Busting the Myth: The Real Scoop on Tea

Alissa Deeter and Miriam van Mersbergen

Alissa Deeter

Miriam van Mersbergen

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THE MYTH

It is generally believed that drinking caffeine free "herbal tea" is a positive step in vocal maintenance by offering up the benefits of medicinal botanicals as well as hydration and soothing warmth. In contrast, caffeinated tea is generally contraindicated for singer use due to its dehydrating reputation.[1] Recent research about caffeine's diuretic effects calls into question whether caffeinated tea, consumed in moderate amounts, is as dehydrating as historically regarded.[2] There is also a dubious understanding about what constitutes "tea" versus "herbal tea" and the benefits associated with these separate infusions. One major issue in disseminating the truth about tea is the sheer volume of information; a simple article database search using the keyword "tea" returns almost two million hits. With so much information, it can be difficult to extract helpful facts concerning singer use. The following will provide some clarity on the history of tea, its major components, and its medicinal reputation, as well as offering insight as to whether singers can safely drink it.

TEA TIME

The singer health community commonly dictates vocalists avoid consuming goods that could be detrimental for singing. When it comes to beverages, that counsel tends to include beverages containing caffeine.[3] What a conundrum then, when according to the Tea Association of the United States of America (www.teausa.com), Americans consumed well over sixty-five billion servings of tea in 2010, both hot and iced, equating to over three billion gallons and about half the American population drinking tea on any given day.[4] The majority of tea consumed was black tea, with green tea taking a modest second place. With such impressive consumption statistics, the question arises whether the majority of beverage-consuming singers truly abstain from tea in order to avoid the negative side effects that potentially could result from drinking it.

Tea has a rich history and a global popularity. Next to water, tea is reputed to be the most widely consumed beverage in the world.[5] Its presence can be traced back to China as early as 3000 BCE and originally was consumed as a medicinal drink for various illnesses. The practice of drinking tea as a health promoter commenced around 1100 BCE, and subsequent appreciation for it as a valued beverage resulted in a flourishing tea trade. Today, tea is considered a drink of both function and pleasure, offering up a purported bevy of health benefits while being aromatic and pleasing to the palate.[6]

TABLE 1. Property characteristics of green, oolong, and black tea.*

	Green Tea	Oolong Tea	Black Tea
Process	Short, no fermentation	Partial fermentation	Longer fermentation
Color	Green or yellow	Brown	Red or black
Taste	Sweet after bitter	Verdant and sweet	Strong, distinct flavor

*From A.B. Sharangi, "Medicinal and Therapeutic Potentialities of Tea [Camellia Sinensis L.]—A Review," *Food Research International* 42, no. 5/6 (June 2009): 534.

Strictly defined, tea is an infusion of leaves from the Camellia sinensis plant that is native to China and currently is harvested globally in more than thirty countries. Black, green, and oolong all are derived from C. sinensis. Of all the tea grown world-wide, 78% is black tea and 20% is green tea with the remaining 2% being oolong.[7] Distinctions between these teas depend on the fermentation process of the leaves. Fermentation in this case refers to oxidation and the amount of time the leaves are exposed to the air while drying. Differences in fermentation result in varied property characteristics (Table 1).

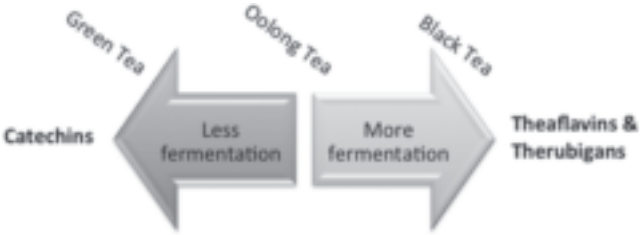

Figure 1. Polyphenol concentrations due to the fermentation process (from Raymond Cooper, D. James Morré, and Dorothy Morré, "Medicinal Benefits of Green Tea: Part I. Review of Noncancer Health Benefits," *Journal of Alternative & Complementary Medicine* 11, no. 3 [June 2005]: 521).

