

The Immune System: how toxins can save your life

Dr William Barnes B, Sc., M.B., Ch, B. (Otago)
Fellow Australian College of Nutritional and Environmental Medicine.

This article is the first of a series by Dr William Barnes which explore the structure and function of the immune system, and how it fits into the changing medical paradigm.

Part 1

We read and hear a lot about the immune system, yet most lay people and a lot of professionals know little about its structure or the emerging field of immunotherapy, particularly in relation to the treatment and prevention of cancer.

The purpose of this series of articles is to shed some light on a grey subject. I'd like to begin with a brief history of the origins of immunotherapy.

This is the story of William Coley, who is often referred to in medical texts on cancer, although his enormous contribution to the advancement of cancer therapy is rarely acknowledged. Far from being a 'quack', or 'alternative' doctor, he worked in one of the most prestigious cancer hospitals in the USA – New York Memorial Hospital, later to become Sloan and Kettering.

Coley's work spans the 19th and 20th centuries, and it could be said his treatment for certain types of cancer, although not currently used, has not yet been surpassed.

In his lifetime, the biggest problem facing Coley was finding credible explanations for how his treatment worked. We are only now starting to understand the natural immune forces his treatment unleashed. He therefore stood little chance in the 1920s of finding a reasonable and plausible explanation.

Coley trained and practised as a Surgeon, and it was after a tragic case in which a young girl died of osteosarcoma that Coley started to look for an alternative surgery for this fatal disease. His search started with a review of all osteosarcoma patients treated in New York hospitals, he found though, that all cases had been treated with surgery.

There was however an interesting breakthrough when he came across a patient named Stein, a German immigrant living in New York. Stein had a history of Osteosarcoma in the neck region, and had had repeated surgery over two years, yet suffered further recurrences. In October 1884 he was in a terminal state barely able to breathe or eat, when he had developed a raging fever which progressed into an angry red rash that raced across his face and neck. It turned out to be the disease erysipelas, an infection caused by a bacterium called streptococcus pyogenes. This was a common enough infection of the throat. The infection could be fatal.

Stein's infection raged and he was put in isolation. However, rather than progression to death a remarkable thing happened. Doctors and hospital staff noticed the large ulcerated tumour on his neck had regressed and was replaced by a healthy scar. His surgeon was astonished and delighted.

By February 1885, he was well enough to be discharged. However, to Coley's dismay Stein's case had not been followed up. It took several weeks to find him, but Coley was determined to track him down to see whether his amazing recovery has been sustained. He recalled him back to the New York hospital for examination where Stein was found to be in excellent health with no visible sign of cancer!

Coley was so impressed that he undertook an exhaustive research of this phenomenon and found it documented in European literature. He was greatly impressed by a paper written in 1880 by the German physician P. Bruns, who had coordinated a survey of therapies using erysipelas.

In Coley's words, "he collected 14 cases of undoubted malignant disease, in which erysipelas occurred either accidentally or by inoculation. Of these 5 were sarcoma and 3 were epithelioma. Of the 5 cases

of Sarcoma 3 cases were fully and permanently cured.” He also claimed there were 40 cases of remission after accidental infection with erysipelas.

Corey’s next task was to try inoculating patients himself. His first case was a man named Zola. On the 3rd of May 1891 Coley initiated the first experiment of immunotherapy in America. This was the genesis of a 40 year experiment with erysipelas and its toxins in the treatment of sarcoma. Initially Coley had great difficulty initiating the desired infection. Eventually though he got a significant response with an outcome of remission in the patient lasting eight years.

Carried out in the days before antibiotics, an induction of this type of infection was an unreliable and dangerous procedure. This prompted Coley to further develop the treatment. He postulated that the toxins released by the infection were the active ingredients. He found that by adding toxins from other bacteria he achieved superior results.

Whether this was a stroke of genius or just good luck, the addition of the toxins from *B prodigiosus* invoked a powerful immune response. Today we know this toxin stimulates the immune system to produce substances such as interferon, interleukin and tumour necrosis factor.

As is often the case, Coley’s therapies worked best in his own hands. Results by other physicians were much less spectacular, so people became sceptical about his therapy. It was not until much later that it was discovered the commercial production of his toxins for general use were grossly inferior to his own. Coley was unaware of this because he used a preparation that was produced by a small lab for his own private use.

Coley’s success was eventually determined after the development of a bone sarcoma registry set up in the 1930s when a great debate was developing about the use of amputation and radiotherapy as the treatment of choice in bone cancer. Coley’s toxins won hands down. Of all the cases presented radiotherapy only accounted for two long term survivors, and both of these had concurrently been given Coley’s toxins! Coley’s results showed much greater success. He was able to achieve long term survival in over 40% of his patients.

Although Coley’s study methodology did not compare with the more rigorous methodology used today, no-one has got close to reproducing his results, with with the advent of more modern therapies.

Unfortunately bias rather than wisdom has prevailed. At the time Coley presented his results he was retired and his health was failing. No-one took up his work and his treatment dropped into obscurity. The challenge is still there however. What forces did this treatment unleash? We are at a point where understanding and using these forces is possible, beginning a new era in cancer therapy.

References

1. [A Commotion in the Blood](#)
Stephen S Hall, Henry Holt and Co
2. [At war within: The double edged sword of immunity](#)
William Clark, Oxford Uni press
3. [Scientific American](#)
Sept 1993 and Sept 1996
4. [History of Immunology](#)
Loudible pus Silverstein
5. [Erysipelas and prodigious toxins](#)
JAMA 108-1067-69
6. [Cancer Therapy](#)
Ralph W. Moss Equinox Press NY