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Reprinted from

Biological Trace Element Research, 2011, Volume 143, Number 3,  
Pages 1219-1222



Springer Healthcare

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Published online: 5 October 2011  
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Klaus Schwarz (1914–1978) was a leading trace element researcher and is best known for his discovery of the nutritional essentiality of selenium. To honor trace element researchers that have made major discoveries in this field, the Klaus Schwarz Commemorative Medal was created in 1978 by G.N. Schrauzer, the Founder and President of the International Association of Bioinorganic Scientists, Inc.

This year, the Klaus Schwarz Medal is awarded to Joel D. Wallach D.V.M., N.D., for his 1978 discovery of an animal model of cystic fibrosis (CF) in the offspring of a family of inadequately fed rhesus monkeys (see Fig. 1). The discovery of this first animal model of CF demonstrated that pancreatic lesions histologically identical to those observed in patients with CF can be produced by dietary means, i.e., nutritional imbalances such as selenium deficiency, and that some forms of CF are, in principle, nutritionally preventable.

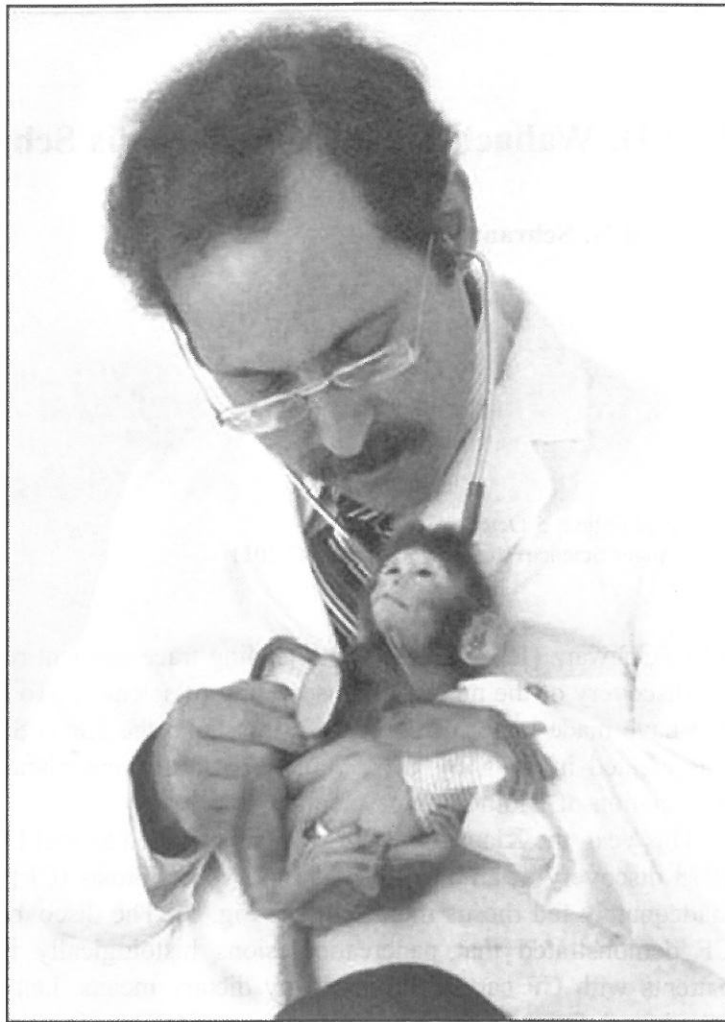
Joel D. Wallach was born in West St. Louis County on June 4, 1940. After finishing high school, he enrolled in the University of Missouri at Columbia, first to study Agriculture with a major in animal husbandry and a minor in field crops and soils. In 1962, he received a B.S. Degree in Agriculture from Missouri and continued on to study veterinary medicine at the same institution, which in 1964 awarded him the degree of Doctor of Veterinary Medicine. From 1966 to 1967, he held a postdoctoral fellowship in comparative medicine at the Center for the Biology of Natural Systems, Washington University, St. Louis. Thereafter, he worked at Iowa State University Diagnostic Laboratory, Ames, Iowa, and subsequently, for 2 years, at Natal Fish & Game Department, Natal, Republic of South Africa.

