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INSIDE

*Products with
highest pesti-
cide exposure*
page 75

*The role of
biofeedback
in asthma*
page 78

*Iridology as
a diagnostic
tool*
page 81

*Administra-
tion of
high-dose
vitamin D
to prevent
fractures*
page 84

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Food for Thought: Organic

By Susan T. Marcolina, MD, FACP

AS MORE EVIDENCE REVEALS A CORRELATION BETWEEN WHAT WE eat and how much we eat and the likelihood of developing cancer and other chronic diseases, the old adage “you are what you eat” takes on new meaning as we make daily choices about our food intake.^{1,2}

Large areas of the planet, however, including countries in South-east Asia and Sub-Saharan Africa, have the highest population growth, the highest food poverty, and little choice about food intake. Food poverty also exists for many people in economically developed nations.³ As a result, many agricultural practices developed over the past 60 years, such as the use of synthetic pesticides, fertilizers, and hormones (livestock raising) and most recently the introduction of genetically modified organisms (GMOs), have been incorporated into conventional farming as a means to augment the necessary crop yields to feed the growing global population.

With limited resources available in many third world countries, it is important to decide which practices not only will provide increased crop yields while maintaining the sustainability of land they are grown upon, but also will augment the health of those who consume these crops. The resurgence of organic farming practices may be another means by which to address both the quality and quantity of food production and health promotion. This paper will provide an overview of the risks and benefits associated with both conventional and organic farming, focusing on perspectives both local and global. It is a topic that is timely as well as emotionally charged.

Agrichemical Pesticide Use

Each year, 750 million pounds of pesticides are used on farms in the United States.⁴ Nitrates, pesticides, and industrial chemicals used in agriculture are found in both surface and ground water in 46% of all U.S. counties.⁵ These substances move up the food chain, then are concentrated and stored in adipose tissue where they have cumulative effects on our health. Table 1 outlines some of the health effects attributed to agricultural pesticides.^{6,7}

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Table 1

Adverse health effects of agricultural pesticides⁶

Pesticide Type	Examples	Health Effects	Notes
Organophosphates	Phosmet, malathion, methylparathion	CNS toxicity	EPA cancelled all food uses of methylparathion due to risk posed to children
Organochlorines	DDT/DDE (metabolite), aldrin, dieldrin, lindane, chlordane, methoxychlor	Presence of DDT in cord blood associated with preterm births and intrauterine growth retardation Weak estrogenic effects; dieldrin associated with dose-related increased breast cancer risk	Half-life of DDT = 59 years; banned in United States in 1972 due to avian toxicity (increased fragility and breakage of bald eagle and brown pelican eggs)
Carbamates	Aldicarb, carbofuran	CNS toxicity	
Pyrethroids	Permethrin, cypermethrin, cyfluthrin	CNS toxicity; immunologic toxins; endocrine disruptors	Synthetic version of the naturally occurring pesticide pyrethrin in chrysanthemums

Adapted from: U.S. Environmental Protection Agency web site. Available at: www.epa.gov/pesticides.

Children are at particular risk for adverse effects from exposures to pesticide residues. Children are more vulnerable to toxin exposure due to smaller size, higher metabolic rate, developmental vulnerability, hand-to-mouth activity, and increased consumption of water and food associated with multiple pesticide residues. A National Academy of Sciences' study, published in

1993, determined that the Environmental Protection Agency (EPA) exposure tolerances underestimate toxicity to children because EPA tests were conducted primarily on adult males or animal species exposed to one chemical at a time.⁸ Table 2 gives the Environmental Working Group's (EWG's) current list of produce grown with the heaviest pesticide applications.⁹

Ames et al, however, contend that the widespread belief of U.S. consumers that pesticide residues on food pose a serious cancer risk is grossly exaggerated. He explains that part of the reason for the exaggeration has been that the major source of information of carcinogenic effects of synthetic pesticides on humans comes from high-dose rodent cancer tests. Such testing, he believes, requires the use of both qualitative extrapolation from effects on rodents to effects on humans and quantitative extrapolation from the high dose given to rodents to the much lower pesticide residue actually measured annually by the Food and Drug Administration (FDA) in the annual Total Diet Study, which measures dietary pesticide residues in table-ready food. In other words, Americans are more likely to develop cancer from exposure to cigarette smoking, genetic susceptibility, and dietary deficiencies than from pesticide residues on their food.¹⁰

Organic Agriculture: Statistics

The market for organic foods has increased 40-fold from 1986 to 1996 and is expected to grow at a rate of 24% per year. Sales of organic food in the United States totaled \$7.8 billion in 2000.¹¹

Organic Farming: Origins and Practices

Sir Albert Howard, imperial economic botanist to India at the turn of the 20th century, is credited with the

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Table 2 Products with highest pesticide exposure ⁹	
Fruits	Vegetables
Peaches	Spinach
Apples	Bell peppers
Strawberries	Celery
Nectarines	Potatoes
Pears	Hot peppers
Cherries	
Red raspberries	
Imported grapes	

Source: Environmental Working Group's FoodNews.org.

initial development of modern organic methods of agriculture. Since the East Indian farmers with whom he worked could not afford imported synthetic fertilizers and pesticides, Sir Albert developed ways to recycle natural nutrients from locally available animal manure and waste plant materials. Such composting enriched and replenished the soil and diminished problems with erosion, all of which increased crop yields.⁵

In the past decade in the United States, there has been a resurgence of interest in the implementation of sustainable agriculture methods to help farmers avoid the use of chemical pesticides and petroleum-based fertilizers. Such methods are governed by the principles of crop rotation (planting different crops in the same field during different seasons), renewal of the soil tilth (the soil's texture, nutrients, and ability to hold water) with composting, and the planting of cover crops such as peas, oats vetch, and clover. These cover crops fix nitrogen, provide habitat for beneficial insects that prey on destructive pests, crowd out noxious weeds, and prevent runoff and erosion of the soil. Crops grown utilizing these principles have yields comparable to those of conventionally grown crops with less adverse environmental impact and the market for their goods is steadily growing.^{4,12}

Organic: What's in a Name?

