

Alternative Approaches to Epilepsy Treatment

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Complementary and alternative medicine (CAM) is a diverse group of health care practices and products that fall outside the realm of traditional Western medical theory and practice and that are used to complement or replace conventional medical therapies. The use of CAM has increased over the past two decades, and surveys have shown that up to 44% of patients with epilepsy are using some form of CAM treatment. This article reviews the CAM modalities of meditation, yoga, relaxation techniques, biofeedback, nutritional and herbal supplements, dietary measures, chiropractic care, acupuncture, Reiki, and homeopathy and what is known about their potential efficacy in patients with epilepsy.

Introduction

Complementary and alternative medicine (CAM) is a diverse group of health care practices and products that fall outside the realm of traditional Western medical theory and practice and that are used to complement or replace conventional medical therapies [1].

The use of CAM has been increasing in recent years in the United States. In a 1997 telephone survey, Eisenberg et al. [2] found that about 42% of the US population reported some form of CAM use, up from 33.8% in 1990. A follow-up study showed this prevalence to have remained stable in 2002 [3]. Data from the National Center for Complementary and Alternative Medicine (NCCAM, the National Institutes of Health center that was established in 1998 to explore alternative and complementary practices) showed that about 38% of all adults, 44% of adults from 50 to 59 years old, and 12% of children reported using CAM in 2007 [4].

The NCCAM groups CAM practices into four domains (mind–body medicine, biologically based practices, manipu-

lative and body-based practices, and energy medicine) as well as whole medical systems such as homeopathic medicine, traditional Chinese medicine, and Ayurveda, whose practices include modalities from multiple domains. Examples of CAM include acupuncture, meditation, yoga, biofeedback, nutritional and herbal supplements, Reiki, and chiropractic care. This review explores what is known about the utility of these therapies for the treatment of epilepsy.

Complementary and Alternative Medicine in Epilepsy

Although most people with epilepsy are able to achieve seizure freedom with conventional antiepileptic medication, up to one-third of patients are refractory to medical treatment [5]. Some of these individuals may be cured by resective epilepsy surgery, and others benefit from devices such as the vagus nerve stimulator. But those who are not candidates for these therapies are left with few options other than the often-disheartening prospect of continually trying new medications in various combinations. Because unremitting seizures have a profound effect on individuals' physical, emotional, and social health and because antiepileptic medications so often cause adverse effects, it is not surprising that many people with epilepsy would seek alternative approaches to treatment.

The reported prevalence of CAM use in epilepsy differs slightly depending on the population studied and the researchers' definition of CAM. An Ohio survey found that 24% of patients in a tertiary care epilepsy clinic reported using alternative medical treatments. Only 31% of these patients reported that they had discussed the use of such treatments with their neurologist [6]. In a 2003 survey of epilepsy patients in Arizona, 44% of respondents reported using some form of CAM for their seizures [7]. Stress management techniques and prayer were the methods most commonly used, followed by herbal supplements, chiropractic care, magnets, yoga, and acupuncture. A 2007 survey of Midwestern patients found that 39% of patients reported using CAM, with 25% using CAM specifically for epilepsy [8]. In this study, prayer/spirituality was the most commonly used practice, followed by "mega" vitamins, chiropractic care, and stress management. In sum, at least 24% to 44% of epilepsy patients appear to already be using CAM in some form.

Table 1. Randomized controlled trials of complementary and alternative treatments for epilepsy

	Study	Overall change in seizure frequency in treatment arm	Control/placebo response
Yoga and meditation	Panjwani et al. [11]	62% reduction at 3 mo; 86% reduction at 6 mo	No significant change
Relaxation training	Dahl et al. [15]	68% reduction	68% increase in seizure frequency in attention control group; 2% reduction in no-treatment group
Biofeedback	Puskarich et al. [16]	29% reduction	3% decrease
	Nagai et al. [17] (galvanic skin response biofeedback)	6 of 10 patients with > 50% reduction	No significant change
	Lantz and Sterman [18] (neurofeedback)	61% reduction	No significant change
Omega-3 fatty acids	Bromfield et al. [26]	6% increase	12% decrease
	Yuen et al. [28]	Wk 1–6: 5 of 29 patients with ≥ 50% reduction Wk 7–12: 4 of 30 patients with ≥ 50% reduction	Wk 1–6: 0 of 27 patients with ≥ 50% reduction Wk 7–12: 5 of 27 patients with ≥ 50% reduction
Ketogenic diet	Neal et al. [30••]	38% mean reduction	37% mean increase
Acupuncture	Kloster et al. [40]	Nonsignificant level of reduction	Increase in seizure-free weeks; no reduction of seizure frequency

Given the demonstrated use of CAM therapies by patients with epilepsy (often without the knowledge of their treating neurologist), practitioners caring for patients with epilepsy would benefit from developing a working knowledge of the various alternative and complementary treatments and the evidence (if any) supporting their utility in managing this chronic disease.

