

# Adolf Kussmaul

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Adolf Kussmaul was one of the great physicians of the second half of the 19th century, one of the pioneers who broke the "unnatural alliance" which medicine had formed with philosophical speculation and placed scientific medicine rightly among the biological sciences. He considered himself most fortunate to have passed through life as a child of the 19th century. "No other century is comparable with it in enthusiasm and ability to penetrate the secrets of nature, none has advanced the general welfare and made life more pleasant with the same measure of inventive spirit, and finally, none has scattered more decisively and victoriously the chains of slavery in all parts of the world."

Adolf Kussmaul's grandfather was a "feldsherer" in the little country village of Soellingen, Germany, and had the official title "chirurgus." Kussmaul's father, born in 1790, served as an army surgeon (Wundarzt) for five years and then continued the study of medicine. His clinical notes compiled in 1819 and 1820 are of interest in that they depict the status of clinical medicine of the time based on philosophical deductions: "Liver and spleen are two oppositely-placed poles, as are also iron and mercury. Iron is the stiffest and most solid, mercury the softest and most penetrable of all metals. From this, a theory regarding the value of iron in diseases of the spleen can be deduced. Just as mercury is helpful in diseases of the liver, so iron is in the diseases of the spleen."

Adolf Kussmaul was born Feb. 22, 1822, in Graben, near Karlsruhe, Germany. The origin of the rather unusual name, Kussmaul, ("kiss snout"), cannot be ascertained definitely. Adolf Kussmaul considered himself to be a descendant of the great physician Oribasius ("os," the mouth; and "basium," the kiss). Others believed that Oribasius was a latinized Greek word and meant "hill-goer" or "hill-man." Some interpreted the name Kussmaul as being derived from the old German

"Kusso" (the good one) and "Mulo" (the energetic one). In his autobiography, Kussmaul recounts many episodes of embarrassment and amusement caused by his name. A prominent lady to whom he was introduced early in his career asked him to repeat the name and then said simply: "No. It is impossible. No one can have such a name." One of his teachers advised him on several occasions to have his name changed. Kussmaul politely rejected such advice, emphasizing that his family came "from the oldest medical nobility."

Kussmaul completed his medical studies in Heidelberg. The medical school of the University of Heidelberg became a growing center of scientific research and attracted many promising young men. Henle, the anatomist, was one of the leading rebels against philosophical medicine. His goal was "rational medicine" based on exact anatomical observations. Henle was editor of the journal *Zeitschrift fuer rationelle Medizin* and of the *Handbuch der rationellen Pathologie*. In order to understand the medical milieu of that time one must recall that diseases were diagnosed according to symptoms only. Thus, the common clinical diagnoses were dropsy, jaundice, cyanosis, hyperpyrexia, apoplexy and dysentery. Kussmaul had great admiration for Henle and for another teacher, the obstetrician Naegele, one who placed obstetrics on a sound anatomical and physiological basis. During the last year of his study (1845) Kussmaul wrote a paper on the anatomical, physiological and pathological nature of the color changes in the fundus of the eye. Through this paper he was awarded the Karl Friedrich Gold Medallion, to the great satisfaction of his father. He worked hard on the structure of an ophthalmoscope, but it was reserved for Helmholtz to fulfill this dream.

Kussmaul's postgraduate work brought him to Vienna and Prague. In Vienna, Rokitansky, Hebra and Skoda were his teachers. Rokitansky's autopsies, Hebra's lectures on skin diseases and Skoda's correlation of auscultation and percussion with autopsy findings were of great interest to Kussmaul. But his respect went to Semmelweis who was then engaged in his work on the causes of puerperal fever. Kussmaul was permitted to practice in

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the obstetrical wards, a privilege seldom granted. In Prague, Kussmaul worked under an outstanding teacher, Johannes Oppolzer. Upon his return to Germany he served in the army as a military surgeon. He then settled for four years in Kadern, a picturesque small town in the Black Forest, where he developed an extensive and profitable general practice.