TEA CHEMISTRY—A PRIMER

Polyphenols

Brewed tea contains many active biological compounds, and the chemistry of tea changes depending on the level of fermentation the leaves undergo. The major components of interest are found in the structural category called *polyphenols*. Polyphenols are a class of chemicals found in many foods from fruits and vegetables to nuts, tea, and dark chocolate. These organic components underlie the unique physical, chemical, and biologic properties of various plants such as color and smell. Polyphenols can be split into two groups, *flavonoids* and *nonflavonoids*. Over 4000 flavonoids have been identified, many of which are found in produce and beverages such as tea, red wine, and beer.[8] Flavonoids have aroused considerable interest due to their potential beneficial effects on human health and have been reported to have antiviral, antiallergic, antiplatelet, antiinflammatory, antitumor, and antioxidant activities.[9] These alleged health benefits also have been associated with tea consumption due to the presence of these specific tea polyphenols.

The partitioning of polyphenols does not end with flavonoids. The amount of fermentation that tea leaves undergo dictates the kind of flavonoid compounds present. For example, to produce green tea, the leaves are steamed or dried at high temperatures to avoid oxidation. This process results in a high amount of flavonoids called *catechins*. The specific catechin compound epigallocatechin-3-gallate (EGCG) is identified as a principal component in green tea, contributing to approximately 30% of the total antioxidant capacity.[10] In the manufacturing of black tea, the leaves are permitted to wither and are then crushed, allowing oxidation to take place. During this process, the majority of catechins undergo an enzymatic transformation, resulting in a higher number of *theaflavins* and *thearubigins*. Both theaflavins and thearubigins contribute towards the taste and color of black tea and have their own antioxidant properties. Oolong tea is only partially fermented and therefore falls somewhere in between green and black tea in polyphenol concentrations (Figure 1).

About White Tea

White tea is derived from the young leaves and buds of Camellia sinensis and is harvested only once a year in the early spring. White tea is steamed and dried immediately

after picking to prevent oxidation, leaving the white leaf hairs intact and hence its white appearance. The history of white tea is not as clear and agreed upon as black and green tea and a survey of literature offered limited research available with large amounts of conflicting data. A study published in *Food Chemistry* points out, "In spite of numerous data about the phenolic constituents, antioxidant activity and ameliorating effects of green and black tea on human health, little is known in this sense about white tea, which is the rarest and the least processed tea.[11] Due to the divided opinions concerning white tea, the authors felt it best to leave this tea variety out of this particular discussion.

Antioxidant Activity

A significant portion of the value tea polyphenols possess relies on their antioxidant abilities. Antioxidants work by protecting cells from the destruction of free radicals.[12] Free radicals are molecules with unpaired electrons that go on a search and destroy mission in order to acquire the missing electron. Free radicals are not an exceptional event; they result from normal essential metabolic processes in the human body or from external sources such as exposure to X-rays, ozone, cigarette smoke, air pollutants, and industrial chemicals.[13] Antioxidants have an extra electron to give up and can keep the free radicals at bay from other cells; however, if there is an imbalance between the free radicals and the antioxidants, then the free radicals are allowed to attack nearby cells to steal away an electron, resulting in oxidative stress. Oxidative stress has been linked to cancer, aging, atherosclerosis, ischemic injury, inflammation, and neurodegenerative diseases (Parkinson's and Alzheimer's).[14]

Antioxidants are readily available in a bevy of food staples. Standard dietary antioxidants include vitamin C (in foods such as citrus, broccoli, and sweet red pepper), vitamin E (in foods such as almonds, spinach, and olives), and carotenoids (in foods such as carrots, sweet potatoes, and kale). Flavonoids are different compounds than antioxidants but do have antioxidant properties depending on their molecular structure. In tea, the major flavonoids that act as antioxidants are epigallocatechin-3-gallate (EGCG), the primary catechin in green tea, and theaflavin, a major component of black tea. The antioxidant properties of tea have been widely researched and assessed; although there is a wide margin of opinion as to the extent of the health benefits tea possesses, it is generally agreed that tea, particularly green tea, warrants a positive recommendation for consumption.

