

On Nature, Science and their Dangers

by Ted Kaptchuk

The combination of two very publicized simultaneous events has recently encouraged many new patients to seek care from practitioners of East Asian medicine. One incident was a series of newspaper reports concerning the manufacturers of arthritis painkillers such as Vioxx, Celebrex and Bextra, who deliberately hid incriminating information of potential adverse drug effects. (1, 2) The second was the publication in a prominent medical journal (with subsequent media attention) of one of the largest randomized controlled trials of acupuncture ever undertaken which demonstrated acupuncture's superiority over placebo for osteoarthritis of the knees. (3) People saw the utility in trying Chinese medicine as the news bulletins' messages resonated with the public image we try to promote: nature is safer and Chinese medicine works according to the criteria of modern biomedicine. Before we get complacent, I thought it would be worthwhile to share some of my personal observations concerning "natural" and "see, it works according to the criteria of biomedicine." My fundamental concern is that these two messages can, if they have not already, become booby traps that could backfire on the profession of Oriental medicine.

The word 'nature' had no equivalent term in the Chinese language before the late nineteenth century. (4) After this time, the early term *zi-ran* ("what is so of itself") which carried the implications of "spontaneous process" was adopted to mean "nature" for use in translating Western scientific writings. The Chinese had no radical dichotomy between human culture and nature: both operated according to the same laws and were fundamentally linked. The idea that Chinese medicine is "natural" (as opposed to man-made or synthetic) and, therefore, somehow safe, is not an argument found anywhere in the Chinese classics. The current Chinese medicine argument that 'nature equals safe' was only adopted in the early twentieth century as a defensive tool by the Chinese medical profession to resist the complete seizure of medical power and legitimacy by elite Western medicine physicians. (5) For Chinese medicine, the 'nature equals safe' was a political maneuver to survive in competition with Western medicine. (6) This merger of a belief in "benevolent nature" with a less powerful medical system is equivalent to what happened in the west, at the same time when unorthodox medicines [such as homeopathy, chiropractic and health food] also adopted a natural is better and safer rhetoric. (7,8)

In fact, until the end of the nineteenth century, Chinese practitioners saw their medicine, especially the herbal medicine, as being potentially dangerous and toxic. For example, a central theme of the *Materia Medica Classic of the Divine Husbandman* (Shen-nong Ben-cao Jing, c. 150 CE) is herbal toxicity. Two thirds of the 365 herbs listed are "poisonous" (*you du*). Only 120 herbs were "without poison" and are described as not harmful if taken for a long period of time. The Chinese understood that any pharmacodynamic substance generally implies possible toxicity. Medicine in one dosage becomes poison in another dosage.

While our profession sometimes presumes that “nature is safe”, Western physicians are constantly bombarded with medical journals reporting that Chinese herbs are toxic, have potential drug-herb interactions, are adulterated by synthetic drugs, are contaminated by heavy metals and otherwise precarious. Unfortunately, these reports are often true. In fact, aconite (fu zi) is toxic and even bitter almond (xing ren) in especially high dosages is dangerous. A sample of 2069 patent formulas manufactured in Taiwan found 24% contaminated by at least one camouflaged drug, (9) while a survey of 260 Asia-manufactured patent medicines collected from California retail stores found 7% containing pharmaceuticals. (10) Chinese herbs do interact with western drugs as the well documented example of warfarin and salvia (dan shen) demonstrate (11); and many herbal preparations have unacceptable levels of heavy metals. (12) The blitz of negative information, while alarmist, is not usually inaccurate. But in the face of such information, we still talk “natural is safe.” This bury-our-head-in-the-sand attitude reinforces the perception that practitioners of Chinese medicine, who also believe in qi or yin/yang are naïve and gullible.