In spite of heavy routine work, long working hours and sleepless nights, Kussmaul found time to continue his scientific work. Based on his observations in country practice he published papers on acute rheumatism, dysentery, stomatitis septica, typhoid fever and phlebitis hepatica. This phase of his life was terminated by a severe protracted disease "meningitis lumbalis." His feet were senseless and the bladder was paralyzed; the symptoms of paraplegia are suggestive of poliomyelitis. The paralysis of the bladder subsided first but it took many months before Kussmaul could leave his bed and a number of years before he had the normal use of his legs.

Having recovered from this disease, Kussmaul decided to change his life radically. He gave up country practice and made preparations for the academic career which had always been his real ambition. Kussmaul learned a good lesson from his sickness. It made him become, in his own words, "an understanding physician." He often recited to his students the lessons of his disease. He wished them to pass through a serious disease in order to become good physicians. They would then understand what care, kindness and tenderness mean to a suffering patient. He insisted that his students should learn the particulars of nursing, the making of a bed, the preparation of food. He laid great stress upon the moral and mental influence of the physician upon his patient.

With his modest savings he pursued the study of the scientific branches of medicine. He was attracted to Wuerzburg by the great personality of Virchow. In 1856, he was admitted to the University of Heidelberg as an instructor (privat-dozent) and was appointed in the following year professor extraordinarius. He devoted the second of his autobiographies to this period of his life. In 1859, he was called to the chair of medicine in Erlangen, in 1864 in the same capacity to the University of Freiburg, and in 1876 to the new medical school of the University of Strassburg. In 1888, he retired from his academic positions and returned to his beloved Heidelberg where he spent the remainder of his life.

Kussmaul's scientific contributions extended into many fields of medicine. Some of his classical papers exerted a deep influence upon the development of medicine. His famous essay "Studies on the Psychology of the New-

born" was delivered as the opening address before the Medical Faculty of the University of Erlangen. Published in 1859, it was republished in 1885 and 1896. Another classic is his paper on "Disorders of the Speech." He published pioneering work on rigor mortis, mercury poisoning, osteomyelitis, embolism of the mesenteric arteries, paradoxical pulse and periarteritis nodosa. He gained great popularity by the use of the stomach tube in the treatment of pyloric obstruction. Although Kussmaul did not invent the stomach tube, as some erroneously believe, he carefully described the indications and contraindications for its use. He predicted so many years ago "that the keener intellects of future generations will undertake in such case to resort to gastrotomy, stomach fistula or enlargement of the pyloric opening by means of a knife or tube, in order to obtain radical results."

Closely associated with his work on the use of the stomach tube were observations of the esophagus and stomach in which the esophagoscope and gastroscope were employed (probably the endoscope of Désormeaux). He used the instrument first in a professional sword-swallower. The light source was too weak to permit reliable observation. His work as well as that of his students gave important impetus to the development of modern gastroenterology. It included basic observations on gastric secretion, motor activity of the stomach, treatment of ileus and treatment of gastric ulcer.

Kussmaul's last publication in Freiburg was concerned with diabetes mellitus ("Zur Lehre vom Diabetes Mellitus," 1874). He observed in three diabetics a hitherto undescribed terminal symptom complex which he called "diabetic coma." The striking features were dyspnea of a special character associated with rapid pulse and general debility. The description of the dyspnea reads as follows:

"*A peculiar type of dyspnea.* In this type of dyspnea there is not the least suggestion, as is so common in all other types, that the passage of air to or from the lung has to combat obstruction; to the contrary, it passes in and out with the greatest of ease. The thorax expands noticeably in all directions without a pulling-in of the lower end of the sternum or of the intercostal spaces. (In the last minutes of life when I could no longer examine the patients it may have been different.) The complete inspiration is followed by a likewise complete expiration. In the deepest parts of the lungs, one can notice perfectly clear, loud and distinct vesicular breathing; and yet everything is indicative of extreme air hunger, such as the discomfort of angusty of which the patient complains, the extreme activity of the respiratory

muscles, and the loud noise that the powerful inspirations and more so the expirations make as the air passes through the larynx. A true stridor, however, never exists. . . . The marked contrast between the extreme general weakness of the patient and the powerful respiratory movements is a striking peculiarity of this picture."