Mind–Body Therapies

Mind–body therapies facilitate development of the mind’s inherent ability to affect the body’s function. Recent literature has shown efficacy of mind–body interventions in the treatment of coronary artery disease, arthritis, and other types of acute and chronic pain and in symptom reduction in cancer patients [9]. Moreover, NCCAM concludes the following: “Mechanisms may exist by which the brain and central nervous system influence immune, endocrine, and autonomic functioning, which is known to have an impact on health” [9]. Mind–body therapies in general have the advantage of relatively few side effects and can often be easily taught to patients in an outpatient medical setting. Once instructed, patients can then practice the techniques independently at home.

Yoga and meditation

In a 2006 review of 20 randomized controlled trials of the efficacy of meditative practices for treating various medical illnesses, Arias et al. [10•] found that the some of the strongest evidence for efficacy was in the treatment of epi-

lepsy. The authors reported: “These findings support the hypothesis that meditative treatments have a multifaceted effect on psychologic as well as biologic function, and that secondary physical benefits may occur via alterations in psychoneuroendocrine/immune and autonomic nervous system pathways.”

Unfortunately, there have been few randomized controlled trials of yoga and meditation practices in epilepsy. Panjwani et al. [11] studied the effects of a Sahaja yoga meditation protocol on 32 patients with idiopathic epilepsy (Table 1). Patients were randomly assigned to one of three groups: group I practiced Sahaja yoga for 6 months, group II practiced exercises mimicking Sahaja yoga, and group III practiced neither. Group I patients reported a 62% reduction in seizure frequency at 3 months and a further decrease of 86% at 6 months of intervention. Interestingly, this response is considerably higher than that seen in drug trials of refractory epilepsy, although the populations studied are unquestionably different. Power spectral analysis of the electroencephalogram (EEG) showed a shift in frequency from 0 to 8 Hz toward 8 to 20 Hz. The ratio of EEG powers in delta (D), theta (T), alpha (A), and beta (B) bands were increased. Percentage D power decreased, and percentage A power increased. No significant changes in any parameter were demonstrated by groups II and III. The same authors reported measuring galvanic skin resistance, blood lactate, and urinary vanillylmandelic acid (VMA) at 0, 3, and 6 months [12]. Significant changes in these indices were seen in subjects in group I but not groups II and III, suggesting that the

mechanism of clinical efficacy may be due to stress reduction following Sahaja yoga practice.

In another study, 11 adults with refractory epilepsy were given instruction in meditation, which they then practiced at home for 20 minutes daily for 1 year [13]. Nine adults acted as waiting-list controls. All subjects in the intervention group showed a statistically significant reduction in seizure frequency and duration, an increase in the background EEG frequency, a reduction in mean spectral intensity of the 0.7–7.7 Hz segment, and an increase in the mean spectral intensity in the 8–12 Hz segment of the EEG. The control patients did not show significant changes in seizure frequency or duration during the study period.

A more recent investigation studied yoga's effect on the autonomic functions of patients with refractory epilepsy, with the consideration that autonomic dysfunction may be a key component in the underlying mechanisms of sudden unexplained death in epilepsy (SUDEP) and improvement in autonomic function could thus be beneficial in reducing SUDEP risk [14]. The 18 members of the yoga group performed exercises including breathing exercises, meditation, and yoga asanas (postures) for 1 hour daily for 10 weeks under the supervision of a yoga instructor. The 16 members of the exercise group performed a non-yoga exercise regimen consisting of quiet sitting for 20 minutes and simple physical exercise for 40 minutes each day for 10 weeks. Baseline autonomic function parameters were measured for each group and compared with those of 142 healthy volunteers. The yoga group showed significant improvement in parasympathetic parameters and a decrease in seizure frequency scores. There were no changes in the exercise group. The authors concluded that yoga may have a role as adjuvant therapy in the management of autonomic dysfunction in patients with refractory epilepsy.

