Scientifically Illiterate

A knowledge of chemistry is necessary in order to make good medical decisions.

By Donald Weaver

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Chemistry is the central science, drawing on the basic principles of physics while enabling biological phenomena to be understood at a molecular level. It would seem reasonable that a truly informed person in the modern world should have at least a rudimentary scientific literacy in the molecular sciences as well as being able to read and write. Regrettably, this is not the case.

Nowhere are the implications more apparent than in the health care system. The failure to appreciate chemistry and the molecular sciences is seen on an everyday basis in medicine. In my own medical practice, the following four cases occurred during a recent two-month period.

**A patient refused to receive intravenous anti-migraine drugs because she was concerned that the sodium chloride and glucose in the intravenous solutions were synthetic in origin. She passionately believed that the molecules and even the constituent atoms themselves were fundamentally different between synthetic glucose and natural source glucose.

**A patient abruptly stopped his anti-seizure medications. He did so after purchasing two rather large horseshoe magnets which he now places on either side of his head when he sleeps at night. Because he had suddenly stopped his anticonvulsant drugs, he experienced several severe seizures producing a painful recurrent shoulder dislocation.

**A patient stopped taking her cholinesterase enzyme inhibitor for Alzheimer's Disease. At her family's urging, she was taking large doses of Vitamin E and *Gingko Biloba* at four times the recommended daily dose. The family refused to believe that their mother's subsequent haemorrhages were due to this mixture of agents.

**An epileptic patient decided to forego her conventional therapy in order to have "the bone plates in her skull manipulated." She now visits an alternative medicine practitioner who literally beats up her head once a month. She stopped taking her anti-convulsants and has recently experienced a recurrence of her seizures. Not surprisingly, she now also has headaches.

These people are not educationally deprived — all have high school education, two have post-secondary school education. They are simply average Canadians trying to do what they think is best for themselves.

The situation is probably only going to get worse. Medical therapeutics are getting more complicated. With the new millennium will come improved receptor site specific drugs, gene therapies, anti-apoptotic agents, and a variety of other increasingly sophisticated chemical attacks on human disease.

As every physician knows (and as every lawyer is quick to remind us), it is the obligation of the physician to ensure that patients understand their therapies. Where does one start? Is it possible to obtain informed consent from an individual who genuinely believes that having her head systematically punched once a month to reshape skull morphology will beneficially influence neurotransmitter flow in the superficial layers of the cerebral cortex?

Furthermore, with medical schools deleting chemistry as a prerequisite (to pursue "more human-centred disciplines"), the physicians themselves won't understand the newly-evolving molecular-based therapies. It will ultimately be a situation of the blind leading the blind.

Concomitant with the rise in scientific illiteracy has been the blossoming of so-called alternative therapies. Yes, the snake oil salesman is back! Alternative therapies come in a wide variety, including the good, the bad, and the downright ridiculous.

First, there is the megavitamin approach. This is based upon the notion that if a little of something is good for you, then a whole lot is probably really good for you. Apart from producing expensive and usually brightly-coloured urine, there are little if any hard data to support the widespread use of large doses of vitamins.

Next are the dietary approaches. There are the high protein/low carbohydrate, high carbohydrate/low protein, high protein, and no protein diets — all with the exact same therapeutic objective.

Then there are the therapeutic touch practitioners. This involves the practitioner systematically waving his hands over the affected individual to promote therapeutic perturbations in the conventionally-undetectable energy fields surrounding the patient.

The most rapidly growing alternative therapy is herbal remedies. The problem is not with their potential benefits. Rather, it is the failure of society to demand the same rigorous scientific scrutiny as is used for conventional drugs. Just because they are natural doesn't make them safer. After all, cobra venom comes from an all-natural source.

In the next millennium, humankind will have to confront an array of assaults. There is the spectre of prion diseases, killer viruses, drug-resistant bacteria, and environmental cancers — prospects made even more scary by the decline of scientifc literacy and the rise of pseudoscience.

These problems cannot be avoided. They will have to be confronted using good rigorous science as a weapon of salvation — a weapon wielded by people who know how!

***(Adapted with permission from* Canadian Chemical News, July/ August 1999)**