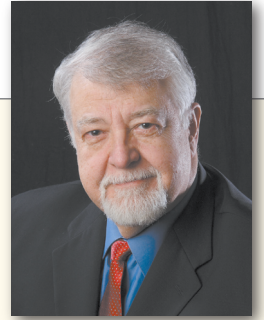


Worms & Innovation

By Mike Rainone



Patience, scholarship, an open-minded passion, and self-created luck; perhaps these more than genius are the keys to solving the toughest problems — the problems that matter.

At 62 years old, I am pretty hard to surprise — or shock for that matter. My sense of humor is numb, according to my 20-something children.

Maybe I've seen too much. I expect everything imaginable to be possible and expect innovation and advancement as due course. I have followed technology for a long time and watched the promise delivered on proteomics, genomics, stem cells, chirality, room temperature superconductors, shape memory alloys, polymers, and nanoparticle everything.

However, every once in a while, I am astounded, completely taken off guard by something totally unexpected. If you have kept up with these columns you can predict, at least for me, that the unexpected comes from the realm of the biological sciences, especially medicine. Our bodies, especially our minds, are the most complex machines in the universe, and since medical science is so new, each discovery about this human mechanism is almost pioneering.

James Watson and Francis Crick defined DNA only a half-century ago, and it took another 50 years to sequence the genome. Understanding the function of each combination will take generations to complete. Clearly, the list of what we do know or think we know is dwarfed by what we don't.

The immune system is one thing we think we have figured out, but a recent article in *The Scientist* was so mind-blowing I am pretty convinced that we still don't know much.

As faithful readers know, in the first of my many previous lives I was occupied as a clinical psychologist (preparation for dealing with engineers on a full time basis in my current life). My training was heavily focused on autistic children at a time when the autism diagnosis was very new, and I remain to this day aware of many of the treatment modalities for the illness. When I came across the article that used the phrase "worms" and "autism" together, I was hooked.

The true story is about a family at wits end with an autistic teenager, a near-adult child who had descended into physical self-abuse, violent behavior, and the very real possibility of accidental death. The father, Stewart, began a systematic study of anything, including alternative therapies, that may of helped. Having tried everything from anti-psychotics to behavioral therapy to no avail, his thorough Internet search

provided a glimmer of hope. Here is a lesson to be learned: He saw a glimmer that no one in the field of Autism research recognized.

The glimmer was work by a team of researchers at the University of Iowa on Crohn's disease. Students of the autoimmune disease noted epidemiological evidence that people who emigrated from an undeveloped area such as India, where the disease is unknown, to the developed world (specifically, the U.K.) faced a serious and significant increase in the probability of developing Crohn's.

In addition, in the U.S., studies on children living in rural southern states where pig farming is common — as are the worm infections that come from living close to them — epidemiologists found no bowel disorders. As programs were implemented to stop the worm infections, autoimmune diseases became far more prevalent.

The great breakthrough came when Stewart wondered if, instead of looking for something in the environment that caused the disease, scientists should be looking for something that was missing, something that allowed the disease to thrive with its absence.

Armed with an assortment of indirect pointers, specifically an experimental treatment in Iowa that involved ingesting the ovum of porcine tapeworm, as a possible remedy for Crohn's disease and ulcerative colitis, Stewart wrote a medical white paper that piqued the interest of researchers in his area. After years of working with the FDA for permission just to perform the clinical test on his son, the ovum were obtained and ingested. After a false start, the dosage was adjusted and within ten weeks the results were in. I don't have to go into details of the complete remission of symptoms; I wouldn't be writing about it if it didn't work famously. I will report that the autistic behavior simply went away.

The mechanism of the remediation for autoimmune diseases, which now may include autism, goes something like this: *Trichuris suis*, the pig whipworm ovum which cannot thrive in the human gut (also the reason they picked them), provokes a systemic immune response. In this case, the important immune system response seems to be one of regulation, a balance if you will, between the T-cells which tell the body to attack and those that function to prevent it from attacking our own tissue.

The story of the Johnson family, father Stewart and autistic son Lawrence, is a story that speaks to the best of problem solving. It is a casebook of lessons for new product developers, engineers, and anyone faced with a seemingly insoluble problem.

The first and second lessons address persistence (2005 to present), and refusal to accept failure — a failure that may have institutionalized Lawrence for the rest of his life.

The third lesson is dear to my heart: An openness to embrace alternatives that are not in the mainstream. It is not likely that many of us would connect the dots from a porcine worm ovum to our immune system to autism, not in a million years.

The final lesson is a dedication to serious scholarship to find and understand both the underlying social cultural systems in place, which include a notoriously stodgy FDA and a risk-averse medical establishment, but also the immunological precedents which, in some ways, were pointing arrow-like toward this solution but were circumstantial and obscure to those not desperate for a solution.

I have addressed problem-solving many times in the past, but Stewart Johnson's efforts remind me that I have not given enough attention to the importance of understanding the socio-cultural context of the problem as a critical part of the problem solving process. Without patience, Stewart Johnson would never have survived the rigors of the FDA. Without scholarship, he would not have convinced medical researchers to even look outside the box. Without his passion for the future of his son, nothing would have happened. Patience, scholarship, an open-minded passion, and self-created luck; perhaps these more than genius are the keys to solving the toughest problems, the problems that matter.

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