Other relaxation techniques

In addition to yoga and meditation, researchers have investigated other psychologically based relaxation techniques for stress management and seizure reduction. Dahl et al. [15] studied the effects of a relaxation treatment program in adults with refractory epilepsy. Eighteen patients were randomized to three groups: contingent relaxation, attention control treatment, and no treatment. Participants in the contingent relaxation group were taught a progressive muscle relaxation technique, which they learned to use in different situations (including at the onset of seizures), and were taught to recognize early signals cuing the onset of their seizures. The attention control treatment participants received “supportive” therapy in which they discussed topics restricted to epilepsy (ie, the patient's experience of seizures, what epilepsy meant to the patient, and public attitude toward epilepsy). There was a 68% reduction in seizure frequency in the contingent relaxation group, an increase in seizures in the attention control group, and a 2% reduction in the group with no treatment.

A similar relaxation technique was tested in a 1992 study that compared results in 13 patients who were taught a method of progressive muscle relaxation and 11 members of a “quiet sitting” group [16]. Both groups reported a decrease in seizure frequency, but the mean decrease was 29% for the muscle relaxation group and 3% for the quiet sitting group.

Biofeedback

Biofeedback is another mind–body technique in which a specific index of an automatic body function (such as heart rate, brain waves, or skin resistance) is monitored and transmitted directly to the patient, thereby enabling the patient to become aware of normally unconscious body processes and to learn to gain control over them. Nagai et al. [17] studied the clinical efficacy of galvanic skin response (GSR) biofeedback training in a single-blind, randomized controlled study of 18 patients with refractory epilepsy. GSR is an indicator of peripheral autonomic change, with increased skin conductance associated with an enhanced arousal level. Patients were assigned either to the treatment biofeedback or sham biofeedback group for a total of 12 sessions during the 1-month treatment period. After completing the treatment, patients were asked to continue the biofeedback skills they had learned at home (without machines) as well as to use this same skill when they felt a seizure was about to start. Six of 10 patients in the biofeedback group experienced a greater than 50% reduction in seizure frequency in the posttreatment period, but there was no significant reduction in the control group. The patients who demonstrated increases in GSR change benefited the most, suggesting that the positive response was due to a physiologic response beyond a placebo effect. These authors conclude that GSR biofeedback has significant potential as an adjunctive treatment to pharmacoresistant epilepsy.

Neurofeedback is a form of biofeedback in which patients are positively reinforced for producing certain EEG frequencies. The one randomized controlled trial for neurofeedback in epilepsy randomized 24 patients with uncontrolled epilepsy to one of three groups [18]. Group I received contingent EEG biofeedback training, group II received noncontingent biofeedback, and group III was the no-intervention control. The intervention was performed for 30 minutes three times a week for 6 weeks. Median seizure reduction in the contingent training group was 61%. There was no significant reduction in either control group. Two reviews of neurofeedback studies concluded that there is compelling scientific evidence for the use of neurofeedback as adjunctive treatment for epilepsy but that further research is needed [19,20]. Of particular concern is the lack of consensus regarding optimal neurofeedback techniques and the lack of regulation by any licensing body for neurofeedback practitioners.

In sum, the studies of mind–body therapies in epilepsy have been small and of varying quality. There are certain methodologic difficulties inherent in some of these

practices (such as, as another author suggests, the inability to have a double-blinded yoga protocol [21]). Relying on individuals to report their own seizure frequency may yield unreliable outcome data. However, the available data do suggest that these mind–body therapies may be useful as adjunctive treatment for people with refractory epilepsy and that there is an as yet poorly understood pathophysiologic mechanism to account for this.

Biologically Based Practices

Biologically based practices include nutritional and herbal supplements, which are used instead of or in conjunction with conventional pharmaceuticals, as well as whole diets.

