AMERICAN HEALTH CONSULTANTS®

ALTERNATIVE THERAPIES IN WOMEN'S HEALTH

Science-based Information for Clinicians

American Health Consultants Home Page—http://www.ahcpub.com

CME for Physicians—http://www.cmeweb.com

Omega-3 Fatty Acids and Pregnancy

By Jerry Cott, PhD

THE RELATIVE DEARTH OF OMEGA-3 (N-3) FATTY ACIDS IN A TYPICAL American diet may have an effect on several diseases and conditions. Six of 10 prospective cohort studies have reported an inverse relationship between fish intake and cardiovascular disease mortality.[1] Depletion of n-3 fatty acids, particularly docosahexaenoic acid (DHA), may be important in the etiology of depression, aggression, schizophrenia, and other mental and neurological disorders.[2] Insufficient intake of n-3 fatty acids also may be a risk factor in preterm birth.

Olsen et al suggested that the type of fatty acids in the diet may influence the length of gestation.[3] In the Faeroe Islands, women deliver their babies after the customary 40 weeks of gestation while a high percentage of women in other parts of Denmark go into labor almost a week earlier. The difference was thought to be a result of the marine diet eaten on the Faeroes. Olsen et al hypothesized that a high intake of marine-derived n-3 fatty acids might prolong pregnancy by shifting the balance of production of prostaglandins involved in parturition. Prostacyclin, an omega-3-derived eicosanoid, is a vasodilator and smooth muscle relaxer, so it would be expected to work in the opposite way to the omega-6-derived thromboxane, a vasoconstrictor.[4]

In a clinical trial, these same investigators tested the effects of a fish oil supplement on pregnancy duration, birthweight, and birth length.[5] Five hundred thirty-three healthy Danish women in week 30 of pregnancy were randomized to four 1 g capsules/d of a fish oil supplement (Pikasol, containing 2.7 g n-3 fatty acids), four 1 g olive oil capsules/d (control), or no supplementation. At the end of this study, the mean length of gestation differed by ANOVA ($P = 0.006$). Gestation was longest in the fish oil group and lowest in the olive oil group. The result was similar when the analysis was limited to the 443 women who underwent early ultrasound estimates of gestational age. Pregnancies in the fish oil group averaged 4.0 days longer (95% CI 1.5-6.4) than those in the olive oil group and the birthweight was 107 g (range 1-214 g) higher. The difference between the fish oil

Volume 2 • Number 12 • December 2000 • Pages 89-96

INSIDE

group and the other groups was increased by a low fish intake at baseline. Thus, fish oil supplementation in the third trimester seems to prolong pregnancy without detrimental effects on the growth of the fetus or on the course of labor.

Although a difference of four days in term deliveries may be of little clinical significance, fish oil may be helpful in preventing recurrent preterm birth. In the Fish Oil Trials In Pregnancy (FOTIP) study, Olsen et al examined the preventive effects of dietary n-3 fatty acids on preterm delivery and several other outcomes.[6] Four prophylactic trials included 232 women with a previous preterm delivery who were randomized to 2.7 g/d n-3 fatty acids or olive oil placebo, starting from about 20 weeks. Fish oil reduced the risk of preterm delivery from 33.3% to 21.3% (odds ratio 0.54, 95% CI 0.30-0.98).

Pregnancy-Induced Hypertension and Intrauterine Growth Retardation

In preeclampsia, a disturbance in thromboxane and prostacyclin biosynthesis has been observed. Sorensen et al studied whether fish oil supplementation in late pregnancy interferes with maternal and fetal production of the omega-6-derived thromboxane A2 and prostacyclin I2.[7] Forty-seven women in the 13th week of pregnancy were randomly assigned to receive fish oil (Pikasol), olive oil, or no supplementation. At the 37th week, the mean concentrations of the EPA-derived metabolites, thromboxane B3, and prostacyclin I3, were two to three times higher ($P < 0.001$) in the fish oil group compared with combined control groups. There were no significant effects of fish oil on the prostacyclin I2 metabolite. In umbilical cord blood, the mean concentration of thromboxane B2 was significantly lower in the group receiving fish oil ($P = 0.03$) compared to other groups. The authors concluded that fish oil was metabolized to the eicosanoids thromboxane A3 and prostacyclin I3 in pregnant women. Thus, there are theoretical reasons why fish oil may help to prevent or treat pregnancy-induced hypertension (PIH) or intrauterine growth retardation (IUGR).

