The best of both approaches

The role of science in complementary and alternative medicine • *by Dónal O'Mathúna*

The 20th Century has witnessed remarkable advances in health and medicine. The creation of infrastructures and measures to improve public health, as well as medical advances in the second half of the century, have increased the life expectancy of many people around the world. Antibiotics have finally given us a potent weapon to combat infectious diseases, we can effectively control diabetes and have made large strides towards curing some forms of cancer. The life expectancy of HIV-infected patients has been improved, and surgery allows us to replace failing organs through transplantation. And there is still more to come. It is not an exaggeration to expect that the Human Genome Project and advances in biomedical research will allow the pharmaceutical industry to develop new drugs against a wide variety of diseases. Yet even as conventional medicine reaches into the cell to touch every molecule, patients are reaching out to alternatives without a proven track record that promise to treat them better.

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This is not a complete rejection of conventional medicine, but patients are sensing they can benefit from the best of both approaches.

Unfortunately, uncertainty over exactly what constitutes 'alternative medicine' hampers progress. The problem even starts with its definition: these therapies have been described as alternative, complementary, unorthodox, unconventional, unproven, holistic, fringe, integrative, natural or New Age medicine. Such terms

often tell us more about how the speaker views the approach rather than explaining the phenomenon. In fact, the same holds

true of the medicine associated with physicians and hospitals, which is variously labelled as conventional, modern, scientific, orthodox, allopathic, reductionistic, biochemical or physicalistic medicine. Here, I will use the term 'conventional medicine' for the latter and 'complementary and alternative medicine' (CAM), which captures two of its main characteristics, for the former.

David Eisenberg from Harvard Medical School was one of the first to examine the popularity of CAM in the US. He defined unconventional therapies 'as medical interventions not taught widely at US medical schools or generally available at US hospitals' (Eisenberg *et al.*, 1993, 1998), but he immediately stumbled upon the problem of precisely defining CAM. Initially he included exercise and prayer,

but later excluded these practices citing methodological difficulties. If Eisenberg and his colleagues had included them in their final report, the conclusion would have been that around 80% of Americans use CAM, rather than the 34% reported for 1990 and 42% for 1997. Other researchers have used even broader definitions, including physiotherapy, counselling, nutrition counselling, active listening and patient advocacy as alternative or 'natural' therapies (Daniels and McCabe, 1994; Fawcett *et al.*, 1994).

According to Eisenberg, the therapies most commonly used are chiropractic, relaxation techniques, herbal medicine and massage. Of intermediate popularity are therapies many would regard as common sense, such as support groups and dieting, and their inclusion helps to bolster the perception that alternative medicine is very popular. Eisenberg's studies also revealed that the least frequently used therapies, such as homeopathy, hypnosis and acupuncture, were those that differed the most from conventional medicine. While a concise definition remains elusive, three general characteristics of CAM have emerged. First, as Eisenberg recognised, such therapies are primarily approaches to maintaining health or promoting healing that conventional medicine has not emphasised. The role of spirituality, for instance, has long been recognised, but its consideration is often left to hospital chaplains and community religious leaders.

The second characteristic of CAM is an emphasis on a holistic approach to health and healing, referring to the importance of caring for a person's mind, body and soul. CAM criticises what it sees as conventional medicine's view of patients as 'bags of chemicals' and highlights the importance to their healing of a person's many facets. This approach also leads to an emphasis on non-invasive 'natural'

methods of healing, and stress prevention, alongside the treatment of diseases. Some

instance, was initially isolated from the yew tree (*Taxus brevifolia*) by systematic

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of these approaches are rejected by the medical establishment, sometimes for legitimate scientific reasons, sometimes not.

The third characteristic of CAM is a lack of well-designed clinical studies to support the efficacy or safety of particular therapies or remedies. Despite many studies on CAM, the objective evidence for these therapies is often far less compelling than is required for conventional therapies.

These characteristics are not incompatible with conventional medicine that can, for example, be practised in a holistic way. The medical ethics literature emphasises the importance of bedside manner, of caring for patients as whole beings. Indeed, conventional medicine is increasingly becoming more concerned with issues of diet, stress and many other factors that go beyond the physical realm. In the same way, CAM must be open to science.

In general, CAM therapies can be divided into five categories, of varying popularity, credibility and effectiveness.

