



Case Study: Congenital Toxoplasmosis Diagnosis and a Pair of Myers-Briggs Type Indicator® (MBTI®) Test Results for an Academic Pathologist

Ronald S. Weinstein^{1,2*} and Michael J. Holcomb²

¹Department of Pathology, The University of Arizona, USA

²Department of Telemedicine, The University of Arizona, USA

Abstract

This case study is based on a personal narrative by Ronald S. Weinstein (RSW), a co-author of this paper. RSW is a Massachusetts General Hospital-trained pathologist who still works full time in Arizona at age 80. RSW's parents were handed a diagnosis of congenital toxoplasmosis for RSW when he was 8 years old. This was based on his worsening near-sightedness, blurring of vision, and an eye examination by a family doctor showing retinal scarring near the macula and moderate to severe myopia in the right eye. At age 21, a Harvard-trained ophthalmologist examined RSW's eyes with an ophthalmoscope and confirmed the diagnosis of retinal toxoplasmosis, with blurring of vision, peri-macular retinal scarring, moderate to severe myopia, and chorioretinitis in the right eye. The left eye showed mild myopia. Over a half century later, RSW's toxoplasma IgG antibody level is significantly elevated at 75.00 IU/mL with a value ≥ 10.00 IU/mL being positive ("reactive"); and toxoplasma IgM antibody at < 8.0 AU/mL with the reference range < 8.00 AU/mL being negative. A recent publication describes an association between toxoplasmosis and certain changes in behavioral patterns including an "elevated risk-tolerance" [6]. In 1959, while in college, RSW took a MBTI® Personality Profile test which was administered by his undergraduate college psychology professor. RSW was classified as being in the MBTI®'s INTP (Introversion, Intuition, Thinking, and Perceiving) group, interestingly a "preferred group" for medical school admissions at that time. RSW "retested" into the same MBTI® INTP group at age 72. It can be suggested that RSW's toxoplasmosis and his MBTI® testing experience each significantly influenced RSW's career in positive ways. His congenital toxoplasmosis focused his parents' attention on his vision issues and potential partial remedies, including what evolved into a unique personalized vocational training program for RSW. The initial MBTI® test experience opened up a valuable communication channel between RSW and the MBTI® test administrator, his college psychology professor. A common thread that runs through the story of RSW's congenital toxoplasmosis disease progression and his MBTI® test experiences is his unusually high tolerance for risk and his risk management style.

Keywords: Toxoplasmosis; *T. gondii*; Myers-Briggs Type Indicator®; Pathology; Massachusetts General Hospital

Introduction

This personal narrative-based case study incorporates published materials that cover various aspects of RSW's half century-long combined academic and business careers [1-5]. Details on aspects of his medical history, including his congenital toxoplasmosis, are described in this report.

While infection with *T. gondii* has historically been associated with negative health effects on its hosts, recently, infection by *T. gondii* has been associated with behavioral changes including reduced fear and an "elevated tolerance for risk [6-10]." RSW was diagnosed with congenital toxoplasmosis at age 8. This

produced unilateral retinal scarring with visual field defects and moderate to severe myopia. His delayed learning to read may have been related to his vision issues. By coincidence, RSW took a professionally-administered MBTI® personality profile assessment twice, at ages 21 and 72, with a 51-year interval between tests.

In the 1950s, personality profiling, using Myers-Briggs Type Indicator (MBTI®), became available at many undergraduate colleges in the United States. Medical schools became interested in students' MBTI® scores both as a tool for predicting the future academic successes of pre-medical students once admitted to medical school, and for predicting future medical specialty career choices for their incoming medical students [11-15]. The Education Testing Service (ETS) in Princeton, New Jersey, the publisher of the popular Scholastic Achievement Tests (SAT) for high school students, was also the first publisher of the Myers-Briggs Type Indicator (MBTI®) Personality Profile questionnaire. ETS was financially incentivized to support medical education uses of the MBTI® [15-21].