In supplementation trials, however, fish oil supplementation does not reduce the risk of PIH or IUGR. In a double-blind trial, 223 pregnant women at high risk for developing PIH or IUGR were randomized to 2.7 g/d fish oil (MaxEpa, containing1.62 g of eicosapentaenoic acid [EPA] and 1.08 g of DHA) or placebo (a matching air-filled capsule).[8] In an intention-to-treat analysis, there was no difference between the placebo and active treatment groups for occurrence of proteinuric PIH, non-proteinuric PIH, birthweight < 3rd percentile, or the duration of pregnancy. There was no evidence from this study for a useful effect of fish oil supplementation.

The FOTIP study tested the preventive effects of dietary n-3 fatty acids on preterm delivery, IUGR, and PIH.[6] In six multicenter trials, women with high-risk pregnancies were randomly assigned to receive fish oil (2.7 g/d n-3 fatty acids in the prophylactic trials and 6.1 g/d n-3 fatty acids in the therapeutic trials) or olive oil from about 20 weeks (prophylactic trials) or 33 weeks (therapeutic trials) before delivery. Four prophylactic trials enrolled a total of 232 women with a previous preterm delivery, 280 women with IUGR, 386 women with PIH, and 579 women with twin pregnancies. Two therapeutic trials enrolled a total of 79 women with preeclampsia and 63 with suspected IUGR. In women with a previous preterm birth, fish oil reduced the risk of preterm birth but did not affect recurrence risks for the other outcomes. In twin pregnancies, there were no differences between groups in any outcome. The therapeutic trials detected no significant differences between groups in predefined outcomes. In the combined trials, fish oil delayed spontaneous delivery (proportional hazards ratio 1.22; $P = 0.002$). Thus, fish oil supplementation reduced the risk of preterm delivery in women with a previous preterm birth, but had no effect on preterm delivery of twins. Fish oil had no effect on IUGR or PIH.

In Western societies, most people eat more solid fats (rich in saturated fatty acids) and less soft fats (rich in

Alternative Therapies in Women's Health, ISSN 1522-3396, is published monthly by American Health Consultants, 3525 Piedmont Rd., NE, Bldg. 6, Suite 400, Atlanta, GA 30305.

VICE PRESIDENT/PUBLISHER: Brenda L. Mooney.
EDITORIAL GROUP HEAD: Leslie G. Coplin.
MANAGING EDITOR: Kevin New.
GST Registration Number: R128870672.
Periodical rate postage pending at Atlanta, GA.
POSTMASTER: Send address changes to ***Alternative Therapies in Women's Health***, P.O. Box 740059, Atlanta, GA 30374.

Back issues: $33. Missing issues will be fulfilled by Customer Service free of charge when contacted within one month of the missing issue's date.

AMERICAN HEALTH CONSULTANTS™
THOMSON HEALTHCARE

Subscriber Information

Customer Service: 1-800-688-2421.
Customer Service E-Mail: customerservice@ahcpub.com
Editorial E-Mail: leslie.coplin@ahcpub.com
World-Wide Web: http://www.ahcpub.com

Subscription Prices

United States
$249 per year (Student/Resident rate: $100).
Multiple Copies
1-9 additional copies: $179 each; 10 or more copies: $159 each
Outside the United States
$279 per year plus GST (Student/Resident rate: $115 plus GST).

Accreditation

American Health Consultants (AHC) is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to provide continuing medical education for physicians. American Health Consultants designates this continuing medical education activity for up to 20 hours in category 1 credit toward the AMA Physician's Recognition Award. Each physician should claim only those hours of credit that he/she actually spent in the educational activity. This CME activity was planned and produced in accordance with the ACCME Essentials.
For CME credit, add $50.

Questions & Comments

Please call **Leslie Coplin**, Editorial Group Head, at (404) 262-5534 between 8:30 a.m. and 4:30 p.m. ET, Monday-Friday.

Conflict of Interest Disclosure

In order to reveal any potential bias in this publication, and in accordance with Accreditation Council for Continuing Education guidelines, physicians have reported the following relationships with companies related to the field of study covered by this CME program. Dr. Barr, Dr. Cott, Dr. Fugh-Berman, Dr. Greenwood, Dr. Kronenberg, Dr. McPartland, and Dr. Massion have reported no relationships with companies related to the field of study covered by this CME program. Dr. Awang has the following relationships: consultant for Leiner Health Products, Chai-Na-Ta Corp, and Health 4 All Products. Dr. Cates serves on the Women's Health Leadership Council for Advanced Care Products, Scientific Advisory Board—Contraception for Wyeth, and Prevention of Adolescent Pregnancy Advisory Board for Johnson & Johnson. Dr. Low Dog is a consultant for the Materia Medica Group. Dr. Pan is a researcher for Chitosan+C and GreenFoods, Inc. California. Dr. Scialli has the following relationships: consultant for TAP Holdings, Merck, and Eli Lilly & Co.; speaker for TAP, Eli Lilly, and RPR; researcher for TAP, Wyeth-Ayerst, and Pfizer.