The U.S. Department of Agriculture (USDA) has clarified the definition of organic with standards published in October 2002. These labeling rules help consumers know the exact organic content of the foods they purchase. Organic food is produced without using pesticides, synthetic fertilizers, sewage sludge, bioengineering, or ionizing radiation. A farm cannot be certified as organic until it has performed organic practices for three years. The companies responsible for handling and processing of organic food also must be certified.

"Natural" is not synonymous with organic, nor is hormone-free or free-range, although such claims, if truthful, can be used on food labels. Fines for illegal organic labeling run \$10,000 per violation.¹³

Nutritional Benefits of Organic Produce

Serious limitations exist in the quality and quantity of nutritional data from comparative studies of organic and conventionally grown produce. The reviews compiled by Woese et al and Worthington show a trend for increased nutrient content and decreased nitrate and water content of organically produced foods.^{14,15} Asami et al, however, found higher levels of total secondary phenolic metabolites and ascorbic acid ($P < 0.05$) in strawberries, marionberries, and corn produced using organic and sustainable agricultural methods versus conventional agriculture methods.¹⁶

Prior to the Asami study, there had been concern that levels of some phenolics were lower in foods grown utilizing conventional agricultural practices since the pesticides and fertilizers disrupt the natural production of phenolic metabolites in the plant. These phenolic metabolites protect the fruits from insect predation, photo-oxidation, and bacterial and fungal infections. Evidence has demonstrated a wide range of activity for these phenolic compounds in humans including potent antioxidant, anticancer, and inhibition of platelet aggregation functions, which have important implications for health.¹⁷

Cost

Organic goods can cost 20-100% more than conventionally produced goods, depending upon the location and the product sold. This is because organic farming is more labor intensive, involving hand weeding, tilling, planting of cover crops, composting plant waste, and hand harvesting of certain heirloom crops.¹⁸

Organic Farming Yields

In a 21-year study of agricultural and economic performance of biodynamic, bio-organic, and conventional farming systems in central Europe, Mader et al found that, although crop yields were about 20% lower in the two organic systems compared to the conventional farming system, the input of fertilizer and energy was 34-53% lower and pesticide use was decreased by 97%. The soils in the organically farmed plots also were healthier with greater aggregate stability, which was positively correlated with more numerous, biodiverse populations of nutrient-recycling microbes.¹⁹

It is a common misconception that organic food are at greater risk of contamination by *E. coli* due to animal

manure applications. Organic standards impose strict guidelines for manure use in organic farming: Manure must be first composted or applied at least 90 days prior to harvest, which allows plenty of time for breakdown of any microbial pathogens.²⁰

Genetically Modified (GM) Crops: Seeds of Discontent?

Genetic manipulation has been used in farming for many thousands of years. Native Americans developed corn by selective breeding over a period of generations to create a more productive, tasty variety. Within the past 20 years, however, genetic engineering techniques have resulted in the development of crops containing specific single-gene transfers that cause predictable changes in the plants and produce immediate results.

GM crops are extensively tested with regard to their composition, safety, growth, nutrition profiles, and environmental effects prior to introduction into the marketplace. Evaluations take place under the auspices of four federal regulatory agencies, including the FDA, the National Institutes of Health, the EPA, and the Animal Plant Health Inspection Service of the USDA.¹⁸ At present there exist few data suggesting direct harm to humans who eat genetically modified foods, yet public perception is often at odds with this fact.²¹

GM Technology: History and Development

GM crops were first grown commercially in the United States in 1996. Currently four countries (USA, Argentina, Canada, and China) account for 99% of the total global area of GM crops. Although more than 50 biotechnology crop products have passed the regulatory review process and been commercialized, the four main GM crops are soy, cotton, oilseed rape, and maize, which account for 99% of the total global GM acreage.

The U.S. company Monsanto dominates the GM market and is responsible for 91% of the total GM acreage. Sixty percent of the processed food products in the United States contain GM ingredients, represented almost entirely by corn and soybeans.²²

GM crops have been engineered with two traits. One set (RoundUp Ready soy, oilseed rape, and maize) is resistant to the particular herbicide RoundUp such that it can still be applied to the field for weed control while the crop plants are growing. The other set (Bt maize and Bt cotton) contains the gene from the soil bacteria *Bacillus thuringiensis* (Bt).

Naturally occurring *Bacillus thuringiensis* has been used as a selective biological control in organic farming for 40 years. The bacterial spores are applied in spray

form during the intermittent infestations of pest larvae throughout the growing season. Its potency degrades after three days. The Bt transgenes in GM crops, however, are active throughout the plant and during the entire growth cycle. Such Bt organisms have been modified to express “Cry,” a class of insecticidal proteins, which destroys the digestive tract of the European corn borer and other harmful caterpillar larvae, but is harmless to humans, mammals, and birds.^{18,19} As a result of this persistent, widespread exposure, however, insects with a natural immunity have survived and formed the basis of a resistant population. Although Bt cotton has successfully reduced the overall use of insecticides for bollworms and budworms, these effects have varied widely in different states.

With regard to the herbicide-tolerant crops (like RoundUp Ready soybean varieties), most farmers have to apply herbicides several times throughout the life cycle of the crops. Susceptibility to glycosate (RoundUp) varies among species of weeds and shifts are occurring in the genetic composition of field weeds as a result of the introduction of herbicide-resistant crops.^{21,22}

A genetically modified rice cultivar, “golden rice,” which produces both beta-carotene and iron via incorporation of two genes from a daffodil, one from a bacterium, and one from a bean species, has been developed by Zeneca Agrochemicals but is not yet commercially available. There is potential that this bioengineered product, in conjunction with other dietary interventions and a commitment to improvement of socioeconomic status, could alleviate blindness and complications of anemia that occur in billions of people in developing countries who suffer from vitamin A and iron deficiency.