In the face of such a negative report I would obviously not argue for abandoning herbal medicine. The benefits outweigh the risks. Instead, I would argue that our profession should gradually wean itself of the twentieth century “nature-trusting belief” and adopt the more traditional Chinese understanding that all medicines need to be properly used by trained practitioners otherwise they are potentially unsafe. Our treatments work because we have the knowledge to make them safe, not because the herbs are inherently benign. And in terms of patent medicine products, we need to remember that just because a manufacturer says “natural product” does not mean that the products are pure, reliable and prepared under quality controlled conditions. Discernment, caution and care are necessary in all medical systems. I believe that unless we re-organize our rhetoric to match an earlier layer of Chinese thought, the “nature” argument will eventually ensnare us in our own misrepresentations much like the manufacturers of Vioxx and Celebrex were caught in their dishonesty.

The second trap I see in recent events is “see, it works according to the criteria of biomedicine and randomized controlled trials (RCT).” The danger here is that given the history of contradictory RCT evidence in acupuncture research it is likely that new positive trials will be followed by negative trials in the bipolar cycle of positive and negative evidence we have already witnessed. (13) Just witness the even more recent negative RCT of acupuncture for migraine. (14) Interpreting this contradictory evidence is complex and requires a specialized education in epidemiology. (13) Nonetheless, it should be pointed out that a cycle of contradictory evidence is not unique to acupuncture and, in fact, happens even with many FDA approved drugs.

The difference between the drug evidence and acupuncture evidence is that the pharmaceutical companies can often withhold their negative RCT data from surfacing in the public. Depression is a good example. In the US, when a company seeks FDA approval for labeling a drug with a specific indication, two pivotal trials that show superiority over placebo are usually required. Negative RCTs need to be reported to the

FDA, but the company can request that this information remain proprietary, confidential and not shared with the public. Therefore, according to information released by the Freedom of Information Act, we have the situation that for paroxetine, an important antidepressant, only two of the nine RCTs were positive and the data from the seven negative trials was not made public. (15) Also, for fluoxetine, the archetypical serotonin reuptake inhibitor (SSRI), the data submitted to the FDA demonstrated only five out of 13 RCTs to be positive.

The same story can be told for many other classes of drugs including: analgesics, anxiolytics, antihypertensives, hypnotics, antianginal agents, antihistamines, nonsteroidal asthma prophylaxis and motility-modifying drugs. (16) For many complaints, especially those concerned with subjective complaints, RCTs may not have what is called “assay sensitivity.” (16) For whatever reason, the RCT apparatus for detecting a difference between a genuine treatment and a placebo control sometimes is unreliable and contradictory.

This does not mean scientific research concerning Asian medicine is not important, valuable or even essential. It just suggests that the profession of East Asian medicine needs to be critical and cautious before it invests itself in biomedical criteria of efficacy. Instead, we have to realize that RCTs can be serious and genuine efforts (certainly when performed outside of drug company influences) potentially could give our profession valuable feedback and insights. We need to learn how to interpret and incorporate this type of evidence into the Asian tradition of depending on knowledge transmitted from teachers, classical texts and most critically obtained from our patients’ feedback. Such an effort of cross-fertilization will take serious learning and contemplation. But we certainly cannot use the criteria that is common within the profession today: if a RCT supports Oriental medicine it is good research and if it does not find positive evidence for Oriental medicine it is bad research. We cannot afford to have a simplistic and selective double standard of “we like this RCT, but not this RCT.” This approach reeks of the hypocrisy that pharmaceutical companies present to the public on a daily basis. (e.g., 1,2) Selectively trumpeting a particular RCT could cause us to lose our professional integrity and moral standards.

References

- (1) Meier B., Kolata G., Pollack A. Medicine fueled by marketing intensified trouble for pain pills. New York Times. December 19, 2004. pgs. 1, 25.
- (2) Kolata G. Good pill, bad pill: science makes it hard to decipher. New York Times, December 22, 2004, pgs. 1, 20.
- (3) Berman B.M., Lao L., Langenberg P., Lee W.L., Gilpin A.M.K., Hochberg MC. Effectiveness of acupuncture as adjunctive therapy in osteoarthritis of the knee: a randomized controlled trial. Annals of Internal Medicine 2004; 141:901-10.
- (4) Sivin N. State, cosmos, and body in the last three centuries B.C. Harvard Journal of

Asiatic Studies, 1995: 5-37.

(5) Andrews B. The making of modern Chinese medicine, 1895-1937. Unpublished PhD dissertation. Cambridge: University of Cambridge, 1996.