Table 1
Expressions of omega-3 fatty acids

Fatty Acid	Expression (# carbons:# double bonds, location of first double bond)
linoleic acid (LA)	18:2n-6
arachidonic acid (AA)	20:4n-6
docosapentaenoic acid	22:5n-6
alpha-linolenic acid (ALA)	18:3n-3
eicosapentaenoic acid (EPA)	20:5n-3
docosahexaenoic acid (DHA)	22:6n-3

polyunsaturated fatty acids) than they did a century or two ago. In addition, people now eat different types of polyunsaturated fats than they did previously. Today, the average diet contains an excess of corn, soy, or other plant food oils that are rich in omega-6 fatty acids, but low in omega-3 fatty acids (found in fish and flaxseed oil). Interestingly, a vegetarian diet may exacerbate this problem because vegetarians have lower intakes of n-3 fatty acids than omnivores.[9] Vegetarians may want to consider adding flaxseed to their diets. The alpha-linolenic acid (ALA) from flaxseed is converted to EPA and DHA in the body.

Reddy et al examined the effect of a maternal vegetarian diet on pregnancy outcomes and essential fatty acid status of the newborn.[10] Dietary intake and the fatty acid composition of plasma phospholipids were determined in a group of 24 South Asian vegetarian and 24 white omnivore non-pregnant premenopausal women. Umbilical cords and cord blood were collected at delivery from another group of 48 South Asian vegetarian women and 98 white omnivores from the same catchment area along with details of antenatal history and the outcome of pregnancy. The fatty acid composition of the cord blood and phospholipids in cord plasma were analyzed in a subset of 32 pairs of subjects, who were matched for maternal age, gestational age, parity, and sex of infant. Intakes of linoleic acid (LA) expressed as a proportion of the dietary energy and the ratio of LA to ALA were higher in the vegetarian women, and EPA and DHA were absent from their diets. (*See Table 1.*) Compared with omnivores, vegetarians had a higher concentration and proportion of LA and lower concentration and proportion of EPA and DHA in plasma phospholipids, plasma free fatty acid, and total plasma lipids. The proportion of DHA was lower ($P > 0.001$) but that of docosapentaenoic acid was greater ($P < 0.001$) in the cord blood of vegetarians compared to omnivores.

The duration of gestation was 5.6 days shorter, and birth weight, head circumference, and length were lower in the infants born to South Asian vegetarians even after adjusting for maternal height, duration of gestation, parity, gender of infants, and smoking habits. Multivariate analysis did not reveal any relationship between the proportions of DHA in plasma or cord artery phospholipids and the infants' birthweight or head circumference. This study showed that vegetarians give birth to infants with less DHA in their plasma and cord artery phospholipids, but this did not appear to be independently related to pregnancy outcome.

Depletion of maternal omega-3 fatty acids has been noted during pregnancy.[11] The physiology of pregnancy involves the mobilization of polyunsaturated fatty acids from maternal stores to the fetus, and supplementation with essential fatty acids may ensure adequate supplies for the needs of both mother and fetus.[12,13] Hornstra et al demonstrated that maternal essential fatty acids, especially DHA, progressively decrease during pregnancy.[14] Since breast milk has relatively high concentrations of DHA and EPA,[15] decreased levels of DHA in plasma and erythrocytes may remain low for some time postpartum, particularly in lactating women, and may contribute to postpartum depression.[2] The World Health Organization recommends that DHA and EPA be added to infant formulas. European infant formulas routinely are fortified with these fatty acids, but to date the FDA has not allowed the addition of either DHA or EPA to infant formulas sold in the United States. These n-3 fatty acids are necessary for optimal development of the fetal and neonatal visual and nervous systems.[12,16]

Pregnant women who wish to supplement their diet with omega-3 fatty acids have several choices. One option is to eat three servings of fish a week (more than three servings is not recommended for pregnant women because of possible mercury contamination of fish). Another option is to take an n-3 dietary supplement every day (the Danish studies were based on a daily dose of 4 g of fish oil containing a total of 2.4 g of n-3 fatty acids). Fish oil supplements would not be expected to contain mercury, which does not concentrate in fat; however, polychlorinated biphenyls (PCBs) do accumulate in fat. For that reason, flaxseed oil may be a better choice than either of the above. It may be beneficial for lactating women to continue omega-3 supplementation for as long as they breastfeed, or if not breast-feeding to use an infant formula fortified with n-3 fatty acids. ❖

Dr. Cott is Scientific Director and Chief Science Officer at Scientific Herbal Products, Inc. in College Park, MD.

