highly unlikely to develop cancer. To accomplish this, we need to develop a nonendoscopic screening test to diagnose and risk stratify BE in the population at risk and develop more sophisticated endoscopic evaluations, incorporating advanced imaging techniques and biomarkers that can accurately determine those that need intervention. EAC is a devastating disease and our current approaches for disease prevention seem to be flawed.

MASSIMILIANO DI PIETRO
MRC Cancer Cell Unit
Hutchison/MRC Research Centre

MARIA O'DONOVAN
Department of Histopathology
Cambridge University Hospitals

REBECCA C. FITZGERALD
MRC Cancer Cell Unit
Hutchison/MRC Research Centre
Cambridge, United Kingdom

A MINDFUL WAY THROUGH IBS: REDUCING ABDOMINAL PAIN AND IMPROVING QUALITY OF LIFE

Gaylord SA, Palsson OS, Garland EL, et al. **Mindfulness training reduces the severity of irritable bowel syndrome in women: results of a randomized controlled trial. Am J Gastroenterol 2011;106:1678–1688.**

Irritable bowel syndrome (IBS) is a common, gastrointestinal (GI) disorder, which affects nearly 5%–11% of the population (Gut 2007;56:1770–1798). Although the pathophysiology of IBS is not well understood, it is generally accepted that altered brain–gut interactions play a role; therefore, both peripherally and centrally acting therapies are used to treat IBS. With regard to the latter, both psychotropic agents and psychological and behavioral approaches have shown efficacy in reducing IBS symptoms (Gut 2009;58:367–378). Nonpharmacologic, central-acting therapies such as cognitive–behavioral therapy (CBT), hypnosis, and comprehensive stress management improve global symptoms of IBS (Gut 2009;58:367–378). These behavioral therapies aim to reduce over-reactivity to stressors and maladaptive psychological coping behaviors (eg, avoidance, isolation, intrusive thoughts, rumination; Gastroenterol Clin North Am 2011;40:183–206). In general, these treatments are more commonly used in patients with moderate-to-severe IBS symptoms; those refractory to medical therapy; and concurrent symptoms of generalized anxiety disorder, depression, or other psychiatric disorders (Gastroenterology 2002;123:2108–2131).

A central-acting therapy of recent interest for the treatment of IBS is mindfulness meditation. Mindfulness meditation is defined as a "nonjudgmental acceptance and interested awareness of moment-to-moment experience of sensations, perceptions, emotions, and other forms of mental activity" (J Altern Complement Med 2002;8:719–730). Others define mindfulness meditation as paying attention to experiences occurring at the present moment in a nonjudgmental manner (Gen Hosp Psychiatr 1995;17:192–200; Gastroenterol Hepatol 2008;5:624–636). In a recent study by Gaylord et al (Am J Gastroenterol 2011;106:1678–1688), a randomized, controlled, 8-week treatment trial was conducted to determine efficacy of mindfulness in women with IBS immediately after and 3 months after this treatment. Their primary hypothesis was that mindfulness meditation would improve IBS symptom severity as measured by the IBS symptom severity score (IBS-SSS; Aliment Pharmacol Ther 1997;11:395–402) compared with a social support intervention. Secondary outcomes included disease-specific quality of life (QOL; Dig Dis Sci 1998;43:400–411), general psychological distress (Brief Symptom Inventory-18; Administration, scoring, and procedures manual. Minneapolis: National Computer Systems; 2000), and symptom-specific anxiety (Visceral Sensitivity Index; Aliment Pharmacol Ther 2004;20:89–97). Women with IBS who met Rome II diagnostic criteria for IBS (Gut 1999;45[Suppl 2]:II43–47) were enrolled in the study. Inclusion criteria were a diagnosis of IBS by a physician or using Rome II criteria; female gender; age between 18 and 75 years; ability to understand English; and willingness to document bowel symptoms and medication use regularly, complete assessments, and attend weekly structured sessions. The study design was comprised of two 8-week parallel treatment arms, mindfulness meditation, and a social support intervention. Both treatment arms consisted of a 2-hour session per week for 8 weeks and a half-day retreat. The meditation intervention program was led by experienced mindfulness instructors and based on Kabat-Zinn's and Santorelli's mindfulness stress reduction program (Adv Mind Body Med 2005; 21:22–27). One of the mindfulness group interventions was the use of the "body scan," in which patients focused their attention on various parts of the body to perceive sensations (ie, muscle tension). In addition, the mindfulness group was instructed to practice meditation, mindful yoga, coping strategies for IBS symptoms and perceptions, minimize catastrophizing, and read assignments from books such as *Full Catastrophe Living* (New York: Delacorte Press; 1990), and *IBS for Dummies* (Hoboken, NJ: Wiley; 2005). Catastrophizing in pain has been defined as a "tendency to focus on and exaggerate the threat value of painful stimuli and negatively evaluate one's ability to deal with pain" (Psychosom Med 2004;66 435–441). The social support group was taught by masters-level social workers. This intervention consisted of weekly open-group discussions on predesignated topics and patients' related experiences and weekly reading and homework assignments from the book, *IBS for Dummies* (Hoboken, NJ: Wiley; 2005). At the beginning, end, and 3 months after the treatment intervention, IBS-SSS (Aliment Pharmacol Ther