Scientifically unproven therapies

Many CAM therapies have little scientific backing. For example, although some acupuncture studies have revealed that it is effective for specific conditions, there still remains uncertainty about other uses, and much debate revolves around acupuncture's mechanism of action (British Medical Association, 2000). Rather than rejecting these approaches, these challenges should stimulate the ingenuity and inquisitiveness of scientists to find adequate control therapies. Also included in this category are most herbal medicines. Hundreds of plant species are used in thousands of products with different formulations. Yet very few have been clinically tested. This is a huge potential resource for medicine, since more than half of the most prescribed drugs in the US were discovered in nature or are based on natural products (Newman *et al.*, 2000). The anti-cancer agent taxol (paclitaxel), for

testing of plants by the US Department of Agriculture for the National Cancer Institute. Scientific testing of these unproven CAM therapies is obviously necessary for safety reasons too. While clinical studies reveal that the herb St John's wort is effective for relieving mild to moderate depression, other studies show that its active ingredients interfere with the metabolism of other drugs (Moore *et al.*, 2000) such as cyclosporin and oral contraceptives.

Scientifically questionable therapies

This second category of CAM also has little scientific support, but these therapies are also based on principles or theories that contradict well-established scientific knowledge. Homeopathy is a good example, where dilution with shaking, even to the point of diluting out every molecule of original 'active' ingredient, is believed to increase the pharmacological potency of a solution. While proponents claim homeopathy is extremely effective, two-thirds of Americans found it of little or no help (Consumer Reports, 2000); the remaining one-third who said the treatment helped 'much' could well have been benefiting from the placebo effect. Although a 1997 review in *The Lancet* initially found that the placebo effect could not explain all of homeopathy's reported benefits, the researchers later revisited their data and concluded differently (Linde *et al.*, 1999). They found a correlation between the results and the quality of studies, with low-quality studies tending to find homeopathy more effective. These findings are to be expected when therapies are alleged to work by questionable mechanisms, and scientists are justified in remaining sceptical of these approaches.

Quackery and fraud

Although defined in different ways, the term quackery comes from 'quacksalver',

originally applied to untrained persons practising medicine. People who promote quackery generally believe their therapies work, but they do not have enough training to know that their effectiveness is highly unlikely. In contrast, those who promote fraudulent therapies know they are not effective, but they deceive people for profit. Unfortunately, quackery and fraud can occur throughout medicine. But they thrive more easily in an environment

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where therapies are not expected to have scientific support or where the medical establishment is excessively mistrusted. These therapies often make extravagant claims or disguise themselves in pseudo-scientific language. For example, 'Vitamin O' is promoted in the US as having many health benefits. The manufacturers claimed that scientists in the space programme developed a product that contains 'O4 or two O2 molecules joined together in a very stable bond' by using 'breakthrough quantum physics technology'. They later paid a large fine to the US Federal Trade Commission, the agency responsible for monitoring truth in advertising (www.ftc.gov/opa/2000/05/rosecreek2.htm). However, Vitamin O remains on the market, promoted now by testimonials. To help people spot quackery and fraud, scientists must become involved in public education. Only when people become convinced of the importance of scientific testing and critical thinking will the waste of resources spent on quackery and fraud be prevented.

Energy medicine

This is a collection of diverse practices based on the alleged existence of a non-physical force called prana, chi, ka or orgone. This life-energy animates the human body as it is transformed into matter and physical energy through channels called chakras. Since it is non-physical, no instruments can detect or measure it. In this perspective, illness, ageing and death result from imbalances or blockages in the flow of life-energy; healing is achieved by re-balancing its flow through the body. Meditation is a central aspect of

energy medicine, as it trains people to sensitise themselves to detect life-energy and to manipulate it. Best-selling authors (e.g. Deepak Chopra, Larry Dossey and Carolyn Myss) devote their books to these ideas. Energy medicine is at the core of many traditional forms of alternative medicine, such as Chinese and Ayurvedic medicine. Practices such as therapeutic touch, Reiki, qigong and tai chi are based exclusively on these principles. Some claim acupuncture, chiropractic, herbal remedies and homeopathy influence this life-energy, although other practitioners claim these practices have a purely physical mechanism of action. Questions of effectiveness and safety must be addressed here, but so too must the fact that spiritual and religious teachings are often presented in the guise of therapy. When health-care professionals offer or promote energy medicine, they should openly declare that this is based on ancient religious teaching and not on professional training. Barnum (1996) surveyed the popularity of these therapies among US nurses and commented, 'Is the practice of the New Age nurse deceptive? Do patients' weakened conditions simply make them targets of opportunity? If New Age nursing is care of the soul, is it also usurping the field of those perceived to be more prepared for that task, namely, religious priests, ministers, and rabbis? Or is the nurse a representative of a new religion?'