References

1. Albert CM, et al. Fish consumption and risk of sudden cardiac death. *JAMA* 1998;279:23-28.
2. Cott J. Omega-3 fatty acids and psychiatric disorders. *Altern Ther Women's Health* 1999;1:97-101.
3. Olsen SF, et al. Gestational age in relation to marine n-3 fatty acids in maternal erythrocytes: A study of women in the Faroe Islands and Denmark. *Am J Obstet Gynecol* 1991;164(5 Pt 1):1203-1209.
4. Mills JL, et al. Prostacyclin and thromboxane changes predating clinical onset of preeclampsia: A multicenter prospective study. *JAMA* 1999;282:356-362.
5. Olsen SF, et al. Randomised controlled trial of effect of fish-oil supplementation on pregnancy duration. *Lancet* 1992;339:1003-1007.
6. Olsen SF, et al. Randomised clinical trials of fish oil supplementation in high risk pregnancies. Fish Oil Trials In Pregnancy (FOTIP) Team. *BJOG* 2000; 107:382-395.
7. Sorensen JD, et al. Effects of fish oil supplementation in the third trimester of pregnancy on prostacyclin and thromboxane production. *Am J Obstet Gynecol* 1993;168(3 Pt 1):915-922.
8. Onwude JL, et al. A randomised double blind placebo controlled trial of fish oil in high risk pregnancy. *Br J Obstet Gynaecol* 1995;102:95-100.
9. Sanders TA. Essential fatty acid requirements of vegetarians in pregnancy, lactation, and infancy. *Am J Clin Nutr* 1999;70(3 Suppl):555S-559S.
10. Reddy S, et al. The influence of maternal vegetarian diet on essential fatty acid status of the newborn. *Eur J Clin Nutr* 1994;48:358-368.
11. Otto SJ, et al. Maternal and neonatal essential fatty acid status in phospholipids: An international comparative study. *Eur J Clin Nutr* 1997;51:232-242.
12. Holman RT, et al. Deficiency of essential fatty acids and membrane fluidity during pregnancy and lactation. *Proc Natl Acad Sci U S A* 1991;88:4835-4839.
13. Al MD, et al. Maternal essential fatty acid patterns during normal pregnancy and their relationship to the neonatal essential fatty acid status. *Br J Nutr* 1995;74:55-68.
14. Hornstra G, et al. Essential fatty acids in pregnancy and early human development. *Eur J Obstet Gynecol Reprod Biol* 1995;61:57-62.
15. Salem N. Omega-3 fatty acids: Molecular and biochemical aspects. In: Spiller GA, Scala J. *New Protective Roles for Selected Nutrients.* New York: Alan E. Liss, Inc.: 1989: 109-228.
16. Hornstra G. Essential fatty acids in mothers and their neonates. *Am J Clin Nutr* 2000;71(5 suppl):126S-129S.

Menstrual Disturbances and Vegetarianism

By Susan I. Barr, PhD, RDN

MENSTRUAL CYCLE VARIATIONS HAVE POTENTIAL BIOlogical relevance in relation to the risks of hormone-related cancers, osteoporosis, and infertility. In the 1980s, several reports suggested that women following vegetarian diets were more likely to experience menstrual cycle disturbances.[1-4] Vegetarianism also was common among young women with anorexia nervosa,[5,6] (for which amenorrhea is a diagnostic criterion). Over the past two decades, additional research has been published; some of this research contradicts earlier observations. Accordingly, this review will explore whether vegetarianism is associated with disturbances of cycle length (amenorrhea, oligomenorrhea) and cycle characteristics (anovulation, length of the follicular and luteal phases). Dysmenorrhea, premenstrual syndrome, menorrhagia, and symptoms associated with menopause are beyond the scope of this article.

