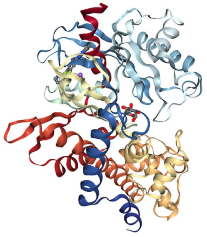
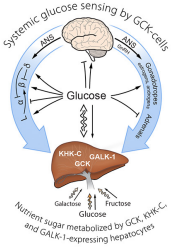
Franz M. Matschinsky, MD

Benjamin Rush Professor of Biochemistry and Biophysics, 1984–2004
Chairman of Department of Biochemistry and Biophysics, 1984–1993
Director of PENN Diabetes Center, 1978–1998

In work of more than 50 years, Franz Matschinsky has developed the concept that the low-affinity glucose phosphorylation enzyme glucokinase functions as metabolic glucose-sensing receptor (glucose sensor) essential for maintaining glucose homeostasis in man. Shown below are the crystal structure of the glucose-bound form of glucokinase and schematically the complementary halves of the glucose homeostatic glucokinase system.



glucokinase: glucose sensor essential for life of most mammals including humans, diabetes gene, drug receptor and model protein.



FM Matschinsky and DF Wilson (2019) The central role of glucokinase in glucose homeostasis: A perspective 50 years after demonstrating the presence of the enzyme in islets of Langerhans. *Front Physiol.* **10**:148.

Liegnitz 1940–1945

SILESIA/GERMANY

Herzog-Heinrich-Schule | Sent by farsighted parents and teachers to the Herzog Heinrich Schule, founded in 1309 as one the oldest Silesian Gymnasiums. Challenged much to combine village farm life with big city school demands.

1940

Born in Breslau on July 17, 1931 to **Maximilian and Maria Matschinsky** of Rothbrünnig near Liegnitz in Schlesien

Werl 1946–1953

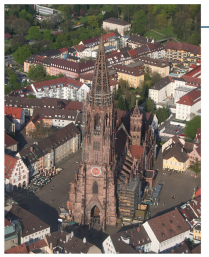
GERMANY

Mariengymnasium | As result of the Potsdam Agreement (1945), the Matschinsky family expelled from Rothbrünnig in 1946 and by chance resettled in Westönnen near Werl/Westfalen.

Entered the Mariengymnasium in Werl and received a classical humanistic education with Abitur in 1953.

Inspired by Drs. Rudolf Preising and Josef Sondermann to love German literature and the Latin and Greek languages.

1950



Hagen 1961–1963
GERMANY
Internship at Marienhospital

Married **Elke Fritz** from Winsen near Lüneburg on November 9, 1962.
SINE QUA NONE!

1960

Freiburg 1953–1955

BADEN-WÜRTTEMBERG/GERMANY

Albert Ludwig University

BS, 1955 Basic Medical Science | Introduced to preclinical medical science; lastingly influenced by Professors Kurt Goerttler (anatomy) and Paul Hoffmann (physiology).

Received highly coveted scholarship from the *Deutschen Forschungsgemeinschaft* (1954/59), crucial for academic career development.

Benno born 1963
Lüneburg

Tanja born 1964
St. Louis

Stephan born 1969
St. Louis

1970

München 1955–1961

BAVARIA, GERMANY

Ludwig-Maximilian University

MD, 1958 | Studied clinical medicine systematically taught at that time in person by the chairs of the major disciplines (1955-59).

Thesis for MD degree *Ueber den Wirkungsmechanismus des Knollenblaetterpilzgiftes Phalloidin*, under Professor Otto Wieland (1959).

Postdoctoral Fellow (1959-61) | With Professor Otto Wieland, studied ketogenesis and antiketogenesis; influenced by him and Professor Feodor Lynen to pursue an academic career.

1980

St. Louis 1963–1978

MISSOURI, UNITED STATES

Washington University

Department of Pharmacology | Postdoctoral Fellow (1963), Assistant Professor (1965), Associate Professor (1967), Professor (1971)

Adapted Professor Oliver H. Lowry's powerful techniques of quantitative histochemistry to the study of glucose and energy metabolism of the islets of Langerhans, the retina, cochlea, and cochlear nucleus, leading to publications significantly advancing these areas of research.

Discovered the presence of the enzyme glucokinase in pancreatic islets recognizing its essential functional role for insulin secretion and glucose homeostasis.

1990

Philadelphia 1978–Present

PENNSYLVANIA, UNITED STATES

University of Pennsylvania

Department of Biochemistry and Biophysics | Professor

Introduced by Dr. Albert Winegrad, joined in 1978 the faculty of the University of Pennsylvania Medical School.

Developed the "glucokinase glucose sensor concept" as critical paradigm for the understanding of normal and impaired glucose homeostasis.

With Drs. Clyde Barker, Ali Naji, and Nicolai Doliba, pioneered physiological chemical studies of isolated pancreatic islets of Langerhans of healthy and diabetic humans.

Elucidated biochemical genetic mechanisms of monogenic forms of diabetes mellitus and hypoglycemia in collaboration with Drs. Mark Magnuson (Vanderbilt University) and Charles Stanley (The Children's Hospital of Philadelphia).

Played an essential role in the discovery of glucokinase activator drugs (GKAs) by a team at Hoffmann La Roche in 2003.

2000

2010

IDF Medal
Solomon A Berson Plenary Lecture
Sydney, 1988

Elliott Proctor Joslin Medal
American Diabetes Association, Inc.
Boston, 1992

The Banting Medal
American Diabetes Association
Atlanta, 1995

Paul-Langerhans-Plakette
Basal, 1996

Selected references (6 of 320)

Matschinsky FM and Ellerman JE (1968) Metabolism of glucose in the islets of Langerhans. *J Biol Chem* **243**:2730-2736.

Trus MD, *et al* (1981) Regulation of glucose metabolism in pancreatic islets. *Diabetes* **30**:911-922.

Bedoya FJ, *et al* (1986) The glucokinase glucose sensor in human pancreatic islet tissue. *Diabetes* **35**:61-67.

Ghosh A, *et al* (1991) The role of ATP and free ADP in metabolic coupling during fuel-stimulated insulin release from islet beta-cells in the isolated perfused rat pancreas. *J Biol Chem* **266**(34):22887-22892.

Matschinsky FM (1996) Banting Lecture 1995. A lesson in metabolic regulation inspired by the glucokinase glucose sensor paradigm. *Diabetes* **45**(2):223-241.

Matschinsky FM, *et al* (2011) Research and development of glucokinase activators for diabetes therapy: theoretical and practical aspects. *Handb Exp Pharmacol* **203**:357-401.