ESR). ESR is a simple, non-specific method which is

widely used in patients to detect or estimate infection, inflammation, neoplastic proliferation and other diseases.

The present paper described the life and achievements of Dr. Edmund F. Biernacki. His contribution to the discovery and clinical application of ESR remains almost unknown, despite the publication of his results in the leading German and Polish journals. His works were done at the end of the 19th century but majority of contemporary medical handbook attributed the early works on clinical application of ESR to Robin Fåhræus [1] and Alf Westergren whose studies were done in the second and third decade of the 20th century [2-3]. In this year, the centenary of the first paper of Biernacki on ESR is celebrated.

Dr. Edmund F. Biernacki was born on the 19th of December, 1866 in Opoczno, a small Polish town in the Radom Province. At that time, Poland was partitioned and Opoczno was located in the part belonging to Russia. After an elementary school in Opoczno, Biernacki attended high schools in Kielce and Lublin where he was an outstanding student [4]. After graduation (1884), he entered the Medical Faculty at the Warsaw University. During his studies, he carried out research under Professor Tumas. His work was very successful, and he published six papers still being a student, all translated into German or Russian. One of them entitled «*Influence of saline subcutaneous infusions on changes in blood and diuresis*» was awarded the Gold Medal by the university [5].

After graduation (1889) Biernacki was appointed an assistant in the Department of Medicine (so-called Department of Therapy) at the Warsaw University under Professor Michał Zieniec. In a short time, he became famous as a talented teacher and successful scientist. He received a grant from «*Kasa imienia Mianowskiego*» («The Mianowski Foundation») for further education in foreign universities. In the next year after graduation, Biernacki visited such famous departments as those at the University of Heidelberg under Professor Erb, Paris under Professor Charcot and Giessen under Professor Riegele. Upon return, he became a senior assistant in the Department of Medicine at the Warsaw University, and continued his scientific activity. During his second travel abroad, he worked in the Department of Physiology in Heidelberg under Professor Kühn, where he investigated the effect of high temperature on digestion. From Heidelberg Biernacki came to Paris and studied new methods of investigation of gastric juice in the laboratory of Professor Hayem. On the way back to Poland, he visited the laboratory of Professor Riegele in Giessen and investigated gastric function in humans [6,7]. The next year in Warsaw was very successful for Biernacki. His interest was concerned with the application of physiological methods to various fields of internal medicine and neurology. In this year beside his discoveries on ERS, he published a valuable paper on anesthesia of the ulnar nerve in patients with tabes [8,9]. This sign is known as the Biernacki's sign.

In 1897, he left the university and became a head of the municipal hospital in Wola, a quarter of Warsaw. The cause which prompted him to move from the university was unclear. Probably intensification of russification of the school of medicine stimulated him to create more independent and more Polish research centers on the basis of the municipal hospital [10]. His efforts were only partially successful. He was able to establish a research laboratory in the hospital but conditions of investigations there were difficult. In 1902, Biernacki decided to move to Lwów (now Lvov, the Ukraine). In that time it was a part of the Austrian Empire where conditions of living and freedom for Poles were better than in Russia. After nostrification of his Russian diploma and so-called habilitation (thesis presentation and examination for the docent degree), he became an associate professor of general and experimental pathology at the University of Lwów.

During summers to improve his financial situation, he practiced medicine in one of the most famous spas, Karlsbad (now Karlovy Vary, Czech Republic). On January 29, 1908 the Medical Faculty in Lwów granted Biernacki the title of professor but the Austrian Imperial Ministry refused to give him paying position so until the last days of his life he was employed as an associate professor [10]. Biernacki died suddenly in Lwów on December 29, 1911 at the age of 45.

Ancient Greeks and Romans as well as Renaissance physicians observed a phenomenon related to ESR. They knew that blood obtained from blood letting, a common method of treatment of these times, left in a container in some cases separate into upper layer, the buffy coat. The appearance of this layer was associated with inflammation and the buffy coat was called «*crusta phlogistica*» or «*crusta inflammatoria*». Formation of the buffy coat resulted from a rapid sedimentation of erythrocytes in blood with subsequent clotting of the white-yellow upper layer. It occurred in patients with certain disorders and had not been found in healthy individuals.