Vegetarianism

The question of whether vegetarianism influences women's menstrual characteristics is complicated by several factors, beginning with the definition of vegetarianism. Defined as "the theory or practice of living on a diet made up of vegetables, fruits, grains, nuts, and sometimes eggs or dairy products,"[7] vegetarianism encompasses great variability in dietary patterns, ranging from the consumption of < 200 g/wk of meat[1] to strict veganism (which excludes all animal products, including honey and gelatin). In addition to the different degrees to which those who consider themselves vegetarian exclude animal products, there also is variability in terms of which plant products are included or emphasized. Some individuals simply exclude meat while making few other alterations to the traditional Western diet; others make extensive use of legumes, nuts, seeds, and soy products. There is no single "vegetarian diet," and as in omnivorous diets, dietary intake of fat and fiber can vary widely. This has obvious implications when considering potential mechanisms by which components of a vegetarian diet could affect the menstrual cycle.

Vegetarianism may be a marker for a lifestyle choice as well as a dietary choice: Vegetarians frequently are reported to differ from the general public in exercise habits, smoking, alcohol use, and body weight.[8,9] Many of these variables have been associated with women's

menstrual characteristics and must be controlled for in study design and/or analysis. Vegetarians are not a homogeneous group: Lifestyle practices of those who are vegetarian for religious reasons (in North America, predominantly Seventh-Day Adventists) may differ considerably from those who become vegetarian for other reasons, such as animal rights issues or weight concerns, and this also could affect study results.

Potential Mechanisms for Effects of Vegetarianism on the Menstrual Cycle

Vegetarianism could directly or indirectly affect the menstrual cycle by several potential mechanisms.[10] These include body weight (menstrual disturbances are more common among both underweight and overweight women); the lifestyle variables mentioned above; fiber, fat, phytoestrogens, and other dietary components that may be more or less common in vegetarian diets; and social cognitive variables. Women with high levels of cognitive dietary restraint (i.e., who consciously attempt to limit their food intake to control body weight), for example, have a higher prevalence of menstrual disturbances,[11-14] even when relative body weight does not differ from those with low restraint. High restraint is associated with higher 24-hour urinary cortisol excretion.[15] As a biological marker of stress, cortisol is known to be associated with changes in ovarian function.[16] Whether psychosocial stress differs between vegetarians and omnivores has received little study.

Given this background, what does the scientific literature find when comparing menstrual cycle characteristics of vegetarians and nonvegetarians? The available literature can be divided into two categories: 1) studies comparing women grouped by menstrual cycle function, in which the prevalence of vegetarianism is compared; and 2) studies comparing women grouped by dietary pattern, in which the prevalence of menstrual disturbances is compared.

Studies Comparing Women Grouped by Menstrual Cycle Function

Studies of this nature were among the first to link menstrual disturbances with vegetarian diets. In 1984, Brooks et al reported on the diets of 26 women runners of similar age, percent body fat, and training volume.[1] Eleven women were amenorrheic (≤ 1 cycle in the six months preceding the study) while 15 had regular cycles (12 periods per year). The two groups had similar energy intakes, but nine of 11 amenorrheic runners were classified as vegetarian (defined in this study as < 200 g/wk of meat or poultry) compared to only two of 15 eumenorrheic runners. Generally comparable results were obtained in a study of eight amenorrheic and nine regularly menstruating runners who were similar in age, relative weight, and training volume.[4] Diets of the women were classified as "vegetarian" if they contained < 200 g/week of meat or poultry; exclusion of red meat was reported separately. The prevalence of vegetarianism was higher in the amenorrheic group (25% vs. 11%), as was the proportion of women excluding red meat (100% vs. 44%). In this study, however, reported energy intakes of amenorrheic women averaged only 64% of the regularly menstruating runners; caloric restriction rather than meat restriction could explain results.

The prevalence of vegetarianism among women with anorexia nervosa also has been interpreted as suggesting that vegetarian diets may contribute to menstrual dysfunction. Among consecutive anorexic patients in two series, 45%[5] and 54%[6] were vegetarian, which is much higher than the 2-4% prevalence reported among the general public.[17] Additional analysis of the data from the study by O'Connor et al, however, suggested that vegetarianism was a consequence of the eating disorder and associated menstrual dysfunction, rather than a cause: It preceded the onset of the illness in only 6% of patients.[6] For young women intent on losing weight, vegetarianism may be a socially acceptable way to exclude food (and calories) from the diet.

Studies Comparing Women Grouped by Dietary Pattern

One of the first reports comparing women grouped by dietary pattern was that of Slavin et al, who studied 173 active premenopausal women.[2] The prevalence of amenorrhea (< 3 cycles per year) was highest among women who described their diets as "vegetarian" (14/45 or 31%), intermediate among those following a "high-carbohydrate, low-fat" diet (6/44 or 14%), and lowest among those on a "balanced four food group" diet (3/84 or 4%). Actual contents of the diets, however, were not described, nor were other characteristics (age, body fat, training volume) compared among the diet groups.