(6) Bray F. Chinese medicine. In: Bynum WF, Porter R (eds) Companion Encyclopedia of the History of Medicine. London: Routledge, 1994

(7) Kaptchuk T.J. The persuasive appeal of alternative medicine. Annals of Internal Medicine 1998; 129:1061-65.

(8) Kaptchuk T.J. Varieties of healing, 1: Medical pluralism in the United States. Annals of Internal Medicine 2001; 135:196-204.

(9) Huang W.F., Wen K.C., Hsiao M.L. Adulteration by synthetic therapeutic substances in traditional Chinese medicines in Taiwan. Journal of Clinical Pharmacology 1997; 37: 563-4.

(10) Ko RJ. Adulterants in Asian patient medicines. New England Journal of Medicine 1998; 339: 847

(11) Cheng T.O. Warfarin danshen interaction. Annals of Thoracic Surgery 1999; 67:894.

(12) Espinoza EO, Mann MI. Arsenic and mercury in traditional Chinese herbal balls. New England Journal of Medicine 1995; 333:803-05.

(13) Kaptchuk T.J. Acupuncture: theory, efficacy, and practice. Annals of Internal Medicine 2002; 136:374-83.

(14) Linde K., Steng A., Jurgens S., Hoppe A, Brinkhaus B, Wit C et al. Acupuncture for patients with migraine. A randomized controlled trial. Journal of the American Medical Association 2005; 293:2118-2125.

(15) Fava M., Evins A.E., Dorer D.J., Schoenfeld D.A. The problem of the placebo response in clinical trials for psychiatric disorders: culprits, possible remedies, and a novel study design approach. Psychotherapy & Psychosomatics 2003; 72: 115-127.

(16) Temple R., Ellenberg S.S. 2000. Placebo-controlled trials and active-control trials in the evaluation of new treatments. Annals of Internal Medicine 2000; 133:455-63.

Cordyceps Sinensis: Mushroom of Stamina and Longevity

Cordyceps sinensis (dong chong xia cao) has been in use in China for over a thousand years. It is recognized as one of China's medicinal treasures, a tonic used to reinforce the body's source of vital energy, increasing levels of stamina and enhancing the immune

system's ability to fight disease. Cordyceps is renowned for its ability to boost physical performance, and endurance in athletes. In China it is also commonly used for hyperglycemia, hyperlipidemia, hyposexuality, liver diseases, and heart disorders.

Reference to the mushroom dates back to 620 C.E., and its first written record appears in 200 A.D. in Sheng Nung's Classic Herbal of the Divine Plowman. It was described as transforming from animal to plant and back to animal again, and named dong chong xia cao, or 'winter worm, summer grass.' Its unique growth process explains this ancient description. The Cordyceps mycelium germinates inside a moth larva, the fruiting body sprouting up from the head of the caterpillar husk, twig or blade shaped, with a dark brown base and black tip. Though there is debate as to whether the fungus grows outside the caterpillar or from its interior, mycologist Malcom Clark believes Cordyceps spores are actually ingested, then germinate and fully occupy the remains of the caterpillar's body, in the formation of this unusual medicine. Cordyceps is native to very high altitudes in southern China, Tibet and Nepal regions.

Owing to Cordyceps' scarcity in the wild and increasing medical demand, methods of cultivating the mycelia on grains, primarily rice and soybeans, were developed in the 1980's. Tests have shown the potency of the mycelia grown under laboratory conditions to be equal or greater than the wild, caterpillar-body form. Further, purity is assured. Extraction with both water and alcohol accesses optimal levels of medicinally important compounds, such as polysaccharides.

Pharmacology

The biological actions of Cordyceps sinensis are due to a number of constituents in its makeup. Cordycepin (cordycepin-3-deoxyadenosine) is its major bioactive substance, found in very high concentrations; 32% of the fungus by weight. Other important substances include glutamic acid; amino acids (phenylalanine, proline, histidine, valine, oxyvaline, arginine), unsaturated fatty acids (oleic and linoleic acids); carbohydrates (d-mannitol); vitamin B12, Galactomannan polysaccharides, Beta Glucans and some pyranosides. Polysaccharides such as Beta Glucan have a very powerful biological response modifier that is able to alter the degree to which the immune system responds to a stimulus. For more information on Beta Glucan please reference the July 2005 edition of Crossroads on Reishi.