Herbal and dietary supplements are among the most commonly used form of CAM. Kaufman et al. [22] found that 14% of all respondents in a population survey on medication use reported using herbal or nutritional supplements; this number rose to 16% in patients also taking prescription medication. There has been recent attention in the popular press about the potential dangers of these supplements, which do not have to undergo the same regulatory scrutiny as prescription and over-the-counter pharmaceuticals [23]. Practitioners caring for patients with epilepsy need to be particularly aware of potential interactions that these supplements may have with antiepileptic medication and the proconvulsant effects that some may have (extensively reviewed by Tyagi and Delanty [24] and Samuels et al. [25]). Despite the precautions, there is some evidence that certain herbal and nutritional supplements may be beneficial for people with epilepsy and strong evidence for the use of specific dietary measures (discussed below).

Omega-3 fatty acids

Omega-3 fatty acids are elements of neuronal membrane phospholipids and may play a role in neuronal transmission as well as being anti-inflammatory [26]. Ferrari et al. [27] found that omega-3 fatty acids prevent neuropathological changes in hippocampal formation in rats with epilepsy.

To study the potential clinical benefits of omega-3, Bromfield et al. [26] performed a double-blind randomized placebo-controlled trial to investigate the effects of a polyunsaturated fatty acid (PUFA) supplement on 21 patients with refractory (focal or generalized) epilepsy and found no significant change in seizure frequency among those taking the supplement. Yuen et al. [28] undertook a similar randomized placebo-controlled parallel-group trial of omega-3 fatty acid supplementation in 57 patients with chronic epilepsy. Although seizure frequency was reduced over the first 6 weeks of treatment in the active supplement group, this reduction was not maintained. The authors concluded that further studies with larger sample sizes, different doses and formulations, and longer treatment times are warranted to fully examine the potential effects of omega-3 with respect to reducing seizure frequency.

Given the cardioprotective effects of omega-3 fatty acids and the role of cardiac dysfunction in SUDEP, some have postulated that supplementation could potentially reduce the risk of SUDEP. In a recent review, Scorza et al. [29] recommend that supplementation with 3000 mg to 4000 mg of fish oil supplements daily or consumption of two or three servings of fish per week is safe and has cardioprotective effects in general. Further investigation is needed to determine whether these cardioprotective effects translate into reduced risk of SUDEP.

Whole diets

The high-fat, restricted-carbohydrate ketogenic diet has been used for the treatment of epilepsy since the 1920s. It was designed to mimic the effects of fasting, which had been known to suppress seizures. Neal et al. [30] recently published the first randomized controlled trial to assess the efficacy of the ketogenic diet in 145 children from age 2 to 16 with intractable epilepsy. Children in the diet arm of the study demonstrated a mean seizure frequency reduction of 38%, and those in the control group showed a 37% increase in seizure frequency. The authors reported significant side effects, with just under 25% of children reporting side effects such as vomiting, lack of energy, or hunger and one-third reporting constipation.

While being efficacious, the ketogenic diet is highly restrictive, potentially difficult to adhere to, and has significant adverse effects. The modified Atkins diet has more recently been developed as a less restrictive version of the ketogenic diet: carbohydrates are limited to 10 g/d in children and 15 g/d in adults, and high-fat foods are encouraged. Kossoff and Dorward [31] reported that in several prospective and retrospective studies of children and adults, 45% of patients had a 50% to 90% reduction in seizure frequency, with 28% reporting a greater than 90% seizure reduction. Weber et al. [32] enrolled 15 children with refractory epilepsy in a study of the modified Atkins diet, in which parents were instructed to use a formula to calculate the carbohydrate content of the child's food and were given additional instruction on dietary content. Forty percent responded with a seizure reduction greater than 50% at the 3-month mark of the trial. This study also found that parents were able to comply well with the diet [32].

Further studies are needed to clarify the roles of the ketogenic and modified Atkins diets in the treatment of epilepsy in children and adults, but there is evidence to support the use of these diets as adjunctive therapy in drug-resistant children and possibly in adults.

Herbal remedies

Herbal remedies have been used in traditional Chinese medicine and other traditional medical systems (such as Ayurveda) since ancient times for the treatment of epilepsy [24].

Ojemann et al. [33] reviewed the existing literature on the use of tian ma, an herbal remedy used in China for epilepsy and other conditions. While there is insufficient

research to be conclusive, in vitro and in vivo studies suggest that tian ma and its constituents do have antiepileptic properties. The authors suggested the development of large-scale Western studies to further evaluate its use as an antiepileptic.