However, these nutritional problems are complex. Many people who could benefit from this rice have concomitant protein-calorie malnutrition and intestinal infections that interfere with absorption of beta-carotene and its conversion to vitamin A. Their diets do not contain the fat and vitamin C necessary to absorb the nutrients supplied by this type of rice. Further research may illuminate a way to incorporate such biotechnological improvements into comprehensive aid programs that will improve health in third world nations.²³

GM Crops: Economic Problems

Overall, U.S. farmers have sustained losses with GM crops because GM seeds are significantly more expensive than non-GM seeds, and they cannot be saved to grow the subsequent year’s crop. Despite the fact that herbicide prices have declined, the GM crops attract

lower market prices than those available for non-GM crops. Indeed, guaranteed GM-free crops command significant price premiums, especially in the European markets where there are strict import restrictions for GM produce.²¹

GM Crops:

Contamination Problems

Genetically altered crops have caused widespread contamination of the non-GM varieties of oilseed rape, corn, and soybeans. This contamination occurs in several ways, including accidental seed mixing, the use of soiled planting and harvesting machinery, and gene transfer through cross-pollination by wind or insects.

The StarLink Bt maize was a notorious case. In September 2000, it was discovered that taco shells manufactured by the Kraft Food Company contained the Cry9C transgene protein. This GM maize had been approved by the FDA only for animal feed, due to concerns about the possibility of allergic sensitization. Despite the fact that only 1% of the 2000 U.S. corn harvest contained StarLink, this mixed with and contaminated almost 50% of the national maize supply.²²

Adverse Effects

As depicted in Table 1, cumulative effects of pesticide exposure have been associated with significant health problems. Curl et al have shown statistically significant higher concentrations of organophosphate pesticide residues in the urine of preschool students consuming a diet composed primarily conventional foods versus students consuming a diet composed of organically derived foods.²⁴

Adequate data to predict the long-term effects of ingestion of GM-derived foods have yet to be generated. However, the FDA has received reports of more than 50 allergic reactions to StarLink-modified corn, ranging from mild skin rashes and gastrointestinal symptoms to life-threatening anaphylaxis.¹⁹

Although such potential risks must be kept in mind and more fully evaluated, the benefits of a diet high in fruits and vegetables are well-established and should be encouraged. Proper cleansing of produce and peeling, where appropriate, can enhance the safety profile of many non-organic foodstuffs.

Conclusion

Dose estimates generated from urinary pesticide metabolite levels suggest that organic diets can reduce the level of pesticide exposure that children receive, thereby lessening potential health risks. Such a dietary change is a relatively simple way for parents to reduce

children's exposure to potential toxins. Patients can minimize expenses by prioritizing organic purchases to the foods listed in Table 2. With the new USDA guidelines for organic product labeling, it will be easier to verify that we are really getting what we pay for.

Although the potential benefit in the fight against global hunger is great, more research needs to be done in order to determine whether GM foods will indeed help safely increase crop yields to provide food, enhance the health and well-being of a growing world population, and end world hunger.

Recommendation

Organic farming methods offer ways to sustainably grow crops with a potentially more favorable environmental impact. The exposure of children to pesticide residues can be minimized with an organic diet. The adoption of such a diet can be cost effective when organic purchases are restricted to fruits and vegetables with the highest pesticide loads when grown conventionally. While promoting these specific types of organic produce, however, health care practitioners should continue to recommend that patients eat five properly washed and prepared servings of fruit and vegetables per day, even if grown conventionally, to promote optimal health. ❖

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References

1. Block G, et al. Fruit, vegetables, and cancer prevention: A review of the epidemiological evidence. *Nutr Cancer* 1992;18:1-29.
2. Hertog M, et al. Dietary antioxidant flavinoids and risk of coronary heart disease: The Zutphen Elderly Study. *Lancet* 1993;342:1007-1011.
3. Uvin P. The state of world hunger. *Nutr Rev* 1994; 52:151-161.
4. Klinkenborg V. A farming revolution: Sustainable agriculture. *National Geographic* 1995;Dec:60-89.
5. Richard D, Beyers D, eds. *Taste Life! The Organic Choice*. Ridgefield, CT: Vital Health Publishing; 1998:151.
6. U.S. Environmental Protection Agency. Pesticides. Available at: www.epa.gov/pesticides. Accessed Feb. 16, 2003.
7. Hoyer AP, et al. Organochlorine exposure and risk of breast cancer. *Lancet* 1998;352:1816-1820.
8. National Research Council. *Pesticides in the Diets of Infants and Children*. Washington, DC: National Academy Press; 1993.

9. Environmental Working Group's FoodNews.org: Foods you'll want to buy organic. Available at: www.food-news.org/highpesticidefoods.php. Accessed April 25, 2003.
10. Ames BN, Gold LS. Environmental pollution, pesticides and the prevention of cancer: Misconceptions. *FASEB J* 1997;11:1041-1052.
11. Bourn D, Prescott J. A comparison of the nutritional value, sensory qualities, and food safety of organically and conventionally produced foods. *Crit Rev Food Sci Nutr* 2002;42:1-34.
12. Reganold JP, et al. Sustainability of three apple production systems. *Nature* 2001;410:926-930.
13. The National Organic Program. Organic Food Standards and Labels: The Facts. Available at: www.ams.usda.gov/nop/consumers/brochure.html. Accessed March 6, 2003.
14. Woese K, et al. A comparison of organically and conventionally grown foods—Results of a review of the relevant literature. *J Food Sci Agric* 1995;74:281-293.
15. Worthington V. Nutritional quality of organic versus conventional fruits, vegetables, and grains. *J Altern Complement Med* 2001;7:161-173.
16. Asami DK, et al. Comparison of the total phenolic and ascorbic acid content of freeze-dried and air-dried marionberry, strawberry, and corn grown using conventional, organic, and sustainable agricultural practices. *J Agric Food Chem* 2003;51:1237-1241.
17. Hertog M, et al. Intake of potentially anticarcinogenic flavonoids and their determinants in adults in The Netherlands. *Nutr Cancer* 1993;20:21-29.
18. Economic Research Service/USDA: Recent Growth Patterns in the U.S. Organic Foods Market. Available at: www.ers.usda.gov/publications/aib777/aib777.pdf.
19. Mader P, et al. Soil fertility and biodiversity in organic farming. *Science* 2002;296:1694-1697.
20. Organic Farming Research Foundation. Frequently Asked Questions About Organic Farming. Available at www.ofrf.org/general/about_organic. Accessed June 6, 2003.
21. Falk MC, et al. Food biotechnology: Benefits and concerns. *J Nutr* 2002;132:1384-1390.
22. Meziani G, Warwick H. Seeds of Doubt. Available at: www.soilassociation.org/web/sa/saweb.nsf/librrtitles/seedsofdoubt_summary.html. Accessed March 31, 2003.
23. Thomson JA. Research needs to improve agricultural productivity and food quality with emphasis on biotechnology. *J Nutr* 2002;132:3441S-3442S.
24. Curl CL, et al. Organophosphorus pesticide exposure of urban and suburban preschool children with organic and conventional diets. *Environ Health Perspect* 2003; 111:377-382.