In Kussmaul's opinion, the dyspnea of diabetic coma was not caused by anoxia of the respiratory centers nor by the accumulation of carbon dioxide in the blood. Its origin was probably an intoxication related to the chemical metabolic disorder in diabetes. No definite statement could be made as to the nature of the toxic agent causing probably both the dyspnea and the coma.

Kussmaul performed clinical and experimental studies on the effects of acetone. He found its action in rabbit and men not as intensive as that of chloroform or ether but stronger than that of alcohol; considerable doses could be tolerated without poisoning. Although he was sceptical as to the role of "acute acetonemia" in the etiology of diabetic coma, he found it quite possible "that prolonged acetonemia may result in chronic intoxication, especially in a weakened nervous system. This intoxication may produce sudden acute symptoms in a manner similar to the delirium tremens of the chronic alcohol addict."

The careful description of the clinical manifestations of diabetic coma by Kussmaul, the experimental work performed to support and explain the clinical findings,

especially the dyspnea, and the conservative interpretation of the observations is generally considered a classical contribution to the knowledge of diabetes mellitus.

When over 75 years old, Kussmaul wrote his celebrated autobiography *Youthful Recollections of an Old Physician*. This beautiful book depicts the genius and great personality of Kussmaul. It has been reprinted in many editions and read by generations of physicians. Another autobiography, *My Instructorship in Heidelberg*, although incomplete, was published after his death by his son-in-law, the surgeon, Vincenz Czerny. Kussmaul also started at this age research work and a monograph on epilepsy which remained unfinished. In his younger years he was very fond of reading and writing poetry. In his later years he found his mislaid poems among old books and published them under the title of *Poetic Juvenile Sins of Dr. Oribasius*.

In the early morning of May 28, 1902, three months after his eightieth birthday, Adolf Kussmaul died suddenly, probably of a myocardial infarction. The foreword to his autobiography written as a poem in his old age reflects his great harmonious personality (translated by T. H. Bast):

If in your heart you must sorrow bear  
And the burden of old age days  
Invite as the guest for your burdens to share  
The remembrance of your youthful ways.

## BOOK REVIEW

STANDARD VALUES IN NUTRITION AND METABOLISM: Edited by Errett C. Albritton, A.B., M.D., Fry Professor of Physiology, The George Washington University. Prepared under the direction of the Committee on the Handbook of Biological Data, American Institute of Biological Sciences and the National Research Council, Air Research Development Command, United States Air Force, Wright-Patterson Air Force Base, pp. 380. McGreggor and Werner, Inc., Dayton, Ohio, July 1954.

This volume is the second part of a handbook of biological data. It represents one of the best efforts to collect and tabulate essential data relating to the field of nutrition and metabolism. More than eight hundred individual scientists have contributed towards making it the valuable compendium that it is. This book is essential to every science reference library throughout the world. It encompasses the nutritional and metabolic requirements of both plant and animal life, including the human.

It presents excellent summaries of metabolic pathways, oxygen requirements and energy exchange values. The data are substantiated by the endless number of references to the original literature. The index is so arranged that there is no difficulty in finding reference material.

The review process to which the material has been subjected is designed to eliminate all questionable and controversial material. The committee hopes that the data as presented represent the acceptable material which can be considered established. The tables present the data with due respect to biological variations and present not only representative values but also the ordinary range of variation of the variables.

Scientists all over the world will be grateful to the Committee on the Handbook of Biological Data and to the Wright Air Development Center, U. S. Air Force, the Office of the Surgeon General, Department of the Army, the Office of Naval Research and the Division of Biology and Medicine of the Atomic Energy Commission for their judgment in authorizing its publication.