Hijikata et al. [34] reported on three cases in which patients with refractory epilepsy showed substantial improvement with the use of the traditional herbal formulation Bu-yang-huan-wu-tang. Tyagi and Delanty [24] cited several compelling open-label studies of Chinese herbal remedies, including Qingyangsen and Zhenxianling, suggesting that these medications may have anticonvulsant effects, with fewer side effects than standard antiepileptic drugs. Randomized blinded trials are needed to substantiate these findings.

Manipulative and Body-Based Practices

Manipulative and body-based practices, including chiropractic and massage therapy, are based on manipulation or movement of the body to stimulate healing and foster wellness.

Case reports [35,36] have demonstrated possible efficacy of chiropractic care in individuals with epilepsy with correction of upper cervical vertebral subluxation, but there have been no large trials to substantiate these findings.

Energy Medicine

Energy medicine therapies such as acupuncture and Reiki use the body's "energy fields" in their healing model.

Acupuncture

Along with herbal remedies, acupuncture is used in traditional Chinese medicine to treat epilepsy. Case reports have demonstrated the potential efficacy of acupuncture in patients with epilepsy [37], and mouse studies have shown that acupuncture may inhibit kainic acid-induced epileptic seizure and hippocampal cell death [38]. However, few randomized trials have studied the effects of acupuncture, and those that do exist are small and have short follow-up [39]. In one Norwegian trial, 29 patients with intractable epilepsy were randomized to receive acupuncture or sham acupuncture [40]. Seizure frequency was reduced in both groups, but the reduction did not reach a level of statistical significance. The authors suggested that a larger sample size may have been needed to see differences and that they could not prove the existence of a beneficial effect of acupuncture for intractable epilepsy [40].

Reiki

Reiki is a healing practice that originated in Japan in which the practitioner places his or her hands on or just above the patient to facilitate the healing response. Only one small, single-arm study investigating the effects of Reiki on patients with epilepsy exists [41]. Fifteen patients with refractory epilepsy underwent 3 months of treatment

with Reiki-like healing practices and were shown to have reduced seizure frequency and significantly increased serum magnesium. Although the study was of poor methodology with no control group, its findings warrant further investigation.

Homeopathy

Homeopathic medicine is an alternative medical system that was developed in Germany in the late 1700s and introduced into the United States in the early 19th century. Homeopathy is based on the similia principle ("like cures like"). Treatment is individualized and based on a person's physical symptoms as well as lifestyle and emotional state. It is given in the form of very small doses of remedies that in larger quantities would produce similar symptoms of illness. Evidence to support homeopathy for the treatment of a wide variety of conditions is contradictory, but clinical trials are confounded by the individualized nature of homeopathic care (ie, two individuals with the same medical diagnosis will not necessarily receive the same treatment). The most frequently used homeopathic remedies in epilepsy are silicea, cuprum, causticum, hyosciamus, *Aethusa cynapium*, *Agaricus muscaricus*, *Artemesia absinthium*, stramonium, and *Cicuta virosa* [42]. Unfortunately, studies to validate the efficacy of these treatments have not been undertaken in humans.

Conclusions

CAM therapies have become increasingly popular in the past two decades, and there is strong evidence that a significant number of people with epilepsy are already using these treatments. The paucity of evidence supporting the efficacy of many of these therapies may be due to the lack of well-designed, large, prospective, randomized studies. Moreover, many of these therapies pose challenges to the usual methods of medical research, and novel research strategies may be required to adequately investigate their utility [43]. Practitioners caring for patients with epilepsy should routinely ask about the use of CAM therapies, especially herbal and dietary supplements, due to the risk of interaction with antiepileptic drugs or proconvulsant effects and also to gain an anecdotal understanding of which CAM methods seem to help patients most. It may be that many more patients could benefit from some of these therapies as adjunctive treatment, particularly in patients with refractory seizures. For example, stress-reduction techniques such as meditation could be easily taught in the outpatient setting. Future research should seek to determine whether CAM practices improve quality of life for patients with epilepsy.

Disclosure

No potential conflict of interest relevant to this article was reported.