The Role of Biofeedback in Asthma

By Georges Ramalanjaona, MD, DSc, MBA, FACEP

ASTHMA IS A CHRONIC INFLAMMATORY DISORDER OF the airways. Airway inflammation causes recurrent episodes of wheezing, breathlessness, chest tightness, and coughing. These episodes of asthma symptoms usually are associated with widespread but variable airflow obstruction that often is reversible either spontaneously or with treatment.¹ More than 17 million people in the United States have asthma, including nearly 5 million children. Each year, asthma results in 2 million emergency department visits with nearly half a million hospitalizations and 5,000 deaths. As a consequence of asthma exacerbations, 3 million days of work are lost and 11 million days of school are missed, three times the rate of other causes of school absenteeism. The estimated annual cost related to asthma exceeds \$12 billion.²

Although there is no known cure for asthma, pharmacologic therapies are highly effective in controlling symptoms of asthma. However, these drugs can have debilitating physical and emotional side effects, and patient compliance is estimated to be less than 50%.

Due to such limitations, more progressive treatment strategies combine pharmacologic intervention with psychoeducational programs such as biofeedback to improve health outcomes for adults and children with asthma.³ This article will review the current evidence on the role of biofeedback in the treatment of asthma.

Mechanism of Action

Asthma is characterized by chronic inflammation of the airway and smooth muscle dysfunction. Airflow obstruction is caused by a variety of changes in the airway, including bronchoconstriction, airway edema, chronic mucus plug formation, and airway remodeling. Inflammation causes an associated increase in the existing airway hyperresponsiveness to a variety of stimuli, including allergens, irritants, cold air, and viruses. These stimuli or precipitants result in airflow obstruction and asthma symptoms in the patient with asthma.¹ This airflow obstruction is mediated by increased vagal efferent activity that is not effectively countered by sympathetic efferent activity or baroreflex mechanisms.

Biofeedback is defined as a learned method to monitor and gain control over automatic reflex-regulated body functions using data obtained from a monitoring apparatus. Although the various biofeedback techniques

are not applied in uniform fashion, they do apply the same underlying principle—the self-regulation of a process typically believed to be involuntary—to achieve clinical benefit.

It is hypothesized that biofeedback affects both respiratory and immune functions in asthma. In one study, biofeedback appeared to lessen bronchoconstriction by inducing relaxation of the facial muscles, which was associated with a decrease in air flow resistance as evidenced by an increase in Peak Expiratory Flow Rate (PEFR) in both asthmatic and healthy children.⁴ Biofeedback also affects immune function. A biofeedback-assisted relaxation group displayed an increase in blastogenesis (stimulation of undifferentiated cells) in response to mitogens and a decline in number of neutrophils when compared to a control group.⁵

Biofeedback Techniques

Although a wide range of biofeedback systems exist, a small number of specific biofeedback techniques have been associated with successful results in treating asthma. They include:

Respiratory Sinus Arrhythmia Biofeedback (RSA-BF). RSA-BF is the pattern of heart rate variation that accompanies the respiratory cycle. RSA-BF amplitude is both vagally mediated and modulated by the sympathetic and autonomic systems, which in turn affect the autonomic changes in asthma. RSA-BF intervenes at these levels to improve asthma symptoms.

With RSA-BF, electrodes are attached to the body to measure heart rate. The electrodes are connected to a device that translates the heart rate into a visual and auditory form. Using these visual and auditory cues and slow deep breathing exercises, patients learn to improve asthma symptoms by controlling heart rate.

Neck/Trapezius Electromyographic Biofeedback (EMG-BF) and Incentive Spirometry Biofeedback. This technique involves training subjects in abdominal breathing and relaxation of thoracic muscles assisted by EMG-BF training of the scalene and trapezius muscles and incentive spirometer training of thoracic muscles during slow and even breathing.

A variety of other biofeedback techniques also may prove useful to asthma patients.

- The electromyogram uses electrodes to measure muscle tension and can be used to promote relaxation in muscles that become tense in response to stress.
- Temperature biofeedback monitors skin temperature as a patient learns to redirect blood flow to specific muscles or organs.
- Galvanic skin response (also used in the lie detector test) measures electrical conductance in the skin,

which is related to the activity of the sweat glands and emotional arousal.

- The electroencephalogram, although relatively imprecise, monitors brain wave activity. Patients using this device are trained to activate certain brain wave frequencies to achieve desired mental states.

Clinical Studies

Although a wealth of literature has been published on the role of biofeedback in asthma, randomized clinical trials (RCTs) are relatively scarce. Limitations of these RCTs include small number of participants, lack of standardized method for biofeedback technique, and relative short-term follow-up.

In one RCT, Harding and Maher investigated 16 adolescent and adult asthmatics who were divided in two groups: The experimental group (n = 8) received two to five training sessions to reach asymptotic levels of voluntary biofeedback cardiac acceleration while a matched control group (n = 8) received only one session.⁶ Inclusion criteria include history of asthma without other concurrent diseases. Those patients on steroid therapy or showing more than 20% suggestibility index calculated from both bronchoconstriction and bronchodilation trials were excluded. Results showed statistically significant differences (P < 0.01) between PEFR values for the experimental group compared to the control group. Furthermore, the experimental group displayed significant improvement in the post-test versus pre-training period on all three indices of asthma severity (P < 0.05; mean attack frequency per week: 4.12 vs. 6.7; medication usage per week 4.5 vs. 12.8; amount of medication use per attack per week 0.5 vs. 1.6). The control group did not show significant changes in any of the three indices of severity. The authors concluded that biofeedback produced a potential short-term therapeutic benefit on asthma severity and function.