1997;11:395–402), IBS-QOL (Dig Dis Sci 1998;43:400–411), Visceral Sensitivity Index (Aliment Pharmacol Ther 2004;20:89–97), and Brief Symptom Inventory-18 (Administration, scoring, and procedures manual. Minneapolis: National Computer Systems; 2000) were completed by all subjects. Mindfulness score was also measured in the 2 groups using a validated Five-Facet Mindfulness Questionnaire (Assessment 2008;15:329–342), which is a questionnaire that measures 5 factors of mindfulness: nonreactivity to inner experience ("I perceive my feelings and emotions without having to react to them"), a nonjudgmental attitude ("I believe some of my thoughts are abnormal or bad and I shouldn't think that way"), acting with awareness ("I find myself doing things without paying attention"), describing emotional experience ("I'm good at finding words to describe my feelings"), and observing ("I pay attention to sensations, such as the wind in my hair or sun on my face") (Assessment 2006;13:27–45; Ann Behav Med 2010;39:151–161).

A total of 223 women were screened through from an IBS registry of patients interested in research, patients in physicians' offices, local advertisements, and flyers; 97 were eligible, but 22 dropped out before the intervention and 9 dropped out during the intervention. In total, 36 mindfulness group participants and 39 social support group participants completed the study. With regard to the primary outcome measure, the mindfulness group experienced significant decreases in their IBS-SSS scores immediately posttreatment compared with the social support group ($P = .006$), and at the 3-month follow-up ($P = .001$). Compared with the social support group, the mindfulness group also had a reduction in IBS-SSS of 26.4% versus 6.2% posttreatment, and 38.2% versus 11.8% at the 3-month follow-up. A clinically significant improvement in IBS-SSS has been defined as an at least 50-point reduction (Aliment Pharmacol Ther 1997;11:395–402). The percentage of subjects meeting this 50-point reduction at posttreatment in the mindfulness group and social support group was 68.8% versus 45.2% ($P = .06$), and 75.0% versus 53.1% ($P = .08$) at the 3-month follow-up, respectively. With regard to individual symptoms, a decrease in abdominal pain severity was significantly greater in the mindfulness group than in the social support group at posttreatment ($P = .013$) and at the 3-month follow-up ($P = .015$). Additionally, at the 3-month follow-up, a significantly greater reduction in abdominal pain frequency and life interference was seen in the mindfulness group compared with the social support group ($P = .007$ and $P = .037$, respectively). The mindfulness group also had greater improvement in IBS-QOL compared with the social support group with a greater degree of improvement seen at the 3-month follow-up ($P = .027$) but not immediately posttreatment ($P = .08$). With respect to psychological symptoms, the mindfulness group had significantly greater improvements than the social support group at the 3-month follow-up for anxiety symptoms ($P = .02$), general psychological symptom severity scores ($P = .049$), and GI symptom anxiety ($P = .023$). Because of the nature of study protocol, subjects and therapists could not be blinded to the treatment interventions. However, providing no information about the hypothesized superiority of mindfulness training in IBS minimized differences in expectancy of the treatments, and this was verified using a treatment credibility scale completed by subjects after the first treatment session.

