Book Review

THE REMARKABLE STORY OF COPAXONE: AN APPROACH TO THE TREATMENT OF MULTIPLE SCLEROSIS

by Kenneth P. Johnson, MD, 219 pp., DiaMedica, 2010, $14.95

Although multiple sclerosis (MS) has existed for centuries (some reports date back to the 14th century, some even earlier, to the Egyptians), it was only in the very late 20th century that the first treatment was on the horizon. As Dr. Kenneth P. Johnson very eloquently (and at times quite dramatically) elucidates in *The Remarkable Story of Copaxone*, the road to a treatment was long and fraught with struggle. Perched on a hill facing the Mediterranean Sea in Rehovot, Israel, stands the Weizmann Institute of Science, where a driven and passionate trio of scientists came upon a structure called "copolymer 1," or Cop1, as it came to be known. Michael Sela, Ruth Arnon, and Dora Teitelbaum found that this complex protein would have the ability to suppress experimental allergic encephalomyelitis (or EAE, the animal equivalent of MS) in guinea pigs and rabbits. Becoming what is now known to most neurologists as a landmark event of scientific serendipity, their work would provide the foundation for the discovery of the first successful treatment for MS.

Dr. Johnson, now Professor Emeritus in the Department of Neurology at the University of Maryland, has personal experience with the struggle for an acceptable treatment for MS, having assembled the multiuniversity group of the pivotal Cop1 Trial in the United States in 1989. He has since been a powerful and active voice in MS research, having founded the Americas Committee for Treatment and Research in Multiple Sclerosis (ACTRIMS). In 2000, he was awarded the Dystel Prize for his leading role on the frontier of MS research. As gifted a writer as he is a physician, he elegantly describes the journey of Copaxone to the forefront of the pharmaceutical market in MS treatment options. The book begins with a brief albeit valuable discussion about the disease itself, geared primarily toward the nonscientist—its definition and clinical features, as well as, following a brief depiction of the CNS, a clear and concise explanation of its pathophysiology. This is done with an appropriate amount of detail (for instance, he describes the Expanded Disability Status Scale, or EDSS, in its entirety) as well as a flair for nuance to pique the interest of the reader (the original Pasteur vaccination process for rabies apparently required 14 to 21 injections). Thereafter begins the journey toward Copaxone's discovery. Describing in some detail the personal histories of the individuals primarily involved in its discovery and approval, Dr. Johnson allows the reader to understand the depth to which each of these people was committed to this medication—from the brilliant Chaim Weizmann, who had a key role in inspiring the Institute that bears his name, to the many pharmacists and chemists responsible for maintaining the fidelity of Copaxone's structure in clinical trials. One aspect of this discovery highlighted throughout the book is the historical context in which it was made—in the late 1960s and 1970s, Israel was in a constant state of political unrest, making the efforts and successes of its scientists all the more impressive. There is no doubt that the commitment of these scientists to their work allowed them to succeed in the toughest of circumstances. In this way, the book reads as a historical narrative allowing the reader to place the subject amid the political climate of the time. Ultimately, the story of Copaxone reads like a celebration of victory, from the groundbreaking positive results of the pilot study in 1994 to its triumphant approval by the Food and Drug Administration on September 19, 1996.

There are some limitations to the book. Perhaps at times MS is depicted in an excessively hopeless light—patients are described as "emotionally devastated" with the possibility of a "blemished future." Likely due in large part to these new treatments, this is becoming less and less the norm for these patients, and the disease thus less "life-defining." It is clear that quality of life for many patients has changed for the better over the past decade. Nevertheless, depression, changing family dynamics, and various other emotional and personal struggles continue to be significant issues in the lives of these patients as they live with their diagnosis.

Clearly this is a book that can be appreciated by not only the neurologist and chemist, but also by the lay person—the spouse, the child, the friend of, or

even the individual patient with MS looking for a both a clearer understanding of the disease as well as the strides made in its treatment over a comparably short amount of time. Dr. Johnson explains various scientific concepts useful to scientists and laymen alike, ranging from the details that go into a clinical trial to the notion of molecular mimicry. This book has the potential to be read by patients and physicians for years down the road. More than a scientific text, it reads as a historical narrative punctuated by personal stories of triumph. Despite the fact that not all would agree with the statement that MS is thought to be the "disease that shatters dreams," it is clear that the discovery of Copaxone as well as the remaining ABCR drugs has changed the lives of patients throughout the world. What is perhaps most striking about the spirit of this story as written by Dr. Johnson is the homage he plays to the critical role of patients with MS in the struggle for a treatment. With delicate care, he paints these individuals as the true "heroes" of the book, each one taking a risk in enrolling in trials and then waiting with bated breath for the results. It is these men and women that he honors with this comprehensive and very readable illustration of how the passion and dedication of several individuals ultimately led to the dawn of a new age of hope and optimism for the future of one of the most important illnesses of our time.

Reviewed by Comana Cioroiu, MD

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