References and Recommended Reading

Papers of particular interest, published recently, have been highlighted as:

- Of importance
- Of major importance

1. National Center for Complementary and Alternative Medicine: **What is CAM?** Available at <http://nccam.nih.gov/health/whatiscam/overview.htm>. Accessed May 21, 2009.
 2. Eisenberg DM, Davis RB, Ettner SL, et al.: **Trends in alternative medicine use in the United States, 1990-1997.** *JAMA* 1998, **280**:1569-1575.
 3. Tindle HA, Davis RB, Phillips RS, et al.: **Trends in use of complementary and alternative medicine by US adults: 1997-2002.** *Altern Ther Health Med* 2005, **11**:42-49.
 4. National Center for Complementary and Alternative Medicine: **The Use of Complementary and Alternative Medicine in the United States.** Available at http://nccam.nih.gov/news/cam-stats/2007/camsurvey_fs1.htm. Accessed May 21, 2009.
 5. Kwan P, Brodie MJ: **Early identification of refractory epilepsy.** *N Engl J Med* 2000, **342**:314-319.
 6. Peebles CT, McAuley JW, Roach J, et al.: **Alternative medicine use by patients with epilepsy.** *Epilepsy Behav* 2000, **1**:74-77.
 7. Sirven JI, Drazkowski JF, Zimmerman RS, et al.: **Complementary/alternative medicine for epilepsy in Arizona.** *Neurology* 2003, **61**:576-577.
 8. Liow K, Ablah E, Nguyen JC, et al.: **Pattern and frequency of use of complementary and alternative medicine among patients with epilepsy in the Midwestern United States.** *Epilepsy Behav* 2007, **10**:576-582.
 9. National Center for Complementary and Alternative Medicine: **Mind-Body Medicine: An Overview.** Available at <http://nccam.nih.gov/health/whatiscam/mind-body/mindbody.htm>. Accessed May 21, 2009.
 - 10.• Arias AJ, Steinberg K, Banga A, et al.: **Systematic review of the efficacy of meditation techniques as treatments for medical illness.** *J Altern Complement Med* 2006, **12**:817-832.
- The authors present a systematic review of evidence supporting the efficacy and safety of meditative practices in treating illnesses.
11. Panjwani U, Selvamurthy W, Singh SH, et al.: **Effect of Sahaja yoga practice on seizure control & EEG changes in patients with epilepsy.** *Indian J Med Res* 1996, **103**:165-172.
 12. Panjwani U, Gupta HL, Singh SH, et al.: **Effect of Sahaja yoga practice on stress management in patients with epilepsy.** *Indian J Physiol Pharmacol* 1995, **39**:111-116.
 13. Deepak KK, Manchanda SK, Maheshwari MC: **Meditation improves clinicoelectroencephalographic measures in drug-resistant epileptics.** *Biofeedback Self Regul* 1994, **19**:25-40.
 14. Sathyaprabha TN, Satishchandra P, Pradhan C, et al.: **Modulation of cardiac autonomic balance with adjuvant yoga therapy in patients with refractory epilepsy.** *Epilepsy Behav* 2008, **12**:245-252.
 15. Dahl JA, Melin L, Lund L: **Effects of a contingent relaxation treatment program on adults with refractory epileptic seizures.** *Epilepsia* 1987, **28**:125-132.
 16. Puskarich CA, Whitman S, Dell J, et al.: **Controlled examination of effects of progressive relaxation training on seizure reduction.** *Epilepsia* 1992, **33**:675-680.
 17. Nagai Y, Goldstein LH, Fenwick PB, Trimble MR: **Clinical efficacy of galvanic skin response biofeedback training in reducing seizures in adult epilepsy: a preliminary randomized controlled study.** *Epilepsy Behav* 2004, **5**:216-223.
 18. Lantz D, Sterman MB: **Neuropsychological assessment of subjects with uncontrolled epilepsy: effects of EEG feedback training.** *Epilepsia* 1988, **29**:163-171.
 19. Monderer RS, Harrison DM, Haut SR: **Neurofeedback and epilepsy.** *Epilepsy Behav* 2002, **3**:214-218.
 20. Egner T, Sterman MB: **Neurofeedback treatment of epilepsy: from basic rational to practical application.** *Expert Rev Neurother* 2006, **6**:247-257.
 21. Yardi N: **Yoga for control of epilepsy.** *Seizure* 2001, **10**:7-12.