Pirke et al monitored menstrual function during weight loss in 18 healthy women who initially had normal ovulatory cycles.[3] Nine women were assigned to a vegetarian diet and nine to a nonvegetarian diet. During the six-week intervention, both groups lost approximately 1 kg/week. Seven of the nine women on the vegetarian diet experienced an anovulatory cycle during the intervention, compared to only two of the nine women on the nonvegetarian diet. Although one could speculate that changing to a vegetarian diet might be more stressful than maintaining a nonvegetarian diet, global mood

score actually tended to be somewhat worse among the women on the nonvegetarian diet.

One study that compared hormone levels in vegetarian and nonvegetarian teenage girls also provided relevant data on menstrual characteristics.[18] Vegetarian teens (n = 35) were students at a Seventh-Day Adventist boarding school and nonvegetarians (n = 40) were students at a private boarding school. There were no significant group differences in age, weight, body mass index, caloric intake, exercise, age at menarche, or the percentage of girls with ovulatory cycles. Minor differences were observed in hormone levels (vegetarians had higher follicular phase log estradiol levels and higher luteal phase dehydroepiandrosterone sulfate levels than nonvegetarians). However, this study's results suggested that menstrual characteristics were similar in well-matched groups of lifelong vegetarians and nonvegetarians.

Pedersen et al conducted one of the first studies specifically designed to assess the effects of vegetarian diets on menstrual regularity.[19] Vegetarian (n = 34) and nonvegetarian (n = 41) women reported whether they had regular cycles (11-13 menses per year), irregular cycles (3-10 cycles per year) or were amenorrheic (≤ 2 cycles per year). The women were similar in age and relative weight, but irregular cycles were significantly more common among vegetarians (26% vs 5%). This study had two potential limitations. A crucial limitation is that current oral contraceptive (OC) users were not excluded. The proportion of women currently using OCs in the two groups was not reported, but nonvegetarian women had used OCs for significantly longer. Because OCs impose "regular" cycles, OC use would be expected to contribute to fewer "irregular" cycles. Recruitment bias also may have existed: If recruitment notices described the study as exploring whether menstrual disturbances were more common among vegetarians, vegetarian women with irregular cycles may have been more likely to volunteer. A second study by this group, in which OC users were excluded had similar results.[20] Four of 27 vegetarians (15%) and none of the nonvegetarians reported irregular menses or amenorrhea. The groups were well matched for variables that could confound the results; however, the possibility of a recruitment bias remained.

Barr et al attempted to control for recruitment bias by studying regularly menstruating vegetarian and nonvegetarian women. The occurrence of subclinical menstrual disturbances was assessed prospectively during a six-month study.[12] It was reasoned that if clinical disturbances of menstrual function were more common among vegetarians, subclinical disturbances (anovulation and cycles with a short luteal phase) also would be more common. Other recruitment criteria were intended to reduce the influence of confounding variables, and included no OC use for at least six months, stable weight with body mass index 18-25 kg/m^2, no history of an eating disorder, nulliparous, exercise ≤ 7 hours/week and alcohol intake ≤ 1 drink daily. Participants were similar in age, gynecologic age (years since menarche), exercise level, energy intake, and percent energy as dietary fat, although relative weight of the vegetarian women was lower than that of nonvegetarians. Over the six months of the study, vegetarian women experienced significantly fewer anovulatory cycles (4.6% vs 15.1% of cycles) and also had significantly longer mean luteal phase lengths, although cycle lengths were similar. Thus, in this highly selected group of women, vegetarians had fewer subclinical menstrual disturbances.

Although the results of the above study strongly suggest that vegetarianism is not associated with an increased prevalence of menstrual disturbances, they cannot be generalized to the population level because of the highly selected sample. In the "real world," some women may become vegetarian because of concerns about body weight, and these women could have been excluded from Barr's study.[12] Given that concern about body weight (as reflected by scores for cognitive dietary restraint) has been associated with subclinical menstrual disturbances, population studies are needed to address this question at the broadest level. Results from a study of 666 university women provide some insight into this issue.[21] The study assessed nutrition-related attitudes and behaviors but did not address vegetarianism specifically, thus avoiding a selective recruitment bias. Questionnaires were distributed to all women students in various university classes, and 52 respondents were vegetarian. Compared to the nonvegetarians, the vegetarian women weighed more, exercised more, had higher dietary restraint scores, and were more likely to smoke cigarettes, all of which suggest that concern about body weight is common among this group. Furthermore, they were more likely to have a history of an eating disorder (18% vs 3%) and to ever have tried to lose weight (90% vs 72%). Although the difference was not statistically significant, they tended to be more likely to report irregular menstrual cycles (31% vs 20%, P = 0.096).