Historically, the author of this paper, Ronald S. Weinstein, M.D. (RSW), who has congenital toxoplasmosis took the MBTI® as a college senior, at the urging of his psychology professor and the college president, both of whom he had known for years. Both the professor and the college president were enamored with the idea that certain MBTI® test results could help their students get into their preferred medical schools. It turned out that RSW's MBTI®

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***Corresponding author:** Ronald S. Weinstein, Department of Pathology, The University of Arizona, USA, Email: rweinstein@telemedicine.arizona.edu

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group, “INTP”(Introversion, Intuition, Thinking, and Perceiving), was on medical schools preferred “MBTI® test group” list for medical student applications [13]. RSW’s INTP group classification was listed in RSW’s medical school letters of recommendation. RSW’s MBTI® group, INTP, was a topic for conversation at each of the 5 medical schools where RSW had applied for admission. In 4 of the 5 schools, an extra interview was added to the usual list of three interviews. In each instance, the local chair of psychiatry would meet with RSW, ask a few questions regarding his MBTI® test, and then encourage RSW to come to their school. RSW was accepted to all five medical schools.

RSW took his second MBTI® test 51 years later, at 72 years of age. At the University of Arizona’s College of Medicine-Tucson, academic department chairs and center directors were asked to participate in a personality-related exercise. This included meeting one-on-one with a personal counselor to review the Interpretative Report for their individual MBTI® test.

RSW’s case study is of interest as it provides a combination of quantitative and qualitative observations that align with recent research on the effects of infection with toxoplasmosis that suggests an association between infection of a person with toxoplasmosis and changes in that person’s behavioral tendencies that manifest later in life as reduced fear and an increased tolerance for risk [6].

Case Study

Background

RSW was born November 20, 1938, at Ellis Hospital, in Schenectady, New York. He was mildly jaundiced at birth and was kept in the hospital for three weeks. For the next four months, he was hyper-irritable and cried almost continuously. According to his parents’ recollection years later, RSW’s irritability was a complication of “respiratory problems attributed to chronic lung infections.” According to his mother, “his crying was an embarrassment to his parents and older sister.” This precluded traveling on a train after an initial “disastrous attempt” to travel to RSW’s grandmother’s house in another city, to show off the baby.

In kindergarten, RSW’s “poor vision” was brought to the attention of his parents by his teacher. In the classroom, RSW excelled in arithmetic but was challenged when it came to learning to read. He remained in “remedial reading” classes until mid-way through seventh grade.

At age 8 RSW’s eyes were examined by a doctor who observed that RSW’s vision was “much weaker in the right eye.” He had “healed retinal scars, especially prominent near his right macula [22].”

When RSW was a junior at Union College, (Schenectady, NY) his eyes were examined by a Massachusetts General Hospital (Mass Eye & Ear (ME&E))-trained ophthalmologist. The ophthalmologist rendered the diagnosis of “congenital toxoplasmosis with healed retinal scars and a patch of ‘sub-acute chorioretinitis’ within 4 mm of the right macula.” Despite his vision issues, RSW pursued a career in medical imaging. He

trained as a pathologist at the Massachusetts General Hospital (MGH) (1965-1970), served for 8 years as Director for the National Cancer Institute-funded National Bladder Cancer Central Pathology Laboratory, a job that required many hours of strenuous visual examination of microscopic specimens via diagnostic light microscopy, and co-authored scores of research papers based, in part, on his own performance of high-resolution electron microscopy.

Laboratory testing

Recently, RSW had serological testing for *T. gondii* for purposes of writing this case study. The serological tests were performed by the Sonora Quest Laboratories, Tempe, Arizona, in May, 2019. The tests were performed using the ADVIA Centaur XP Toxoplasma IgG chemiluminometric immunoassay. Toxoplasma antibody (IgG) was 75.00 IU/mL with a value ≥ 10.00 IU/mL being reactive (“positive”). Toxoplasma antibody (IgM) was < 8.00 AU/mL with the reference range < 8.00 AU/mL being negative. Results were independently confirmed by a second laboratory [23-27].

Personality profiling

Results of RSW’s two MBTI® “tests” (questionnaires) were essentially the same.