Traditional Chinese Medical Uses

In TCM, Cordyceps is used to tonify the Kidney and Lung Meridians; the Kidney being the "root of life", and the Lung the "Qi of the entire body,". As Cordyceps tonifies both Yin and Yang, without adverse effects such as increased Dampness or Heat, it is a very safe, balanced herb, ideal for convalescing, elderly, or extremely weak patients. Indications include fatigue, spontaneous or night sweating, and neurasthenia. It assists Lung and Kidney (xu) respiratory disorders, such as asthma, shortness of breath, and consumptive cough with blood-streaked sputum. Tonifying Kidney-Yang and Jing (Essence), it aids generalized soreness, lower back and knee pain, frequent urination,

tinnitus, poor memory, and sexual difficulties, such as impotence and premature ejaculation.

It can be ingested daily for a long period of time, to remedy chronic weakness, or as a tonic for promoting health. A study showed 92% of elderly patients in a controlled study reported reduction of fatigue after taking it for 30 days.(1) As in all herbal therapy, dosage is key. A daily dose of three grams was shown in one study to create a marked effect in elderly patients.(2) Traditionally, Cordyceps was cooked in a duck meat stew as a potent tonic for the elderly and depleted patients with weak protective, or wei qi. Cooked this way, eighty-five grams of Cordyceps was equated with a fifty gram dose of Ginseng. Today the fungus is also cooked with chicken, pork or fish.

Strengthening Immune Function

Cordyceps' ability to immunomodulate is well noted. Cell mediated immune response and cancer therapy studies have substantiated earlier claims as to Cordyceps being a powerful immune regulator. Cordyceps enhances immunity by increasing the activity of T-cells; this allows a partially suppressed immune system the ability to ward off illness. Chen et al, 1993, found that Cordyceps is helpful in treating the autoimmune disease Systemic Lupus Erythematosus (SLE). Scientific studies (Montefiori et al 1989) exemplify cordycepin's ability to curb the action of HIV Type 1, reverse transcriptase, and hence the spread of HIV infection. Cordyceps anti-viral and antibacterial activity is initiated by two derivatives, cordycepin and Corceps acid, which work to resist staphylococcus and other bacillus bacteria strains. Cordyceps also resists epidermal and ascites warts.

Immune function is often compromised as important biological levels of free radical scavenging enzymes are reduced. The oxidative stress caused by the free radicals is viewed as key to the "aging process," leaving one's defense mechanism more prone to illness and degenerative diseases. Cordyceps maintains health and delays conditions caused by aging by eliminating free radicals, thereby reducing damage to vital biochemical processes in the human body. It also shows potential in tempering ravages caused by cortisone intake. A Chinese study involving Cordyceps and cortisone found that although damage induced by cortisone, such as leukocyte decrease, was countered by Cordyceps, the anti-inflammatory function of cortisone was not. (3)

Sexual Tonic

Renowned in China for nearly two thousand years as an aphrodisiac, to replenish sperm and relieve impotence, modern clinical studies on Cordyceps show hope for sexual dysfunction and infertility, as well. In Chinese studies on reduced libido involving both men and women, 66% showed improvement of symptoms and desire. (4) A male fertility study showed Cordyceps to increase sperm count, decrease sperm malformations, and increase survival rate after 8 weeks of supplementation. (5)

Anti-tumor and Anti-Cancer Activity

Cordyceps anti-tumor activity and immune stimulant properties have been substantiated by numerous studies in China and Japan. (6) Water extracts of its mycelium doubled macrophage levels in mice (Koh et al., 2002). A study at Kanazawa Medical University, Japan, found administration of Cordyceps to tumor-bearing mice with decreased phagocytic activity, restored macrophage activity to more than the normal level, allowing them to live significantly longer than the control group. (7) Researchers are intrigued by Cordyceps ability to enhance human NK cell activity, while modulating the overproduction of leukocytes. Studies also suggest hope for leukemia patients, including one which showed cordycepin to be specifically cytotoxic against leukemia cells (Koc et al., 1996).