A more recent RCT pilot study by Lehrer et al compared the effect of EMG-BF and incentive spirometer biofeedback with RSA-BF in asthmatic adults.⁷ The investigators randomly assigned patients to one of three groups: EMG-BF (n = 6), RSA-BF (n = 6), or waiting list control (n = 5). Participants were asthmatic adults, ages 18-65 years (12 females, 5 males) and were screened using the following criteria: a) history of recurrent asthma within the past 12 months and b) abnormal findings on spirometry (FEV₁ < 80, FEF_{50%} < 60%). A total of six 30-minute training sessions were given in each respective biofeedback group. Sessions were held weekly for one month and half, and in each of the testing sessions, 5 minutes of airway resistance and ECG were recorded before and after a 20-minute biofeedback

session. In the RSA-BF group, there was a progressive and persistent decrease in airway resistance, as well as a significant increase ($P < 0.01$) in amplitude of Traub-Hering-Mayer (THM) waves (amplitude of cardiac fluctuations associated with breathing at a rate within a frequency of 0.03-0.12 Hz) in heart period compared to other groups. In summary, the authors pointed to a positive effect of RSA-BF in the treatment of asthma. In this study, the effects of EMG-BF were deemed insignificant.

In another RCT, Coen et al investigated the effects of eight sessions of biofeedback-assisted relaxation on asthma severity, pulmonary function, and immunity.⁸ Twenty patients ages 12-22 years with non-steroid dependent asthma were randomized to a biofeedback relaxation technique applied 15 minutes twice daily ($n = 10$) or a control group receiving weekly telephone contact ($n = 10$). Results showed a significant decrease ($P < 0.02$) in asthma severity and facial muscle tension in the pre- and post-tests of the experimental group, but not in the control group. Improvements in asthma severity were significantly correlated with a decrease in facial muscle tension ($P < 0.05$, $r = 0.72$). CD4 and CD8 lymphocyte counts increased by 25% ($P < 0.05$) in the experimental group compared to the control group. The authors concluded that biofeedback-assisted relaxation training can relieve symptoms of asthma and enhance immune function in young asthmatics.

In a trial notable for duration of follow-up, Kotses et al studied the long-term effects of biofeedback-induced facial relaxation on asthma symptoms in 33 children, ages 7-16 years.⁴ The children were randomly allocated to either biofeedback training to achieve facial relaxation ($n = 15$) or biofeedback training to maintain facial tension at a stable level ($n = 14$). The study design included four phases: four baseline sessions, eight training sessions, four short-term follow-up sessions for up to two months, and four long-term follow-up sessions for up to eight months. The baseline training and short-term follow-up sessions were conducted on a weekly schedule; the long-term sessions were conducted on a monthly basis. Primary outcome measurements included lung function, self-rated asthma severity, medication usage, frequency of attack, and standardized measures of attitude toward asthma. Compared to the control group, the experimental group exhibited significantly better pulmonary function scores ($P < 0.05$), a more positive attitude regarding asthma, and less anxiety at the two- and five-month follow-ups. However, there were no significant differences on self-rated asthma severity, frequency of asthma attack, or medication usage.

Adverse Effects

No adverse effects of properly applied biofeedback have been reported. However, biofeedback therapy is not recommended for patients with severe psychosis, depression, or obsessional neurosis, nor for debilitated patients or those with psychopathic personalities. Because biofeedback can change the need for insulin and other medications, patients with endocrine disorders should seek a physician's advice before adding biofeedback to a treatment plan.

Cost and Commitment

Depending on the condition being treated, biofeedback therapy may represent a significant financial and time commitment. Sessions usually last 30-60 minutes and, to achieve results, 15 or more sessions may be required. Biofeedback may be more effective, especially in the long term, if patients also learn to employ relaxation techniques or self-hypnotism.

Many biofeedback instruments are available commercially; however, the most affordable machines monitor only one system (e.g., a thermometer). Patients should understand that a primary therapeutic goal is to learn the training sufficiently that it may be applied in everyday situations without the help of the machine.

Conclusion

Based on current evidence, biofeedback is a safe and relatively effective therapeutic adjunct for the treatment of asthma in young adolescents and adults.

Recommendation

Biofeedback can be recommended as a complement to conventional pharmacologic intervention for the symptomatic relief of asthma symptoms and as a part of self-regulatory programs to help reduce asthma recurrence. There remains a need to establish standardized protocols for employing the various methods available, and also to further confirm or refute the effectiveness of biofeedback for the treatment of asthma through large clinical trials. ❖

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References

1. National Asthma Education and Prevention Program. National Heart, Lung, and Blood Institute, National Institutes of Health. NIH Publication No. 97-4053.

Available at: www.nhlbi.nih.gov/health/prof/lung/asthma/practgde/practgde.pdf.

- Centers for Disease Control and Prevention. Surveillance for Asthma. U.S. 1960-1995. *Morbid Mortal Weekly Rev* 1998;47:1022-1025.
- Huntley et al. Relaxation therapies for asthma: A systematic review. *Thorax* 2002;57:127-131.
- Kotses H, et al. Long-term effects of biofeedback-induced facial relaxation on measures of asthma severity in children. *Biofeedback Self Regul* 1991;16:1-21.
- Kern-Buell CL, et al. Asthma severity, psychological indicators of arousal, and immune function in asthma patients undergoing biofeedback-assisted relaxation. *Appl Psychophysiol Biofeedback* 2000;25:79-91.
- Harding AV, Maher KR. Biofeedback training of cardiac acceleration; effects on airway resistance in bronchial asthma. *J Psychosom Res* 1982;26:447-454.
- Lehrer P, et al. Respiratory sinus arrhythmia versus neck/trapezius EMG and incentive spirometry biofeedback for asthma: A pilot study. *Appl Psychophysiol Biofeedback* 1997;22:95-109.
- Coen BL, et al. Effects of biofeedback assisted relaxation on asthma severity and immune function. *Ped Asthma Allergen Immunol* 1996;10:71-78.