Comment. Mindfulness-based exercises have been associated with improvement in overall well-being of patients with chronic medical conditions including rheumatoid arthritis, chronic low back pain, type II diabetes, attention deficit hyperactivity disorder, cancer, and organ transplantation (BMC Public Health 2011;11:131; Arthritis Rheum 2007;57:1134–1142; J Consult Clin Psychol 2008;76:408–421; J Attention Disord 2008;11:737–746; Pain 2008;134:310–319; J Am Osteopath Assoc 2010;110:646–652). Mindfulness-based practices such as mindfulness-based stress reduction have been shown to be efficacious at longer follow-up periods of up to 6 months, particularly in rheumatoid arthritis (Arthritis Rheum 2007;57:1134–1142). Interestingly, this study showed no significant improvement in well-being 2 weeks after the completion of the 2-month treatment period but did at the 3-month follow-up period. This is consistent with the observation that the beneficial effects of psychological therapies are typically demonstrated at a longer follow-up period.

Although the efficacy of mindfulness meditation has been studied in multiple non-GI conditions, the study by Gaylord et al (Am J Gastroenterol 2011;106:1678–1688) is only the second conducted in IBS, and the first to solely assess the efficacy of mindfulness. Ljótsson et al (Behav Res Ther 2011;49:58–61) compared the efficacy of a 10-week, Internet-based CBT program that included mindfulness exercises and Internet-delivered stress management in Rome III or physician-diagnosed IBS patients. At the 6-month follow-up, significant group differences were found in the GI Symptom Rating Scale for IBS, favoring the Internet CBT group ($P < .001$). Significant improvements in the cognitive scale for functional bowel disorders, GI symptom-specific anxiety and IBS-QOL, but not current anxiety and depression symptoms, were found with CBT with mindfulness compared with stress management. However, mindfulness exercises were only one part of the CBT intervention, and there was no measure of mindfulness after treatment with tools such as Five-Facet Mindfulness Questionnaire like that used in the Gaylord et al study (Am J Gastroenterol 2011;106:1678–1688). Therefore, it is not clear how much of a role mindfulness played in the efficacy reported in the Ljótsson et al's study (Behav Res Ther 2011;49:58–61).

The Gaylord et al study (Am J Gastroenterol 2011;106:1678–1688) has a number of strengths. It is the first to formulate a well-designed, double-blind, controlled study

to examine solely mindfulness therapy in IBS patients. Baseline IBS severity was similar in the 2 treatment groups, well-trained instructors were employed, and masking techniques were incorporated. Additionally, participants were ensured to have learned the technique of mindfulness by completing a validated mindfulness scale, that is, Five-Facet Mindfulness Questionnaire. Furthermore, Gaylord's study utilized validated outcome measures and a clinically meaningful responder definition for IBS-SSS.

However, there were also limitations in the study. The recruitment was limited to women. Second, the sample is relatively small for a treatment intervention. Last, it would be helpful if the study had a longer follow-up period. Because IBS is a chronic illness, having a therapeutic approach that works long term would be important to know.

The direct mechanisms underlying the beneficial effects of mindfulness meditation in IBS are unclear, but they may include increasing relaxation skills, positive responses, and a sense of self-efficacy. Mindfulness meditation exerts primarily a cognitive or emotional effect rather a behavioral one, because it does not implement a change in behaviors. Specific mindfulness effects involve learning to disentangle oneself from the uncomfortable perception of IBS symptoms and experience them in a different way. Mindfulness meditation may be able to adjust emotional affect such as having the capability to "correct unpleasant moods" (Gastroenterol Hepatol 2008;5:624–636; Assessment 2006;13:27–45; J Pers Soc Psychol 2003;84:822–848). Emotions such as anger have been shown to be associated with increased colonic motility (Dig Dis Sci 2000;45:248–251) and visceral sensitivity (Am J Physiol 2006;291:R277–284) in IBS. It is conceivable that a reduction in these emotions can reduce dysregulated GI function and thus symptoms in IBS patients. Furthermore, mindfulness meditation focuses on acceptance. Kearney et al (Gastroenterol Hepatol 2008;5:624–636) state that mindfulness practices focus on an attitude of acceptance of discomfort in contrast with other IBS therapies, which focus on unpleasant sensations and ways to alleviate those symptoms. IBS is a chronic disorder and focusing on an attitude of acceptance rather than attention to bothersome symptoms may result in overall improved QOL. In addition, IBS patients may also be distracted from their GI symptoms while meditating. Learning to be mindful can take years and patients may be distracted because they are working hard to meditate.