RSW’s 2011 MBTI® Interpretive Report placed him, once again, in the MBTI® INTP group, one of 16 MBTI® Personality Profile groups (Figure 1). RSW’s written Interpretive Report noted that, “INTPs are typically logical, analytical and objectively critical. They organize ideas and knowledge. They are curious and can become deeply absorbed in what they are doing and may lose track of time. INTPs like to work with autonomy. They like to find the theoretical underpinning of ideas.” These descriptors fit RSW’s self-image.

Discussion

As discussed elsewhere, RSW’s parents were deeply concerned about his *T. gondii*-related vision issues, when he was a child. They implemented an extravagant, supplemental education program, starting in the 8th grade, specifically created for RSW by his parents. They ran that resource-rich program in parallel to his regular school curriculum and his normal outside activities. Their education program provided RSW with extensive vocational training and a relatively early exposure to “soft skills” (i.e., engagement and networking, human resource management, leadership, etc.) [1].

Years later, at Union College in his senior year, RSW’s psychology professor made several points of lasting value during his discussion with RSW as a follow-up on RSW’s 1959 MBTI® test results. After reviewing the standard interpretations, and word associations, for the INTP group, the psychology professor added additional related consideration, from his perspective as a psychologist. He emphasized that “RSW had *zero fear* of authority which (is) both ‘a positive and a negative’.” He said that “RSW needs guardrails so that he would not over-step the boundaries of his own authority.” He predicted that RSW was “likely to treat supervisors as equals and would not be intimidated.” RSW was

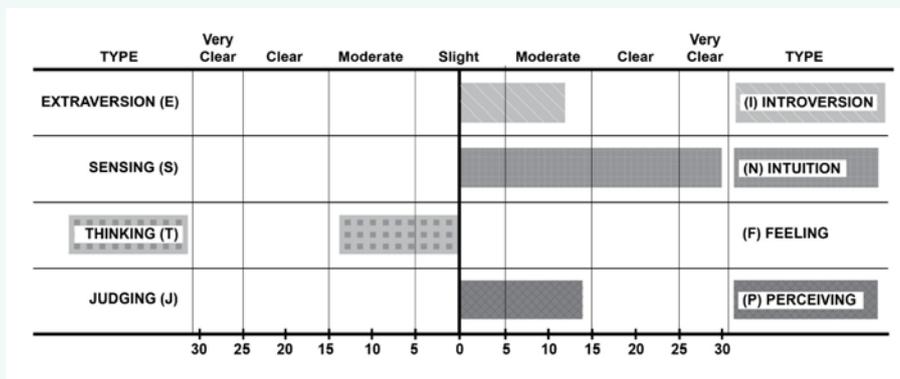


Figure 1 Myers-Briggs Type Indicator (2011) for RSW’s Step 1 results. This graph provides details about RSW’s INTP Personality Profile responses. For each of four “TYPE” paired responses, the longer the horizontal bar, the more clearly RSW expressed that preference on his questionnaire.

“exceptionally self-directed.” The psychology professor advised RSW that he “relies heavily on... (his own)... judgment, sometimes to a fault.” He added that RSW had “remarkable inner strength.” And then he gave a warning, “It may take time for co-workers, supervisors, and employees to understand your choices and actions. Your sense of independence is extraordinary.” He added, “You have a high tolerance for risk” and that would “likely benefit (RSW) throughout (your) career.”

In retrospect, what proved to be especially valuable to RSW was the creation of an awareness of this “zero fear of authority” through insights that his psychology professor had shared with him. RSW’s “lack of awareness of lines of authority and the prerogatives of those above him in a line-of-command,” was news to RSW and thought-provoking. According to the psychology professor, “you automatically blur, or even worse, ignore lines of authority without knowing it.” Ever since then, RSW has kept that warning in mind when he makes new acquaintances and tests the water.