Iridology as a Diagnostic Tool

By Dónal P. O'Mathúna, PhD

THE EYES ARE SAID TO BE A WINDOW TO THE SOUL. Could our eyes also provide portals into our bodies' health? Iridology claims quite literally to do so. In a manner similar to practitioners of some other alternative therapies employing unique diagnostic methods, iridologists claim that every region of the body impacts a particular area of the iris. The patterns and colors of the iris are said to reveal important diagnostic information about the health status of every organ in the body.

Iridology has become particularly popular within certain schools of alternative medicine, with one textbook claiming it is "the most valuable diagnostic tool of the naturopath."¹ The International Iridology Practitioners Association (formerly called the National Iridology Research Association) claims that iridology reveals how well people are "put together," what illnesses they will tend to get, the reasons for various symptoms, and the emotional and behavior factors influencing their health.² This information is said to provide reliable guidance on

the causes of current symptoms and the measures needed to prevent future illnesses.

Background

Iridology has developed over the past 100 years or so, with some historical accounts claiming it developed from observations that birds manifest changes in their irides before and after injuries.³ Veterinary uses of iridology remain popular, but its efficacy has not been substantiated.

Iridologists claim that every organ and part of the human body is represented in a well-defined area of the iris. Weaknesses and strengths in the body manifest themselves by changes in the marks and colors of the iris. For example, changes in the kidneys would manifest themselves at the bottom edge of the iris, with the right kidney affecting the right iris and the left kidney affecting the left iris. Stomach changes would result in changes to the iris immediately above the pupil.

The diagnosis is carried out by direct observation of the eyes or by taking detailed photographs. Computer programs also have been developed to classify the patterns and colors observed. Iridologists examine the photographs and provide patients with lists of concerns based on the patterns seen. Various herbal remedies or dietary supplements often will be suggested to treat the conditions, or prevent them from developing.⁴

Mechanism of Action

Changes do occur in the iris when people have certain diseases, such as rheumatoid arthritis, and rarer conditions like heterochromic cyclitis, melanoma, and metastatic carcinoma.⁵ However, these changes occur throughout the iris, not in isolated regions such as described in iridology. Iridologists claim that a network of thousands of nerves connects all parts of the body to the iris through the optic nerve or the oculomotor nerve.⁶ Such claims have no basis in modern anatomy and physiology, leaving iridology without a plausible mechanism of action.

Clinical Studies

A systematic review of iridology, which included contacting prominent iridology associations, yielded 17 reports in various languages evaluating the reliability of diagnoses made with iridology.⁴ All the uncontrolled studies (many of which also were not blinded) concluded that iridology was a valid diagnostic tool. Given the potential for bias inherent to uncontrolled studies, only controlled, blinded studies will be reported here.

The first controlled study of iridology was a 1979 case-controlled, retrospective study.⁷ Photographic

slides of the irides of 143 patients were taken using iridologist's equipment. Creatinine levels were used to divide hospital in-patients into three groups of subjects: those with kidney disease (6.3-16 mg/dL; n = 24), those with moderate kidney dysfunction (1.6-4.9 mg/dL; n = 24), and controls with normal kidney function (0.5-1.2 mg/dL; n = 95). The photographs were randomly arranged using a random number table and presented to three iridologists. One of the iridologists (Bernard Jensen, DC) was regarded as the leading American iridologist and has written several books highly acclaimed by iridologists. The iridologists' determinations of who did or did not have kidney disease were statistically no more reliable than chance ($P > 0.05$). Three ophthalmologists with no experience in iridology were asked to use any means possible to evaluate kidney function using the same photographs. One of the ophthalmologists did achieve statistical significance in correctly diagnosing kidney disease ($P = 0.035$); the other two did not.

A similar blinded case-controlled study was carried out with 39 patients scheduled to have their gallbladders removed.⁸ A photographic slide of each patient's right iris was obtained using iridologists' procedures. The presence of gallstones and inflamed gallbladders was confirmed during surgery the following day. A control group consisted of 39 subjects with no history of gallbladder disease or gallstones (confirmed by ultrasound). The photographs were randomly coded and sent to five Dutch iridologists who willingly agreed to participate in the study. Their determinations of the presence or absence of gallbladder disease statistically were no better than chance. The observed consistency between each pair of iridologists ranged from 47% to 64% with a mean of 60%, a value only slightly higher than chance.

The most recent study involved photographs from patients with ulcerative colitis (n = 30), coronary heart disease (n = 25), asthma (n = 30), or psoriasis (n = 30).⁹ Subjects in a control group were matched for age and gender. The photographs were randomly ordered and examined by a blinded researcher trained by practicing iridologists and also by a computer program approved by iridologists. No significant differences were found by either method between any group and its control for the presence or absence of any feature deemed by iridology to be connected to the diseased organ.

An earlier report published the results of two trials, one of which was masked.¹⁰ In one study an Australian iridology instructor was shown photographs of the irides of 15 patients who had been medically diagnosed to have a total of 33 health problems. The iridologist did not correctly identify any of these problems, but instead diagnosed 60 other problems that the patients had not

reported. In the blinded trial, four patients had their irides photographed when they were healthy and again when diagnosed with various acute illnesses (pleurisy, gastroenteritis, upper respiratory tract infection, and cystitis). The iridologist made several incorrect diagnoses from the initial photographs and did not correctly identify any of the organs affected during the illness. A fifth subject was photographed twice within two minutes. The iridologist, unaware that this was a control, claimed to detect changes in the iris that indicated disease had developed between the time the photographs were taken.

Another small study presented two iridologists with eight pairs of iris photographs, but their diagnoses were inconsistent and inaccurate, with neither noticing that one pair of photographs was of a glass eye.¹¹

Adverse Effects

Iridology itself is harmless, involving either examination or photography of the eyes. However, harm can occur if iridology is used exclusively and in place of reliable diagnostic tools. The dangers here are significant. For example, the researchers in the aforementioned controlled study of kidney disease calculated (using both the success rate of the best iridologist and the incidence of renal disease) that of those the iridologist diagnosed as having kidney disease, only 2.5% would actually have the disease.⁷ Such false negatives could lead to many people failing to get effective treatment when they have a serious illness. The least reliable iridologist concluded that 88% of those in the control group had kidney disease, even though they had no symptoms and medical tests revealed no kidney dysfunction. False positives would lead to unnecessary anxiety and initiation of superfluous interventions. Since many iridologists recommend dietary supplements and herbal remedies to treat the ailments they diagnose, patients may waste valuable resources or risk potential adverse effects with these supplements.