Conclusion

Although there is no convincing evidence that a vegetarian diet per se causes menstrual disturbances, some studies do report a higher prevalence of menstrual disturbances in vegetarians. Results appear to vary with the characteristics of the vegetarian group studied, suggesting

that factors associated with vegetarianism (e.g., in some young women, the desire to control body weight) are at least as important as components of a vegetarian diet. Nevertheless, results of a carefully controlled prospective study showed clearly that vegetarian women did not have an increased prevalence of subclinical menstrual disturbances. ❖

Dr. Barr is Professor of Nutrition at the University of British Columbia in Vancouver.

References

1. Brooks SM, et al. Diet in athletic amenorrhoea. *Lancet* 1984;1:559-560.
2. Slavin J, et al. Amenorrhoea in vegetarian athletes. *Lancet* 1984;1:1474-1475.
3. Pirke KM, et al. Dieting influences the menstrual cycle: Vegetarian versus nonvegetarian diet. *Fertil Steril* 1986;46:1083-1088.
4. Kaiserauer S, et al. Nutritional, physiological, and menstrual status of distance runners. *Med Sci Sports Exerc* 1989;21:120-125.
5. Bakan R, et al. Dietary zinc intake of vegetarian and nonvegetarian patients with anorexia nervosa. *Int J Eat Disord* 1993;13:229-233.
6. O'Connor MA, et al. Vegetarianism in anorexia nervosa? A review of 116 consecutive cases. *Med J Aust* 1987;147:540-542.
7. *Merriam-Webster's Collegiate Dictionary*. 10th Edition. Springfield MA: Merriam-Webster Inc.; 1999.
8. Dwyer JT. Health aspects of vegetarian diets. *Am J Clin Nutr* 1988;48:712-738.
9. Slattery ML, et al. Meat consumption and its associations with other diet and health factors in young adults: The CARDIA study. *Am J Clin Nutr* 1991;54:930-935.
10. Barr SI. Vegetarianism and the menstrual cycle: Is there an association? *Am J Clin Nutr* 1999;70(3 suppl):549S-554S.
11. Barr SI, et al. Restrained eating and ovulatory disturbances: Possible implications for bone health. *Am J Clin Nutr* 1994;59:92-97.
12. Barr SI, et al. Vegetarian vs nonvegetarian diets, dietary restraint, and subclinical ovulatory disturbances: Prospective 6-mo study. *Am J Clin Nutr* 1994;60:887-894.
13. Schweiger U, et al. Everyday eating behavior and menstrual function in young women. *Fertil Steril* 1992;57:771-775.
14. Lebenstedt M, et al. Reduced resting metabolic rate in athletes with menstrual disorders. *Med Sci Sports Exerc* 1999;31:1250-1256.
15. McLean J, et al. Cognitive dietary restraint is associated with higher urinary cortisol excretion in healthy premenopausal women. *Am J Clin Nutr* (2000, in press).
16. Berga SL. Stress and ovarian function. *Am J Sports Med* 1996;24(6 Suppl):S36-S37.
17. Vegetarian Resource Group. How many vegetarians are there? Available at: http://www.vrg.org/journal/vj2000may/2000maypoll.htm. Accessed August 10, 2000.
18. Persky VW, et al. Hormone levels in vegetarian and nonvegetarian teenage girls: Potential implications for breast cancer risk. *Cancer Res* 1992;52:578-583.
19. Pedersen AB, et al. Menstrual differences due to vegetarian and nonvegetarian diets. *Am J Clin Nutr* 1991;53:879-885.
20. Lloyd T, et al. Urinary hormonal concentrations and spinal bone densities of premenopausal vegetarian and nonvegetarian women. *Am J Clin Nutr* 1991;54:1005-1010.
21. McLean J. Cognitive dietary restraint, food intake and cortisol excretion in premenopausal women. University of British Columbia: Vancouver, B.C., 1999.

CME Questions

22. Fish oil supplementation trials have shown:

a. a reduction in pregnancy-induced hypertension.
b. a reduction in intrauterine growth retardation.
c. both a and b.
d. neither a nor b.