The first clear description of the buffy coat formation, reported as the inflammatory pellicle which reveals its relationship to subsidence of the red globules belongs to Richard Davies, an English physician and polymath [12]. He made his observation in 1748 and published it in 1760 [13]. A few years later, William Hewson (1739–1774) confirmed the relation of the buffy coat formation to sedimentation of erythrocytes [14]. More detailed investigations were carried out by German scientist Herman Nasse of Bonn [15]. He suggested that a decreased level of fibrinogen was responsible for delayed sedimentation and he made some observations of the relationship between diseases and these phenomena.

In 1894 a quantitative method for measurement of ESR and its clinical application was described in detail by Edmund Faustyn Biernacki. The first observations on sedimentation of erythrocytes were done by Biernacki during his studies on the volume of red blood cells.

# GAZETA LEKARSKA

Z PRACOWNI KLINIKI DYAGNOSTYCZNEJ UNIWERSYTETU WARSZAWSKIEGO.

## I. W KWESTYI WZAJEMNEGO STOSUNKU CZERWONYCH CIAŁEK I OSOCZA WE KRWI KRAŻĄCEJ.

(Rzecz wygłoszona na posiedzeniu Tow. Lekar. Warsz. dnia 20. II. 1894.)

Podał

Edmund Biernacki.

„Illut ist ein ganz besonderer Saft“

Szanowni Panowie! Podczas ostatnio przeprowadzonych poszukiwań nad wartością różnych metod, służących do określania ogólnej objętości krążków czerwonych we krwi, udało mi się porzynie pewne spostrzeżenia, rzucające światło na wzajemny stosunek dwóch zasadniczych składników krwi: czerwonych ciałek i osocza. Spostrzeżenia te posłużyły mi za podstawę do teorii, którą mam właśnie zamiar wyłożyć Szanownym Panom.

Wiadomo powszechnie, że krew po wyjściu z ustroju wkrótce dzieli się na dwie części: na skrzep i surowicę; jeśli krew pozostawiamy samej sobie; albo na osad z czerwonych ciałek i surowicę; względnie osocze, jeśli krew otwórkujemy, albo też powstrzymamy jej krzepnięcie przez dodatek nasyconej ilości szczawianu sodu. Po wleciu takiej nieodwłóknionej lub odwłóknionej krwi do cylindra z podziałkami możemy bardzo dokładnie spostrzegać to dzielenie się krwi na dwie ostro odgraniczone warstwy: górną — dość przezroczyste osocze, względnie surowicę, i dolną nieprzezroczystą warstwę czerwonych ciałek, na granicy których z surowicą widać dość często wąską szarawą warstwę białych ciałek krwi. Wysokość osadu czerwonych ciałek stopniowo się zmniejsza i nareszcie śród pewnych warunków dochodzi do pewnego *minimum*, tak, że w przeciągu następujących dni osad nie zmniejsza się nawet na ćwierć centymetra sześciennego. W tym czasie możemy za pomocą dwóch suchych pipetek zebrać oddzielnie osocze, czyli surowicę i osad czerwonych ciałek na suchu porcelanowe niteczki.

Otoż, przy białej lub kropi takiego osadu pod drobnowidzem, bez dodania jakiegokolwiek płynu, przedstawi nam się obraz w dwóch punktach zasadniczo różny od obrazu, jaki daje kropla całkowitej świeżej krwi. Podczas górną w kropli całkowitej krwi, odwłóknionej lub nieodwłóknionej, w przypadkach przedmiotnie badanych wszystkie krążki czerwone leżały w rufkach („*Redkörner*“)

Title-page of the first Polish paper of Biernacki on erythrocyte sedimentation rate  
(*Gazeta Lekarska* 1894, vol. 14, p. 274)

**Ueber die Beziehung des Plasmas zu den rothen  
Blutkörperchen und über den Werth verschiedener Methoden der  
Blutkörperchenvolumbestimmung.**