Complementary therapies

This final category includes much of what is actually beneficial. Almost every popular CAM book includes extensive discussions on nutrition, exercise, stress reduction, relationships, spirituality and other lifestyle issues. Common sense and mounting evidence from studies show that these factors are indeed important in preventing and recovering from illness. The successes of conventional medicine led some patients to believe medicine could fix every health problem. People ran their bodies into the ground, and then turned to the doctor to repair them. But during the last decade or two, people have realised that this does not work and are becoming more interested in taking responsibility for their health to prevent

problems that later require powerful drugs or extensive surgery. Sir William Osler,

the great physician and professor of medicine, valued both, science and

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holism (Osler, 1932). In 1901 he declared, 'A new school of practitioners has arisen which cares nothing for homeopathy and less for so-called allopathy. It seeks to study, rationally and scientifically, the action of drugs, old and new. It is more concerned that a physician shall know how to apply the few great medicines which all have to use, such as quinine, iron, mercury, iodide of potassium, opium and digitalis, than that he should employ a multiplicity of remedies the action of which is extremely doubtful.' Osler then continued, 'Perhaps in no particular does Nineteenth-Century practice differ from that of the preceding centuries more than in the greater attention which is given to the personal comfort of the patient and to all the accessories comprised in the art of nursing'. These two principles form the foundation of every good therapy, whether conventional or alternative.

The history of medicine paints terrible pictures of medicine without science. Patients were bled and given poisonous concoctions, often on the sole basis of anecdotal reputations. Today, all therapies used in conventional medicine must undergo thorough testing before

they are approved using the randomised controlled trial (RCT) as the gold standard of scientific studies. But these studies often work as well with CAM therapies, and many aspects of the RCT were in fact developed with what today would be called CAM therapies. One of the earliest studies to compare groups of similar patients was James Lind's research that identified the value of citrus fruits in preventing and treating scurvy (Mellinkoff, 1995). Later, the 'blinding' of patients was introduced by Benjamin Franklin and his investigators to test the efficacy of animal magnetism, and then refined throughout the 19th Century in testing homeopathic remedies (Kaptchuk, 1998).

Proponents of CAM should therefore realise that scientific studies will be of benefit in the long term. If a CAM therapy

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works, testing will generate the scientific evidence needed to persuade conventional medicine of its value. Without such evidence, no one, not even the CAM expert, knows for sure whether the untested, unproven therapy actually helps. All we know is that some patients report improvements that could have less to do with the therapy and more to do with the placebo effect, the natural course of the illness, or spontaneous remission. Scientists indeed play an important role, both in conducting studies and in helping the public understand the benefits and limits of science, although some from the CAM community are suspicious of science. In many ways, this is a re-enactment of the debate over caring versus curing, which creates a false dichotomy. The two should go hand in hand: patients should be cured in a caring environment. But caring also involves using the best and safest therapies. Uncritical acceptance of CAM allows dubious and questionable therapies to gain credibility and acceptance on the coat-tails of effective therapies and other factors such as nutrition, exercise and relaxation. The

wheat needs to be separated from the chaff. If not, the wheat could just as easily be thrown out with the chaff.

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For example, sales of herbal remedies in the US grew dramatically throughout the 1990s, but declined in 2000 (Blumenthal, 2001). A Consumer Reports (2000) survey showed low patient satisfaction with herbal remedies, even those shown to be effective. Indeed, the fickle market may once again turn against herbal remedies, with the neglect of those herbs that are effective and safe for specific conditions, unless manufacturers agree to market only high-quality products that have been scientifically tested. The current regulatory situation in the US allows products of poor quality to flood the market.

CAM is addressing more than just the Western thirst for health: it also addresses its thirst for spirituality. Medicine and religion have been intertwined throughout human history, except in the modern era. The proper role of spirituality in health care will be more difficult to resolve. Sloan *et al.* (1999) have pointed to an appropriate way to address these issues: 'There is an important difference between "taking into account" marital, financial, or religious factors and "taking them on"

as the objects of interventions'. Hence, CAM can remind conventional medicine of its humane side and help restore the value of caring for people as whole persons. But CAM without respect for scientific evidence would return medicine to an era in which it was little more than magic.

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A plea for funding 'small' basic research in Europe

Practical proposals for the next EU Framework Programme • by *André Goffeau*

Science for *Homo economicus* and *Homo faber* is flourishing, while Science for *Homo sapiens* is diminishing. (Takashi Tachibana, 1998)

Over the last two decades, the European Commission (EC) has become a major player in the European science landscape. Through its Framework Programmes (FPs)

it has supported biological research, among other fields, generally according to top-down priorities set in Brussels by the Commission. And as the economic