23. Which of the following is rich in omega-6 fatty acids?

a. Fish and flaxseed oils
b. Corn and soy oils
c. Both a and b
d. Neither a nor b

24. Flaxseed oil contains:

a. ALA, which is converted to EPA and DHA in the body.
b. DHA and EPA.
c. ALA, DHA, and EPA.
d. None of the above

25. Vegetarianism in women:

a. is not clearly associated with menstrual disturbances.
b. has been associated with a desire to control body weight.
c. may be a marker for lifestyle choice as well as a dietary choice.
d. All of the above

26. A recent trial of homeopathy for radiation dermatitis found:

a. a beneficial effect.
b. no beneficial effect.

With Comments by Adriane Fugh-Berman, MD

Homeopathy for Radiation Dermatitis

Source: Balzarini A, et al. Efficacy of homeopathic treatment of skin reactions during radiotherapy for breast cancer: A randomised, double-blind clinical trial. *Br Homeopath J* 2000;89:8-12.

Design/Setting/Subjects: A randomised, double-blind, placebo-controlled trial in 66 women with breast cancer treated with surgery and beginning radiation treatment. Patients were examined weekly during six weeks of radiation and 15 and 30 days after the end of radiation. A rating scale was used for skin color, heat, edema, and cutaneous hyperpigmentation.

Treatment/Dose/Duration: Patients received placebo or a homeopathic treatment consisting of Belladonna 7cH, 3 granules sublingually bid, and X-ray 15cH, 3 granules sublingually once a day (the X-ray preparation was obtained with progressive solutions-succussions of a hydroalcoholic solution irradiated with x-rays). Both groups also used a topical medication containing flucortolone.

Results: 61 patients completed the study. There was no significant difference in total severity scores between the two groups. The only statistically significant difference between groups was a lower incidence of edema in the treated group at the fifth and sixth weeks; there was no difference between groups at the seventh and eighth visit (after radiation treatment was completed). "Heat" scores were significantly less in the treated group at five of eight time points; there was no difference in erythema nor hyperpigmentation.

Funding: Not stated.

Comment: This study, which utilized two homeopathic treatments including one that consisted of irradiated alcohol and water, does not provide evidence of efficacy of these treatments for preventing radiation dermatitis. Homeopathy is probably the alternative therapy that is least acceptable to conventional physicians; the idea that treatments with vanishingly small amounts of "active" compounds in them could have an effect goes against much of our training. Still, two meta-analyses have found that the clinical effects of homeopathy exceed that of placebo.[1,2] It is not clear, however, for which conditions homeopathy is helpful. ❖

References

1. Linde K, et al. Are the clinical effects of homeopathy placebo effects? A meta-analysis of placebo-controlled trials. *Lancet* 1997;350:834-843.
2. Kleijnen J, et al. Clinical trials of homeopathy. *BMJ* 1991;302:316-323.

Diabetic? Get Thee to a Hot Tub

Source: Hooper PL. Hot tub therapy for type 2 diabetes mellitus. *N Engl J Med* 1999; 341:924-925.

Design/Setting/Subjects: Open pilot study of eight patients (including three women) ages 43-68 with type 2 diabetes mellitus. Diet, exercise routines, and medications were stable for eight weeks before and during the study.

Treatment: Immersion up to the shoulders in a hot tub (37.8° C-41.0° C) at an athletic facility six days a week for three weeks.

Outcome Measures: Plasma glucose, glycosylated hemoglobin, weight.

Results: Mean fasting plasma glucose levels decreased significantly from 182 ± 37 mg/dl to 159 ± 42 mg/dl. Mean glycosylated hemoglobin decreased significantly from 11.3 ± 3.1% to 10.3 ± 2.6%. After 10 days, one patient reduced his dose of insulin by 18%. Weight did not decrease significantly (a mean of 1.7 ± 2.7 kg). Oral temperature increased an average of 0.8° C. Some subjects reported increased well being and improved sleep as the study progressed.

Funding: Not stated.

Comments: We have run several articles recently on the benefits of exercise, so let's give vegging out equal time. I love the idea that lolling about in a hot tub may provide some of the same benefits as exercise. However, 30 minutes in a hot tub is a long time. Patients in this study complained of feeling hot when the water temperature was higher than 40° C and became dizzy on exiting the tub, so were routinely helped from the tub and seated for a while after each session. I wonder what their blood pressure and electrolytes looked like. Still, the results of this small pilot study are interesting and warrant a larger study. But next time, it would be a good idea to test the effect of shorter periods of time, and monitor blood pressure, heart rate, and electrolytes. ❖

In Future Issues:

Noni Juice

Antioxidants and Breast Cancer

Alternatives for Interstitial Cystitis

St. John's Wort and Photosensitivity