Conclusion

Iridology is a practice that is valued by some within alternative medicine, but which has no scientific basis. Moreover, the small number of well-controlled iridology trials has produced results suggesting the intervention to be unreliable at best.

Recommendation

Patients who present on the basis of iridology results should be encouraged to examine the evidence demonstrating the practice's ineffectiveness. Some iridologists themselves have rejected the practice upon consideration of this evidence.⁶ However, practicing iridologists

do not limit themselves to iris examinations, but make other observations and pursue relevant lifestyle information through questioning.⁹ All of this may lead to plausible diagnoses, though not because of iridology.

Patients should be encouraged to base decisions about treatment and preventive strategies on medically reliable tests. Prescribing treatments on the basis of iridology results is not consistent with the principles of evidence-based medicine, nor does it appear to serve the best interest of our patients. ❖

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References

1. Fulder S. *Handbook of Complementary Medicine*. New York: Oxford University Press; 1988.
2. International Iridology Practitioners Association. Available at: www.iridologyassn.org. Accessed April 12, 2003.
3. Murphy CJ, Paul-Murphy J. Iridology. *Arch Ophthalmol* 2000;118:1141.
4. Ernst E. Iridology: Not useful and potentially harmful. *Arch Ophthalmol* 2000;118:120-121.
5. Bartholomew RE, Likely M. Subsiding Australian pseudoscience: Is iridology complementary medicine or witch doctoring? *Aust N Z J Public Health* 1998;22:163-164.
6. Mather JD. Confessions of a former iridologist: Do the eyes really have it? Available at: www.mather.infome-dia.com/reality/confessions.html. Accessed April 12, 2003.
7. Simon A, et al. An evaluation of iridology. *JAMA* 1979;242:1385-1389.
8. Knipschild P. Looking for gall bladder disease in the patient's iris. *Br Med J* 1988;297:1578-1581.
9. Buchanan TJ, et al. An investigation of the relationship between anatomical features in the iris and systematic disease with reference to iridology. *Complement Ther Med* 1996;4:98-102.
10. Cockburn DM. A study of the validity of iris diagnosis. *Aust J Optom* 1981;64:154-157.
11. Emory C. Iridology: Do the eyes have it? *Nutr Forum* 1989;6:4-5.

CME Questions

CME Instructions: Physicians participate in this continuing medical education program by reading the article, using the provided references for further research, and studying the CME questions. Participants should select what they believe to be the correct answers, then refer to the list of correct answers to test their knowledge. To clarify confusion surrounding any questions answered incorrectly, please consult the source material. After completing this activity, you must complete the evaluation form provided at the end of each semester (June and December) and return it in the reply envelope provided to receive a certificate of completion. When your evaluation is received, a certificate will be mailed to you.

35. Because of their lower metabolic rate, adults are more vulnerable to toxin exposure than are children.

- a. True
- b. False

36. Higher concentrations of organophosphate pesticide residues have been found in the urine of preschool children consuming primarily a diet of conventionally grown foods as compared to students eating mainly organic foods.

- a. True
- b. False

37. Which of the following statements is correct?

- a. Organic food is at a greater risk of contamination by *E. coli* than conventionally grown foods due to animal manure applications.
- b. Organic food costs the same as more conventionally grown produce.
- c. Peaches, strawberries, and spinach are foods with generally high pesticide exposure.
- d. Genetically modified (GM) crops command a higher price at market than GM-free crops.

38. Which of the following terms is synonymous with organic?

- a. Natural
- b. Hormone-free
- c. Free-range
- d. None of the above

39. Soy, cotton, oilseed rape, and maize account for 99% of the total global GM acreage.

- a. True
- b. False

40. Which of the following statements is correct?

- a. Biofeedback may affect both respiratory mechanisms as well as immune function in people with asthma.
- b. Biofeedback involves learning to self-regulate processes typically deemed involuntary.
- c. The estimated annual cost related to asthma exceeds \$12 billion.
- d. All of the above

41. According to iridologists, every organ and part of the body is represented in a well-defined area of the iris.

- a. True
- b. False

Answer key: 35. b, 36. a, 37. c, 38. d, 39. a, 40. d, 41. a.

With Comments from Russell H. Greenfield, MD

Administration of High-Dose Vitamin D to Prevent Fractures

Source: Trivedi DP, et al. Effect of four monthly oral vitamin D₃ (cholecalciferol) supplementation on fractures and mortality in men and women living in the community: Randomised double blind controlled trial. *BMJ* 2003;326:469.

Goal: To determine whether the use of high-dose vitamin D administered every four months would have a positive effect on fracture risk and all-cause mortality.

Design: Randomized, double-blind, placebo-controlled pilot trial performed over five years.

Subjects: A total of 2,686 men and women ages 65-85 years recruited from British physician registers (2,037 men, 649 women).

Methods: Subjects were randomized to receive by mail, and then immediately take, either 100,000 IU of cholecalciferol or a matching placebo every four months for a total of five years.

Upon receipt of the capsules, participants were also to fill out forms listing medical events, including fractures.

Four years into the study a modified food frequency questionnaire was employed to estimate dietary calcium intake, and 235 subjects were invited to have serum parathyroid hormone and vitamin D concentrations determined.

Results: Differences appeared one year into the study. A lower fracture rate was found in the vitamin D-treated group as compared with placebo (22% lower rate for first fracture regardless of site, and 33% lower rate for fractures at major osteoporotic sites including the hip, wrist, forearm, and vertebrae).

A lower rate of all-cause mortality found in the vitamin D-treated group did not reach statistical significance. Mean vitamin D concentrations were 40% higher in those who received the active treatment.

Conclusion: A dose of 100,000 IU of vitamin D administered orally in an every-four-month schedule helps prevent fractures in people older than age 65.

Study strengths: Minimal exclusion criteria (generalizable); good compliance with protocol.

Study weaknesses: Majority of data obtained was self-reported by participants; inherent weaknesses associated with food frequency questionnaires.

