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Eladio Viñuela (1937–1999), the molecular biology pioneer in Spain

Eladio Viñuela passed away in Madrid, Spain, on 9 March 1999. Born on 15 February 1937, in Ibahernando, a small village in the province of Cáceres (South-western Spain), he received his academic degrees (M.Sc. and Ph.D.) in Chemistry (Biochemistry) at the Complutense University of Madrid. He took his Ph.D. thesis while working in Alberto Sols' laboratory, and it dealt with glycogen metabolism; he found that liver glucokinase was essentially absent in diabetic patients. For that finding and other studies on other enzymes related to glycogen metabolism like hexokinase and phosphofructokinase, he was awarded the “Leonardo Torres Quevedo” Prize in 1964. Eladio did his postdoctoral training at New York University in the laboratory of Severo Ochoa. There he worked on the replication and translation of bacteriophage MS2 RNA and also made a very interesting observation showing that the proteins translated from a polycistronic messenger RNA start with formyl-methionine. However, his most cited work from that time was one carried out independently in which he described a simple, fast method to determine the molecular weight of proteins. In that work he indicated that the molecular weight of a protein correlates with its electrophoretic mobility in denaturing polyacrylamide gels.

Back in Spain he created the first department of molecular biology, together with his wife Margarita Salas, at the National Research Council (Consejo Superior de Investigaciones Científicas, CSIC), in Madrid. At that time he was dedicated not only to produce excellency in science but also to train molecular biology researchers. For this purpose he worked very hard, without signs of weariness. Eladio taught his students how to be strict in the scientific work, and he tried also to increase their intellectual capacity and their academic knowledge. His attitude was revolutionary to Spanish science, and his students often learned more in five of his seminars than in a whole year at the Faculty of Sciences. That special period

of time has been recently remembered with great affection by his colleagues and students in a most interesting book on his scientific life*. The book contains many anecdotes and stories indicating not only that Eladio was one of the best scientists of his time, but also that he was an excellent human being. At the same time he continued making very important scientific contributions working with his wife, Margarita Salas, on the morphogenesis of bacteriophage $\phi 29$, a virus with a complex morphology but a very small DNA. In the late 1970s he became interested in another virus, the African swine fever virus (ASFV). By analyzing this pathogen, his group became



Fig. 1 Eladio Viñuela (1937–1999)

*Ávila J, Perucho M, López-Otín C (eds) (1998) *Fago $\phi 29$ y los orígenes de la Biología Molecular en España*. Madrid: edición propia, 390 pp

the top specialist in the world. They showed that ASFV is a poxvirus, they indicated that there are multigenetic families for the ASFV DNA, and they also described the whole DNA sequence. As a result of his hard work, he received several awards such as the "Severo Ochoa" Prize, the Finley Prize (shared with M. Salas). Eladio Viñuela's labor as scientific organizer should also be mentioned. He was co-founder with Federico Mayor and Severo Ochoa of the Center for Molecular Biology (Centro de Biología Molecular, CBM) located in the Autonomous University of Madrid, and made the Center, when he was Director, one of the best European research institutes. To that position he dedicated a great amount of time and effort. He also taught some virology classes at the university, and he continued performing excellent scientific research. As a consequence he became a sleepless person, although he continued to be a brilliant, charismatic man. Despite his awards and memberships to institutions such as the Academia Europea, the Spanish Royal Academy of Veterinary and EMBO, some of his students feel that his work was not fully recognized by the whole society, since he created a school of molecular biologists that has yielded many fruits inside and outside Spain. It is mainly Eladio's seminal work that has not been properly recognized. We will miss Eladio, his knowledge and erudition, his superb seminars and discussions, his advice, his broad horizons and his personal attitude. However, he will always be with us in the reminiscences of the great living moments he shared with us.

Most relevant scientific contributions of Prof. Eladio Viñuela

- Discovery of liver glucokinase, the enzyme responsible for glucose utilization whose synthesis is very low in diabetes and is induced by insulin.

Viñuela E, Salas M, Sols A (1963) Glucokinase and hexokinase in liver in relation to glycogen synthesis. *J Biol Chem* 238:1175–1177
- Demonstration that the three proteins of a polycistronic messenger RNA are initiated with formylmethionine.

Viñuela E, Salas M, Ochoa S (1967) Translation of the genetic message. III. Formylmethionine as initiator of proteins programmed by polycistronic messenger RNA. *Proc Natl Acad Sci USA* 57:720–734
- Development of a simple and inexpensive method to determine the molecular weight of proteins in polyacrylamide gels.

Shapiro AL, Viñuela E, Maizel HV (1967) Molecular weight estimation of polypeptide chains by electrophoresis in SDS-polyacrylamide gels. *Biochem Biophys Res Commun* 28:815–820
- Discovery of a nucleic acid-protein complex in bacteriophage ϕ 29.

Ortín J, Viñuela E, Salas M, Vázquez C (1971) DNA-protein complex in circular DNA from phage ϕ 29. *Nature New Biol* 234:275–277
- Demonstration of the existence of multigene families in African swine fever virus DNA.

Viñuela E (1987) Molecular biology of African swine fever virus. In: Becker Y (ed) *African Swine Fever*. Boston: Martinus Nijhoff Pub, pp 31–49
- Demonstration that swine macrophages contain a specific receptor for African swine fever virus, absent in macrophages of other species, and identification of a protein on the surface of African swine fever virus that binds to the cell receptor.

Viñuela E, Alcamí A, Carrascosa AL (1989) African swine fever virus receptor and attachment protein. In: Compans R, Helenius A, Oldstone M (eds) *Cell Biology of Virus Entry, Replication, and Pathogenesis*. UCLA Symposia on Molecular and Cellular Biology. New Series. Vol 90. New York: Alan R. Liss
- Finding an African swine fever virus gene coding for CD2 factor similar to that present in T lymphocytes.

Rodríguez JM, Yáñez RJ, Almazán F, Viñuela E, Rodríguez JF (1993) African swine fever virus encodes a CD2 homolog responsible for the adhesion of erythrocytes to infected cells. *J Virol* 67:5312–5320
- Complete sequencing of the African swine fever virus genome.

Yáñez RJ, Rodríguez JM, Nogal ML, Yuste L, Enriquez C, Rodríguez JF, Viñuela E (1995) Analysis of the complete nucleotide sequence of African swine fever virus. *Virology* 208:249–278