From a biologic perspective, the effects of mindfulness meditation have not been well-studied. One would hypothesize that mindfulness meditation decreases activation of central arousal and corticolimbic networks that modulate the effect of environmental context, cognitions, emotions, and memories on perception and gut function (Annu Rev Med 2011;62:381–396). Mindfulness may also affect processing of afferent input by changing interoception, which is the sense of the physiologic condition of the body (Annu Rev Med 2011;62:381–396), and thus, can reduce future prediction and worrying. Future studies are needed to confirm these hypotheses.

There are advantages and disadvantages of mindfulness therapy. Advantages include being able to learn and practice mindfulness meditation in groups instead of individualized sessions with an instructor. One possible advantage in the future is the availability of Internet-based mindfulness training. Ljótsson et al (Behav Res Ther 2011;49:58–61) implemented mindfulness exercises as part of the Internet-based CBT, although mindfulness was not the primary focus of the study so it is unclear how effective this would be in IBS. Additionally, Gaylord et al (Am J Gastroenterol 2011;106:1678–1688) demonstrated that the efficacy of mindfulness meditation increases as time surpasses, with progressive improvement at 3 months. Furthermore, the use of psychological therapies has been shown to be safe with minimal to no adverse effects with improvements seen in both IBS symptoms and health-related QOL (Gastroenterology 2002;123:2108–2131). Disadvantages of mindfulness meditation and practices may include the need to commit time to attend scheduled weekly training sessions. In this study, there were screen failures and dropouts owing to the time commitment, scheduling participation, and inability to attend all sessions. Additionally, persistence and motivation are needed to consistently practice mindfulness meditation as opposed to simply taking a medication. The maximal benefit of mindfulness may require many months of continued practice, which may be considered a downside by some patients.

This study suggests that mindfulness meditation can be an efficacious therapeutic modality to reduce both IBS and psychological symptoms and daily functioning. For patients interested in learning mindfulness, training is offered in group and individual classes. Mindfulness tapes and books (eg, Jon Kabat Zinn's *Full Catastrophe Living: Using the Wisdom of Your Body and Mind to Face Stress, Pain and Illness*) are also available.

In conclusion, the study by Gaylord et al (Am J Gastroenterol 2011;106:1678–1688) is a novel study demonstrating that mindfulness meditation is a promising and safe therapeutic approach in IBS. However, whether mindfulness meditation would be helpful in all IBS patients is not known and needs to be addressed in larger studies. In addition, future studies are needed to determine the patient predictors (eg, gender and other demographics, duration of disease, bowel habit subtype, psychological symptoms, etc) that are associated with a positive treatment response and outcome. Future studies need to also address the durability of mindfulness meditation's beneficial effect beyond several months in IBS patients, and the biologic mechanisms that underlie the effect of mindfulness meditation.