Enhancing Stamina and Endurance

In 1993 Cordyceps made international sports headlines when Chinese women runners shattered nine world records after training with the use of Cordyceps. Suspicions of steroid use were dispelled by tests. One stunning victory, the 10,000 meter, surpassed the world record by 42 seconds. A 1996 study on long distance runners using Cordyceps mycelium products showed significant improvement in 71% of the subjects, with evidence of increased respiratory activity and metabolism of lactic acid (Hiyoshi et al., 1996). Reaching the mainstream, some marathon runners have incorporated it as part of their training regimen.

Cordyceps is theorized to increase energy by raising plasma cortisol levels, thereby increasing the function of the plasma cortex, and secretion levels of the adrenal gland. This enhanced adrenal functioning strengthens one's vital energy. The herb also helps break down lactic and actinic acid, waste materials in muscles, which brings less fatigue, shorter recovery time, and increased motion potential during times of stress and exertion. A double-blind study at St. Cloud State University found a tonic formula including Cordyceps sped recovery time in athletes, due to significantly less lactic-acid build up. A Japanese research group found aqueous extracts of this mushroom to dilate the aorta by 40% under stress (Naoli, et al., 1994), which would benefit muscles in endurance-based athletics.

For athletes who undergo prolonged intensive exertion, over training syndrome (OS), is a hazard. In both OS and chronic fatigue (CF) the suppression of the immune system is a contributing factor. This immune deficiency results mainly from a counter regulatory shift in the neuroendocrine system during prolonged or repeated stress. Cordyceps works to balance the body's endocrine system, providing hope for OS and CF.

Improving Heart Function (Cardiovascular Tonic / Health)

Cordyceps effect on the heart and cerebral vessels is well noted; it decreases glycerin trilaurate, lowers cholesterol and B-lipoprotein levels, prevents thrombosis, resists arrhythmia and lowers hypertension. Cordyceps apparently helps prevent atherosclerosis

by reducing the blood's viscosity, lessening the potential for platelets to catch in arterial lesions and abrasions, called fibrous plaques. Cordyceps is known for increasing the beneficial cholesterol, HDL, and reducing the detrimental, LDL. A Japanese study showed Cordyceps inhibited LDL oxidation and, thereby, cholesterol deposition in the aorta (Yamaguchi et al., 2000). A 1990 study at Beijing Medical University found a two month protocol of mycelial extract significantly increased average HDL levels. Research also indicates that Cordyceps enhances oxygen uptake by the brain and heart, thereby improving resistance to hypoxia, a condition in which the supply of oxygen to these vital tissues is diminished, even in the presence of adequate blood flow.

Improving Respiratory Function

Traditionally known as a treatment for asthma, and for facilitating the discharge of phlegm from the lungs and trachea, these effects have been confirmed by modern science. Compounds in Cordyceps relax bronchial passages and loosen bronchoalveolar fluids, allowing for a productive cough and aiding respiration (Kuo et al., 2001). The preventative effect of Cordyceps in asthma is in part due to its action as a smooth muscle relaxant. A study published by the Taiwan Pediatric Association in April 1996 supports this information. Cordyceps can assist in reducing airway reactivity and inflammatory responses, therefore reducing the incidence of asthmatic attacks. In the elderly, a study found Cordyceps to significantly improve the maximum amount of oxygen they were able to assimilate. (8)

When to select Cordyceps over other medicinal mushrooms, and how can they be combined?

Almost all medicinal mushrooms enhance immunity, bolster the body's natural defense system, as well as having outright anti-bacterial and anti-viral properties. Studies have also shown varying levels of cancer and tumor inhibition, especially when a variety of mushrooms are used together.

Cordyceps shares these intrinsic qualities but is recognized for its ability to increase physical stamina, energy levels and endurance. Cordyceps is also valuable for the elderly and those in recuperation from long-term illness, and can be safely taken for extended periods. Its ability to strengthen and restore the body likens it to classic herbal tonics, such as ginseng. It strongly assists the respiratory system by its toning, as well as bronchial dilating effect, making it ideal for asthma and conditions with respiratory compromise, such as COPD. Medicinal mushrooms with an anti-inflammatory effect, such as Reishi or Chaga, would compliment the respiratory enhancement of Cordyceps, to benefit this type of condition.

