

## Profile

### Francisco Javier Carod-Artal: from Aragón to the Amazon



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Moneva, a tiny village 80 km from Zaragoza in the region of Aragón, northeastern Spain, home to fewer than 130 people, is an unlikely birthplace for a tropical neurologist. This, however, is where it all started 44 years ago for Francisco Javier Carod-Artal, who would leave the tiny Aguasvivas river behind for the Amazon and its neurological challenges.

Carod-Artal is well known for his research into tropical neurology, neuroepidemiology, stroke, and other neurological disorders, and is also a respected clinician and teacher of Brazilian neurologists. Tropical neurology claimed his interest when, as a resident neurologist at the Miguel Servet Hospital in Zaragoza in 1990, he volunteered with the not-for-profit organisation *Medicus Mundi*. "I got to see the state of the public health systems of Cameroon, Tanzania, and Central America", he explains, "and understood the dire need for collaboration between developed and developing countries."

He would not reach Brazil, however, until 1998, after he completed a master's degree and a doctorate in neurology at the Complutense University (Madrid, Spain), and a post-doctoral research fellowship in stroke and epidemiology at the Neurological Institute in Columbia University (New York, NY, USA), under the supervision of Ralph Sacco (now at the University of Miami, FL, USA). It was Sacco and Jay P Mohr (Columbia University) who fuelled Carod-Artal's interest in stroke in low-income countries. "They guided me into research in stroke and vascular diseases", he explains, "and realising that cerebrovascular diseases, their diagnosis, treatment, and prevention were neglected in many developing countries, my route became clear."

"From the first moment we met Francisco at Columbia University, we recognised that he had a calling and the energy to tackle any challenging task", explains Sacco. "We need more gifted neurologists to use their talents to fight common neurological diseases, such as stroke in emerging nations, and especially to mentor young physicians to build capacity [in these countries]."

Carod-Artal eventually left for Brasília to become a consultant neurologist with the Sarah Network of Rehabilitation Hospitals, where he founded the Department of Neurology and began a programme to train Brazilian neurologists. He also initiated several lines of research. At that time, there were no scales in Portuguese to measure disability and neurological impairment in Brazil, and it was Carod-Artal's team that adapted and validated the stroke impact scale and the cognition and autonomic scales for outcomes in Parkinson's disease (SCOPA) for use in the country. "Also, during my first years in Brazil I treated many patients with neurological impairments caused by tropical diseases, such as *Schistosoma mansoni* myelopathy and HTLV-I tropical spastic

paraparesis, as well as many with Chagas disease and stroke", says Carod-Artal. "So, I started epidemiological studies into the neurological complications of these tropical diseases." He and his colleagues showed that the female worm of *S mansoni* can travel to leptomeningeal vessels of the spinal cord and produce myelopathy, and observed that many patients with Chagas disease were diagnosed only after their first stroke. "Stroke was a neglected complication of this disease", he explains, "and I wondered why there were no stroke prevention programmes for chronic chagasic patients in South America. So we began studies to better understand the cerebrovascular complications of Chagas disease."

In the final years of his 11-year stint in Brazil, having been named professor of neurology in 2000, Carod-Artal studied the effect of stroke on survivors and their families, and undertook epidemiological studies to assess the quality of life of both. This work led to the adoption of strategies by his hospital group to improve treatment of chronic disability. By the time he left Brazil in 2009 he had authored more than 150 papers, was a reviewer for 25 neurology journals, and had trained 25 neurologists. "Under Carod-Artal's leadership, the Sarah Network of Rehabilitation Hospitals became a leading centre for neurorehabilitation research and publication in Brazil", says Ayrton Massaro, president of the Ibero-American Stroke Society. "He has always placed great emphasis on the value of every human life and has published widely on important issues related to the social realities that influence neurological diseases in developing countries."

Carod-Artal is also a respected neuroanthropologist, having undertaken several cross-cultural and anthropological studies on neurological diseases in various isolated tribes in Central and South America. "The classification, recognition, and treatment of neurological diseases such as migraine and epilepsy by shamans in these ancient cultures fascinates me", he declares. Carod-Artal and his neuropsychologist wife Carolina fondly recall living for several weeks with a Kamayura shaman known as Tacumá, in the village of Xingú River, in Mato Grosso, Brazil. "He showed us the life of an ancient South American native society only recently contacted by Western civilization", he explains, "and the ways he used plants to treat epilepsy."

Carod-Artal has temporarily taken up an appointment as a consultant neurologist at the Virgen de la Luz Hospital in Cuenca, Spain, so that his new daughter, Alba, can get to know her grandparents. But the tropical call remains strong. "The Júcar is a beautiful river in Cuenca", he declares, "but the Amazon—you just can't say no."

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