SHARON KIM
Cedars-Sinai Medical Center
Department of Medicine

LIN CHANG
Oppenheimer Family Center for Neurobiology of Stress
Department of Medicine
David Geffen School of Medicine at UCLA
Los Angeles, California

Reply. We appreciate the excellent summary and insightful commentary by Kim and Chang, regarding our recent paper entitled "Mindfulness training reduces the severity of irritable bowel syndrome in women: results of a randomized controlled trial" (Am J Gastroenterol 2011;106: 1678–1688). We are in agreement with most of the authors' points, and are grateful for the opportunity to respond. In terms of study design, we would like to clarify that the study was single-blind and that there was a longer follow-up period than was reported; data from the 6-month follow-up is currently being analyzed and will be reported separately. We agree that, although there was a trend toward improvement in quality of life at the 2-week follow-up, significant improvement did not occur until the 3-month follow-up; this time-period was chosen a priori as our primary outcome point, and our findings are, as Kim and Chang discussed, consistent with observations that beneficial effects of psychological therapies are typically demonstrated over longer follow-up periods. We also agree that including only women in our study limits our ability to generalize the usefulness of mindfulness to men with irritable bowel syndrome (IBS). However, for this feasibility study, we felt that exclusion of men was justified, given that IBS is relatively less prevalent in men, thereby leading to potentially greater difficulties in recruiting men to our study, as well as given our uncertainty regarding women's comfort in discussing their IBS symptoms in a mixed-gender setting. Future studies should consider these factors in determining study design. We also agree that persistence and motivation are likely to be important factors in determining the success of mindfulness training, as with other interventions requiring behavioral change.

Kim and Chang's discussion of possible mechanisms of action of mindfulness in relieving IBS symptoms is of great interest and relevance to our research. In fact, in a follow-up paper published by our group, based on the same study data (J Behav Med 2011 Dec 8 [Epub ahead of print]), Garland et al explored the therapeutic mechanisms of action of mindfulness on IBS symptoms. We hypothesized that mindfulness training might target affective pain processing and catastrophic appraisals of gastrointestinal sensations. We used a theoretically grounded, multivariate path model to test therapeutic mediators of the effect of mindfulness training on IBS severity and quality of life. Study results suggest that mindfulness exerts therapeutic effects by training participants to observe their gut-related thoughts and feelings without catastrophizing or emotionally reacting to them, and to reappraise abdominal sensations in a less threatening way (eg, pressure instead of pain). Our future research agenda calls for further systematic investigation of the psychophysiologic mechanisms underlying the positive impact of mindfulness training on IBS symptoms.

SUSAN A. GAYLORD
Program on Integrative Medicine
Department of Physical Medicine and Rehabilitation
School of Medicine
The University of North Carolina at Chapel Hill
Chapel Hill, North Carolina

OLAFUR S. PALSSON
Department of Medicine
Center for Functional Gastrointestinal and Motility Disorders and Division of Gastroenterology and Hepatology
School of Medicine
The University of North Carolina at Chapel Hill
Chapel Hill, North Carolina

ERIC L. GARLAND
College of Social Work
Florida State University
Tallahassee, Florida

KETURAH R. FAUROT
Program on Integrative Medicine
Department of Physical Medicine and Rehabilitation
School of Medicine
The University of North Carolina at Chapel Hill
Chapel Hill, North Carolina

J. DOUGLAS MANN
Department of Neurology
School of Medicine
The University of North Carolina at Chapel Hill
Chapel Hill, North Carolina

WILLIAM E. WHITEHEAD
Department of Medicine
Center for Functional Gastrointestinal and Motility Disorders and Division of Gastroenterology and Hepatology
School of Medicine
The University of North Carolina at Chapel Hill
Chapel Hill, North Carolina

GASTROENTEROLOGISTS AND THE US OPIOID EPIDEMIC

Dorn SD, Meek PD, Shah ND. **Increasing frequency of opioid prescriptions for chronic abdominal pain in U.S. outpatient clinics. Clin Gastroenterol Hepatol 2011;9: 1078–1085.**

Abdominal pain is present in approximately 10%–50% of adults based on large, epidemiologic studies (Scand J Gastroenterol Suppl 1999;231:3–8) and is among one of the leading causes for consultation to a gastroenterologist (Am J Gastroenterol 2006;101:2128–2138). The evaluation and management of abdominal pain has been associated with significant health care costs (Gastroenterology 2002;122:1500–1511). Therapeutic options for abdominal pain depend on the underlying disorder and may range from proton pump inhibitor therapy for acid-peptic disorders and antispasmodics for irritable bowel syndrome to immunomodulator therapy for inflammatory bowel