Both Reishi and Cordyceps modulate blood pressure, reduce cholesterol, balance blood sugar, and assist with cardiovascular health. Both are noted as anti-oxidants, along with Coriolus/Turkey Tail. In TCM differentiation, Reishi is sweet, neutral and enters the Heart, Liver and Kidney Channels, whereas Cordyceps is sweet, warm and enters the Lung and Kidney channels. While both herbs address issues of the Lung, Reishi stops

cough and arrests wheezing, specifically for cough due to cold. Cordyceps addresses disorders of the Lung and Kidney with chronic cough caused by Yin or Qi deficiency. Reishi is noted for its ability to nourish the Heart and calm the Shen, excellent for emotional well being, while Cordyceps tonifies Kidney Yang and augments Essence, and is historically noted as a sexual tonic.

References

- (1) Cao A., Wen Y. Applied Traditional Chinese Medicine, 1993. 1:32-33
- (2) Zhu J.S., Halpern G.M, Jones K. The Scientific Rediscovery of an Ancient Chinese Herbal Medicine: Cordyceps sinensis. Part I. Journal of Alternative and Complementary Medicine, 1998. 289-303.
- (3) Zang Q.Z., He G.X., Zheng Z.Y., Xu J.H., Liu J.Z., Wang S.Y., Huang J.X., Du D.J., Zeng Q.T., 1985. Pharmacological action of the polysaccharide from Cordyceps. Chinese Traditional Herbal Drugs. 16306-311.
- (4) Wan F, Guo Y, Deng X. Chinese Traditional Patented Medicine. 1988. 9:29-31
- (5) Guo Y.Z. Modern Therapeutics. 1986. (1):60-65
- (6) Tsunoo et al.,1995, et al., 1990; Zhou et al, 1990; Yoshida et al. 1989. Wang & Shiao, 2000.
- (7) Kanazawa Medical University study in Biotherapy. 1990. 2 (3): 199-205.
- (8) Xiao Y., Huang X.Z., Chen G, Wang M.B., Zhu J.S., Cooper C.B. Increased aerobic capacity in healthy elderly humans given fermented Cordyceps Cs-4: a placebo controlled trial. Annual meeting American College of Sports Medicine, June 1999.

Bibliography

Bensky, D. and Gamble A. Chinese Herbal Medicine: Materia Medica revised edition. Eastland Press, Inc. Seattle, WA. 1993.

Chen, J. K. and Chen T.T. Chinese Medical Herbology and Pharmacology. City of Industry, CA: Art of Medicine Press, Inc. 2004.

Gilbert, Udall, K. Immune and Stamina Booster Cordyceps Sinensis. Woodland Publishing. Pleasant Grove, UT. 2000.

Halpern, G.M. and A.H. Miller. Medicinal Mushrooms Ancient Remedies for Modern Ailments. M. Evans and Company, Inc. New York, NY. 2002.

Hobbs, C. Medicinal Mushrooms: An Exploration of Tradition, Healing, & Culture. Botanica Press. Santa Cruz, CA: 1986.

Stamets, P. MycoMedicinals: An Informational Treatise on Mushrooms. MycoMedia Productions. Olympia, WA. 2002.

Miller, Richard Alan. 2005. Cordyceps Sinesis, The longevity and energy mushroom used by the Chinese nobility for more than 3,000 years retrieved from http://nwbotanicals.org/nwb/lexicon/cordyceps_studies.htm

Miller, Diane. Cordyceps Mushrooms. Retrieved from <http://www.leviticus11.com/cordyceps.htm> National Lung Health Education Program. Retrieved from http://www.nlhep.org/lung_trtmnt.html

Dong Chon Xia Cao. Retrieved from http://translate.google.com/translate?hl=en&sl=zhCN&u=http://www.sxagrisc.ac.cn/kjtg/shyjsh/zhjyzh/new_page_1.htm