There have been many opportunities for “taking risks” throughout RSW’s career. Ignoring the advice of the Dean of Tufts Medical School was an early risk. The Dean warned RSW against applying for a pathology residency position at the MGH. No Tufts graduate had ever matched at the MGH. The Dean refused to write a letter of recommendation because it was “a waste of time.” RSW ignored the Dean’s advice, applied on his own, and became the first Tufts Medical School graduate to become an MGH intern, and then resident, at the MGH (Figure 2). The Tufts Medical School Dean made note of that at RSW’s graduation from Tufts, in 1965. Then, early in his MGH pathology internship, RSW asked that he be allowed to serve the dual role as a pathology resident while serving as a National Institutes of Health (NIH)-funded MGH Research Laboratory Director. Either of these jobs was regarded as a “back breaking” job back then. Permission to take this on would require that the MGH Hospital Director, a distinguished leader and eventual President of Rockefeller University, Dr. John H. Knowles, obtain a special waiver from the NIH because interns and residents were not allowed to apply for either RO1- or PO1-NIH grants in those days. Only training grants were awarded to residents at that time. Nevertheless, unlike the

Tufts Dean, Dr. Knowles wrote a letter on RSW’s behalf and the NIH waiver was granted. RSW was appointed Director of the Mixer Laboratory for Electron Microscopy, housed in the MGH Department of Neurosurgery. For the next 4 years, RSW served in this combined role as a resident and a laboratory director. He and his collaborators published 21 papers, a number of which were in top journals including the *New England Journal of Medicine*, the *Journal of Cell Biology*, and *Science* [1]. In 1975, RSW became the youngest Pathology Chair in the United States, at age 36.

Over the years, six medical organizations recruited RSW to be their President. Several organizations recruited him based on his reputation for designing and implementing customized turn-around strategies, aimed at stemming their members’ dwindling interests and participation in their activities. RSW is Past-President of the prestigious United States and Canadian Academy of Pathology and is Past-President and President Emeritus of the American Telemedicine Association, the largest telemedicine association in the world.



Figure 2 Massachusetts General Hospital’s Department of Pathology, 1968.



At the same time, in the business sector, RSW co-founded 6 companies over a time span of 4 decades [1,2]. Each company required substantial risk taking on RSW's part. As an entrepreneur, RSW is known as the "father of telepathology" for inventing, patenting, and commercializing robotic telepathology, and introducing the word "telepathology" into the English language [2-5,28-33]. Soon, telepathology will become a billion-dollar business world-wide, and will have an important role in introducing precision medicine and histogenomics diagnostics around the globe.

As a productive biomedical researcher, he has published over 250 papers in peer reviewed journals, 200 conference papers, 57 book chapters and 11 books. RSW took on the National Institutes of Health (NIH) when it was resisting supporting technology transfer grants and contracts, in the mid-1980s. He succeeded when the National Cancer Institute issued a grant for a six-site National Urinary Bladder Flow Cytometry Network. RSW became Founding Director of this network, and is credited with playing a role in introducing flow cytometry into urology practices. Each of these activities involved its own set of risks which RSW successfully navigated [34,35].

Longevity has been a hallmark of many of RSW's work and personal activities. In the course of his career, a number of challenging and inherently stressful activities were carried out concurrently. With his penchant for stress, RSW has welcomed the opportunity to serve for 44 years as an academic department head, 32 years as a pathology chair and 12 years as director of one of the first academic telemedicine and telehealth departments in the United States, and enjoyed the challenges. He has served under 15 medical school deans and has had continuous extramural federal grant and contract support for the past 52 years, starting in 1966, except for the two years when he was a Major in the US Air Force, during the Vietnam War.

With regards to his family life, RSW met his future wife, Mary Dominica Corabi, when she was an 18-year-old pre-medical student working as an electron microscopy technician, summers, at a Woods Hole Marine Biological Laboratory (MBL) in Woods Hole, Massachusetts. RSW was employed at the MBL as a 23-year-old Head Chemist in their Department of Research Services, working in a summer job between semesters in medical school. For RSW, this was truly "love at first sight." RSW proposed marriage to Mary 4 days after they met and she accepted his offer. They were married two years later, upon her graduation from Barnard College at age 20. They have been happily married for 55 years. Their two adult children have multiple university degrees, from Yale, Harvard, the University of Pennsylvania and Columbia University. Both graduated from undergraduate college *summa cum laude*. They are national leaders in their respective fields, juvenile justice law and "early-college" education. RSW's learning issues related to his congenital toxoplasmosis, i.e., delayed reading, poor school performance in K-9 grades, have not been passed on to the next generation.