 22. Kaufman DW, Kelly JP, Rosenberg L, et al.: **Recent patterns of medication use in the ambulatory adult population of the United States: the Slone survey.** *JAMA* 2002, **287**:337-344.
 23. Singer N: **FDA finds 'natural' diet pills laced with drugs.** *New York Times*. February 9, 2009. Available at http://www.nytimes.com/2009/02/10/business/10pills.html?_r=1&ref=health. Accessed May 21, 2009.
 24. Tyagi A, Delanty N: **Herbal remedies, dietary supplements, and seizures.** *Epilepsia* 2003, **44**:228-235.
 - 25.• Samuels N, Finkelstein Y, Singer SR, et al.: **Herbal medicine and epilepsy: proconvulsant effects and interactions with antiepileptic drugs.** *Epilepsia* 2008, **49**:373-380.
- The authors review the effects of herbal remedies on seizures and their interaction with antiepileptic medications.
26. Bromfield E, Dworetzky B, Hurwitz S, et al.: **A randomized trial of polyunsaturated fatty acids for refractory epilepsy.** *Epilepsy Behav* 2008, **12**:187-190.
 27. Ferrari D, Cysneiros RM, Scorza CA, et al.: **Neuroprotective activity of omega-3 fatty acids against epilepsy-induced hippocampal damage: quantification with immunohistochemical for calcium-binding proteins.** *Epilepsy Behav* 2008, **13**:36-42.
 28. Yuen AW, Sander JW, Fluegel D, et al.: **Omega-3 fatty acid supplementation in patients with chronic epilepsy: a randomized trial.** *Epilepsy Behav* 2005, **7**:253-258.
 29. Scorza FA, Cysneiros RM, Arida RM, et al.: **The other side of the coin: beneficiary effect of omega-3 fatty acids in sudden unexpected death in epilepsy.** *Epilepsy Behav* 2008, **13**:279-283.
 - 30.•• Neal EG, Chaffe H, Schwartz RH, et al.: **The ketogenic diet for the treatment of childhood epilepsy: a randomized controlled trial.** *Lancet Neurol* 2008, **7**:500-506.
- The authors present the first randomized controlled trial examining effects of the ketogenic diet for treatment of epilepsy in children.
31. Kossoff EH, Dorward JL: **The modified Atkins diet.** *Epilepsia* 2008, **49**(Suppl 8):37-41.
 32. Weber S, Molgaard C, Taudorf K, et al.: **Modified Atkins diet to children and adolescents with medical intractable epilepsy.** *Seizure* 2009, **18**:237-240.
 33. Ojemann LM, Nelson WL, Shin DS, et al.: **Tian ma, an ancient Chinese herb, offers new options for the treatment of epilepsy and other conditions.** *Epilepsy Behav* 2006, **8**:376-383.
 34. Hijikata Y, Yasuhara A, Yoshida Y, et al.: **Traditional Chinese medicine treatment of epilepsy.** *J Altern Complement Med* 2006, **12**:673-677.
 35. Pistolesse RA: **Epilepsy and seizure disorders: a review of literature relative to chiropractic care of children.** *J Manipulative Physiol Ther* 2001, **24**:199-205.
 36. Elster EL: **Treatment of bipolar, seizure, and sleep disorders and migraine headaches utilizing a chiropractic technique.** *J Manipulative Physiol Ther* 2004, **27**:E5.
 37. Yongxia R: **Acupuncture treatment of Jacksonian epilepsy--a report of 98 cases.** *J Tradit Chin Med* 2006, **26**:177-178.
 38. Kim ST, Jeon S, Park HJ, et al.: **Acupuncture inhibits kainic acid-induced hippocampal cell death in mice.** *J Physiol Sci* 2008, **58**:31-38.
 39. Cheuk DK, Wong V: **Acupuncture for epilepsy.** *Cochrane Database Syst Rev* 2008 (4):CD005062
 40. Kloster R, Larsson PG, Lossius R, et al.: **The effect of acupuncture in chronic intractable epilepsy.** *Seizure* 1999, **8**:170-174.
 41. A RK, Kurup PA: **Changes in the isoprenoid pathway with transcendental meditation and Reiki healing practices in seizure disorder.** *Neurol India* 2003, **51**:211-214.
 42. Ricotti V, Delanty N: **Use of complementary and alternative medicine in epilepsy.** *Curr Neurol Neurosci Rep* 2006, **6**:347-353.
 - 43.• Schacter SC: **Complementary and alternative medical therapies.** *Curr Opin Neurol* 2008, **21**:184-189.
- The authors review complementary and alternative medical therapies for epilepsy.