During the early 1960s, environmental pollution and other ecological factors were thought to cause the premature death of captive animals and possibly of humans. The National Institutes of Health awarded the St. Louis Zoological Gardens a large grant to identify these factors. The project required a well-rounded wildlife veterinarian and pathologist. Wallach was hired for this position, which provided him with the opportunity to autopsy a wide variety of captive wild animals dying of natural causes in zoos at

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**Fig. 1** J.D. Wallach, in 1979, examining a rhesus monkey with nutritionally induced cystic fibrosis



St. Louis, Chicago, Los Angeles, Jacksonville, and Memphis. Later, working as a veterinary pathologist at the Atlanta/GA-based Yerkes Regional Primate Research Center, Wallach conducted comparative autoptic studies on primates as well as on humans. His work was progressing well until 1978, when he discovered pancreatic lesions in the offspring of a family of inadequately fed rhesus monkeys. Since these lesions were identical histologically to those observed in patients with CF, this led him to propose that some forms of human CF were caused by nutritional imbalances and/or trace element deficiencies.

However, as CF was at that time generally considered to be a genetic disorder, his proposal seemed so inadmissible that he was summarily dismissed from his position at the Yerkes Research Center. As the story of his firing was widely covered by the media, this deprived Wallach of any chance of finding an appropriate position in his profession, forcing him to change his career.

In 1980, Wallach joined the Faculty of the National College of Naturopathic Medicine in Portland, Oregon, where he taught in the area of nutrition while pursuing an N.D. degree in 1982. After obtaining his N.D. degree and license, he went into private practice in Cannon Beach, Oregon, specializing in the nutritional treatment of CF patients. Continuing his CF research, he conducted a survey of 120 families with one or more CF children and found the patient profiles to be consistent with CF as an acquired environmental disease caused by

a prenatal deficiency of selenium, zinc, and riboflavin, and/or exacerbated by diets low in vitamin E and rich in polyunsaturated fatty acids. Based on these findings, Wallach proposed a diet for the prevention and treatment of CF. To demonstrate that CF-like pancreatic lesions develop in populations living in regions naturally low in selenium, he traveled to China in 1987 with his wife, Dr. Ma Lan, a Chinese physician, to conduct a study at Harbin Medical University. The Wallachs, in collaboration with researchers at Harbin Medical University, showed that hitherto unrecognized pancreatic lesions occurred in 35% of 1,700 documented cases of Keshan disease, the endemic cardiomyopathy occurring in low-selenium regions of China [1, 2]. Other researchers have since drawn attention to the aberrant oxygen radical activity and the low selenium and antioxidant status in CF patients [3–5]. It is now also agreed that selenium deficiency may develop in CF children because of digestive malabsorption or after prolonged total parenteral nutrition [6–9]. In addition, a case of cardiomyopathy in a CF patient caused by selenium deficiency has also been described [10]. The therapy of CF patients with selenium and antioxidant vitamins has also been tested in a clinical trial. One German group [11] concluded:

“In cystic fibrosis (CF) patients the antioxidative-oxidative balance is chronically disturbed. Free radicals were generated by bronchialpulmonal infection and additionally (there) exists a deficiency of antioxidative substances by enteral malabsorption especially (of) vitamin E and selenium. For CF patients, therefore, we recommend a sodium selenite substitution therapy, best in combination with vitamin E.”

From 1990 to 1993, Wallach worked as a naturopathic physician for Hospital Santa Monica in Tijuana/Mexico. In 1997, he founded his own vitamin–mineral supplement company, American Longevity, now named Youngevity.

From a historical perspective, Wallach is to be regarded as one of the first practitioners, if not founders, of *epigenetics*, the new research discipline that investigates heritable alterations in gene expression caused by mechanisms other than changes in DNA sequence. With the award of the Klaus Schwarz Medal, Wallach is belatedly honored for a serendipitous discovery that will be of benefit to many.

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