Currently, RSW still works full time, at age 80, as a medical college professor and director of the national award-winning, state-wide, 160-site, Arizona Telemedicine Program which he co-

founded with a prominent Arizona politician, State Corporation Commissioner Bob Burns, in 1996 [1]. RSW was recently awarded his latest National Cancer Institute-funded grant, as co-investigator on a telehealth cancer patient education clinical trial. Funding is for five years, continuing on until the year 2024.

To his own way of thinking, RSW continues testing his personal tolerance of "risk" and "likes the feeling." Conceivably, increased tolerance for taking risks as part of a strategy for achieving rewards could be a positive outcome for some people who are infected, by their pregnant mother, with *T. gondii* in utero. This is so-called "congenital toxoplasmosis."

By 2018, a half century later, a handful of the MGH trainees pictured in Figure (2) along with the MGH Staff, had their publications cited over 10,000 times in the medical literature, as tracked by Research Gate. This can be a measure of outstanding research productivity and, for some future faculty members, academic, business and civic leadership as well. Ronald S. Weinstein's career, the focus of this paper on *congenital toxoplasmosis*, required successful coping with the signs and symptoms of *congenital toxoplasmosis* early in life [1]. Dr. Benjamin Castleman, MGH Chief of Pathology, front row, 4th from the right was RSW's mentor during his pathology training. Dr. Castleman is best known for his work on his namesake disease, "Castleman Disease", and for his leadership in organizing and moderating MGH Clinico-Pathological Conferences for 23 years (1951-1974). Dr. Castleman published a remarkable 2100 Clinico-Pathological Conference cases in the *New England Journal of Medicine* and over a hundred papers on endocrine pathology, while running a large clinical service [36-38]. Dr. Robert E. Scully, is front row, 3rd from the right. Dr. Scully, a prominent gynecopathologist, was also a pioneer in clinical television microscopy, the forerunner to telepathology [39,40]. RSW, a third-year MGH pathology resident when this photo was taken, is standing behind Dr. Scully, in the 3rd row, 2nd from the right. RSW was introduced to clinical television microscopy by Dr. Scully, when they signed-out historical television microscopy cases together [2]. These telemedicine cases originated at a walk-in clinic at the Logan International Airport, in 1968. The airport was linked to the MGH, 2.7 miles away by a bi-directional microwave telecommunications system. While a pathology resident and laboratory director, RSW also co-discovered the 3-dimensional ultrastructure of the nexus "gap" junction, a research breakthrough, and documented the nexus' role in human cervical carcinogenesis, with N. Scott McNutt, M.D., 4th row, 1st on the right [41,42]. RSW went on to invent, patent and commercialize telepathology and introduced the word "telepathology" into the English language [2,4]. Today, digital telepathology is revolutionizing the practice of specialty surgical pathology in developing nations [2,28-33]. 2nd row, 3rd from the right, is Harold F. Dvorak, M.D., who subsequently made the landmark discovery of Vascular Endothelial Growth Factor (VEGF) and developed an effective anti-VEGF therapy for cancer and macular degeneration [43,44]. Dr. Dvorak is seen between E. P. Richardson, Jr., M.D (front row, 5th from the right) and Dr. Castleman. Elizabeth H. Hammond, M.D., 5th row, 3rd from the left, is an authority on cardiac transplantation pathology and predictive cancer-factor evaluation, as well as a national expert



on laboratory quality assurance programs [45]. Stanley J. Robby, M.D., 3rd row, 3rd from the left, is an international authority on the pathology of the female reproductive tract. He served as President of the College of American Pathologists [46]. Vivian W. Pinn, M.D., 4th row, 5th from the left, a nephropathologist, was an academic pathology chair in Washington, D.C., and served as Director of the National Institute of Health's Office of Research on Women's Health [47,48]. Robert B. Colvin, M.D., last row, 2nd from the left, went on to become a distinguished immunopathology researcher [49]. He was named the Benjamin Castleman Chief of Pathology at the MGH, in 1991, and served with distinction in that role [50].

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