Von

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Als eine neue klinische Methode der Blutuntersuchung ist die Bestimmung des Gesamtvolums der rothen Blutkörperchen mittelst der Centrifugalkraft und des dazu dienenden Apparates, sog. «Hämatokrit», in der letzten Zeit eingeführt worden. Zuerst haben diese Methode Blix und Hedin beschrieben; bald darauf modificirte Gärtner den ursprünglichen Apparat und in kurzer Zeit ist eine Reihe von «hämatokritischen» Blutuntersuchungen erschienen (Daland<sup>1)</sup>, Niedergall<sup>2)</sup>, Friedheim<sup>3)</sup>, M. Herz<sup>4)</sup>). Man ersah in der Blutkörperchenvolumbestimmung vor allen Dingen die Methode, die die Blutkörperchenzählung vertreten kann; nachdem es sich aber herausgestellt hat, dass die Grösse des Sedimentes in dem Hämatokrite mit der Blutkörperchenzahl nicht immer parallel geht, solle die genannte Methode eine Ergänzungsmethode der Blutkörperchenzählung sein und die Zusammenstellung der Ergebnisse beider Methoden zu

<sup>1)</sup> Daland, Ueber das Volum der rothen und weissen Blutkörperchen, Fortschritte der Medicin, 1891, Nr. 20.

<sup>2)</sup> Niedergall, cit. nach F. A. Hoffmann's Lehrbuch der Constitutionskrankheiten.

<sup>3)</sup> Friedheim, Ueber die Volumbestimmung der rothen Blutkörperchen etc., Berlin, klinisch. Wochenschr., 1893, Nr. 4.

<sup>4)</sup> M. Herz, Blutkrankheiten, Virchow's Archiv 1893.

He compared various methods of determination of the total erythrocyte volume, including so-called spontaneous sedimentation. During these studies, he found that the rate of sedimentation varied in association with some pathological states [16, 17]. He was the first who paid attention to the rate of sedimentation contrary to earlier studies focused on features of the sediment only.

In further studies, Biernacki described accelerated sedimentation in patients with various fever states, rheumatism, anemia, chronic nephritis, uremia, tuberculosis, pneumonia, influenza and indicated the practical value of the method. He also elaborated technical aspects of the measurement, and designed a special cylinder for this purpose. Using this cylinder, the results could be read in millimeters of the sediment, in volume of the sediment or expressed as a percentage of the total volume of sediment after 24 hours. Biernacki recommended reading after a half hour and after one hour for practical application of ESR. He used venous blood and prevented coagulation by addition of a small amount of sodium oxalate in substantia [18(22)]. In 1906, he reported modification of his method which could use smaller volumes of blood [cited after 7]. It was of importance because before the first world war venous blood drawn with a syringe was relatively uncommon, and blood was obtained by puncture of the finger tip.

In a short time the discovery of Biernacki was included into leading handbooks of hematology [23]. The first paper of Robin Fåhræus (1888–1968) was published in Swedish in 1918 [24]. He tried to apply the ESR for early detection of pregnancy. This paper was followed by two others which contained the history of the ESR and analysis of electrostatic mechanisms which may be responsible for sedimentation of erythrocytes [25, 26]. Fåhræus also described the works of Biernacki. Fåhræus did not consider himself the discoverer of ESR, and together with Alf Westergren (1891–1968) contributed to popularization of this method in clinical practice [27]. Unfortunately, in many modern handbooks of medicine, the discovery of ESR is unjustly attributed to Fåhræus and the studies of Biernacki published still in 19th century are forgotten, although all of them appeared in major Polish and German journals of medicine and physiology.

The aim of this paper is not to diminish the value of works of Biernacki's successors but to indicate this forgotten place of Biernacki in the historical chain of discoveries which lead to wide application of ESR, one of most common laboratory test of the contemporary medicine.

#### SUMMARY

*Dr. Edmund Faustyn Biernacki* was born on December 19, 1866 in Opoczno (Radom Province, Poland). He graduated of the Medical Faculty of the Warsaw University (1889), and continued education in Heidelberg, Paris and Giessen. He worked in the Department of Medicine at the

Warsaw University and the Wola Municipal Hospital in Warsaw. In 1902, he moved to Lwów University. Biernacki died on December 29, 1911 in Lwów.

In 1894, Dr. Biernacki described the quantitative method for measurement of erythrocyte sedimentation rate and its clinical application. His works were forgotten despite that they were published in major German and Polish journals.

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