Of note: The every-four-month dosage schedule of 100,000 IU vitamin D is equivalent to a daily dose of 800 IU vitamin D. Also, parathyroid hormone levels were not affected significantly with the dosage regimen studied in this trial. No adverse effects were reported.

We knew that: The majority of fracture prevention trials have focused on women with osteoporosis or previous fractures.

Clinical import: The conclusions of this well-done pilot trial strongly suggest that a high-dose regimen of vitamin D offered on a schedule that promotes compliance (once every four months) can significantly lessen fracture risk in older adults. Keeping in mind the graying of the population and the well-recognized complications associated with fractures in the elderly, such an intervention could have widespread health benefits—across socioeconomic boundaries.

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Patient Handout: Relaxation Techniques

IN TODAY'S WORLD, STRESS IS EVERYWHERE: IN THE COMMUTE TO WORK, ON THE JOB, AND IN your personal relationships. That's the bad news. The good news is that there are many simple and inexpensive ways to effectively reduce the stress in your life.

The effects of stress on the human body

Left unchecked, stress can have significant effects on your overall health and well-being. Stress can impair your immune system, making you more susceptible to infections, and can increase your risk of cardiovascular disease. Pre-existing health concerns, like asthma or gastrointestinal problems, can be exacerbated by stress.

Stress can be divided into two different types: acute (for example, you're late for work) or chronic (coping with the death of a loved one, divorce, or a difficult job). Both types are associated with considerable impairment (*see Table 1*). In addition, stress may manifest as a physical, perceptual, emotional, or behavioral reaction (*see Table 2*).

Taking control of your response to stress

The first step in taking control of your stress levels involves identifying your stressors and your body's response to them. When you can recognize that you are stressed, you can use one of several relaxation techniques to reduce your stress levels (*see Table 3*).

Controlled breathing exercises also can be used to modify your response to stress.

First exercise: Be aware of your breath. As often as possible, bring your attention to your breath. Are you holding your breath? Are you breathing deeply? Try to imagine that your breathing cycle starts with exhaling not inhaling. Put cues around your environment to remind you to breathe. Notes or colored dots work well, just be sure to change them every three days or so, otherwise you will stop noticing them.

Second exercise: Diaphragmatic breathing. Get into a comfortable position. If you are sitting, place both feet on the floor and use a chair with good back support. If you lie down, place

Table 1

Effects of acute and chronic stress

Acute stress can cause:

- Uneasiness and concern
- Sadness or a heightened sense of energy
- Loss of appetite
- Alertness
- Suppression of the immune system
- Increased metabolism and use of body fats
- Infertility

Chronic stress can cause:

- Anxiety and panic attacks
- Depression or melancholia
- Anorexia or overeating
- Irritability
- Lowered resistance to infections
- Diabetes or hypertension
- Absence of menstruation or loss of sex drive

Source: MayoClinic.com. Accessed June 17, 2002.

Table 2**Recognize your body's signals of stress****Physical**

- Frequent headaches, migraines, numbness in extremities, unusual amount of blinking or yawning, rapid heartbeat, rapid breathing, nervous tics, teeth clenching, nausea, vomiting, sighing

Perceptual

- Losing perspective, repeated forgetfulness, misperceptions, inattentiveness, distractibility

Emotional

- Losing temper, irritability (either everything or nothing bothers you), depression, crying

Behavioral

- Nervous habits, sudden changes in diet, accident prone, increased use of alcohol, caffeine, tobacco, or sugar

Source: Christensen A. *The American Yoga Association's Beginner's Manual*. New York: Simon & Schuster; 1987.

Table 3**Stress relief strategies**

- Take a deep breath
- Stretch during the day, especially if you sit at a desk or talk on the phone
- Take a time out and divert your attention for 5 minutes: walk around the block, look out the window
- Listen to a 10-minute relaxation tape
- Listen to soothing music
- Appreciate something beautiful
- Do something physical
- Pick a small task and finish it
- Take a moment to pray for someone less fortunate than you
- Watch fish swim in an aquarium
- Scan your body for tension and consciously release it
- Have a cup of caffeine-free, calming tea
- Leave 15 minutes early for your next appointment and take your time getting there
- Call a friend and hear some good news
- Repeat a prayer and put things in perspective

Source: Cedars-Sinai Integrative Medicine Medical Group

a pillow under your head and behind your knees. Try not to fall asleep unless you are using this exercise to relax before bed.

Place your hands on your abdomen. As you breathe in, push your abdomen out. Once you've reached full expansion, release your breath and let your abdomen relax naturally. Exhale through your mouth with a gentle sigh. Let your next exhalation follow naturally from the last breath.

Clear your mind and only focus on your breathing. If your attention wanders, try counting or saying inhale/exhale to yourself in your mind.

Third exercise: Meditation breathing. Follow the instructions for diaphragmatic breathing.

Focus your attention on the flow of your breath. Feel it enter your nostrils, roll into your body, and release from your lungs with expiration. Use all your senses to track your breath and do not use your mind for thinking. Try to focus your attention on the action in the moment. This type of practice is called mindfulness.

Use the in and out flow of your breath to focus your attention and send a message to yourself. You might say a word that is important to you, for example, calm, peace, or love. You could imagine breathing in peace with your inspiration and releasing tension with your exhalation.

Fourth exercise: Releasing breath. Get into a comfortable position and scan your body for tension. Take a deep

breath in and with exhalation, release tension from that part of your body.

To increase the effect of this breathing technique, combine it with progressive muscle relaxation. This technique assumes that a muscle will relax more completely if it has been tensed first.

Once you are breathing comfortably, begin at the top, tensing your face or shoulders or making your hands into fists with your inspiration. Hold your tension and your breath for several seconds and then release your breath through your mouth, allowing the muscle you just tensed to go loose and limp. Continue one area at a time until you have gone through your whole body.

[If you find yourself feeling dizzy or a little numb on your hands and feet while practice these exercises, just breathe less deeply for a few minutes.]

Resources

The National Institute of Mental Health: www.nimh.nih.gov, (301) 443-4513.

The National Center for Complementary and Alternative Medicine: www.nccam.nih.gov, (301) 644-6226.

Center for Mind-Body Medicine: www.cmbm.org, (202) 966-7338.