Caffeine

Caffeine is another chemical compound that is naturally occurring in tea. Similar to polyphenols, the amount of caffeine in a specific tea is dependent on the amount of fermentation the leaves have undergone. The United States Food and Drug Administration (www.fda.gov) reports that 90% of people in the world use caffeine in one form or another, and in the U.S., 80% of adults consume caffeine every day, making it America's most popular drug.[15] A normal dose of caffeine is generally considered to be 100 mg, which is roughly the amount found in a cup of coffee. Of all the tea classes, black tea has the most caffeine per cup (roughly around 30–60 mg), while green tea has the lowest amount per cup (15–20 mg) (Table 2).

According to the International Food Information Council Foundation (IFIC), a moderate intake of caffeine, around 300 mg/day, does not cause adverse health effects in healthy adults. Dr. Michael Glade, in his 2010

TABLE 2. Caffeine content in various beverages and other products.*

Product	Approximate Caffeine Content (per serving)
Green tea (8 oz)	20 mg
Oolong tea (8 oz)	30 mg
Hershey's Special Dark Chocolate Bar (1.55 oz)	31 mg
Coca-Cola (12 oz)	35 mg
Black tea (8 oz)	40 mg
Mountain Dew (12 oz)	54 mg
Red Bull (8.3 oz)	76 mg
Ben and Jerry's Coffee Heath Bar Crunch Ice Cream (8 oz)	84 mg
Coffee (8 oz)	100 mg
Excedrin, Extra Strength (2 tablets)	130 mg

*From Raymond Cooper, D. James Morré, and Dorothy Morré, "Medicinal Benefits of Green Tea: Part I. Review of Noncancer Health Benefits," *Journal of Alternative & Complementary Medicine* 11, no. 3 (June 2005): 521.

article for *Nutrition*, references a large body of scientific evidence that describes the beneficial effects of caffeine on humans including an increase in energy availability, an enhancement in cognitive performance, an increase in the ability to concentrate and focus attention.[16] The Mayo Clinic points out that heavy daily caffeine use, more than 500–600 mg/day, may cause adverse affects such as insomnia, nervousness, restlessness, irritability, stomach upset, elevated heart rate, or muscle tremors.[17]

Both historically and presently, the advice to singers to avoid caffeine runs through all disciplines of the voice and speech specialist professions, from speech-language pathologists, voice teachers, and reputable voice centers.[18] There is a long-standing belief that even low to moderate caffeine intake can lead to dehydration, and voice users and specialists know that systemic dehydration has deleterious effects on voice productions, requiring more airflow and effort to produce a soft voice and exacerbating vocal fatigue.[19] However, scientific evidence suggests that caffeine and singing is not as deleterious as it is made out to be, and in an earlier *Journal of Singing* article Vishar Bhavsar points out, "Despite caffeine's reputation as a potent diuretic . . . evidence is lacking for a significant effect of caffeine on body fluid balance."[20] According to the current available research, there are no outstanding contraindications that would deem low to moderate use of caffeine in healthy individuals as dangerous or detrimental to singers or singing. A recent study revealed that after thirty-five minutes of heavy voice use there was no difference in phonatory effort or airflow requirements between those who consumed large amounts of caffeine (480 mg) and those who consumed the same amount of noncaffeinated beverage.[21] Another study on the effects of caffeine and voice production revealed that individual variability and not the effects of caffeine appeared to contribute to differences on a measure of vocal stability.[22] A 2008 study stated that although a large caffeine bolus taken at once (250–500 mg) could cause mild dehydration, an intake of 38–400 mg taken throughout the day was well tolerated.[23] With these results in mind, it seems for vocalists that the intake of caffeine is a matter of individual oversight; if a person is sensitive to the effects of caffeine, that would be an indication to temper its use. Furthermore, if an individual has a medical condition, caffeine intake should always be discussed with a primary health care provider to ensure the safest consumption amounts.

MEDICINAL USES OF TEA

There has been considerable focus on the biological properties of tea and its ability to treat an impressive array of disorders, particularly green tea due to its catechin EGCG. The available data strongly supports the medicinal qualities and health benefits that come from consuming tea, but the reader should be aware that the research does not come to a universal consensus on tea's varied therapeutic attributes.[24]

The University of Maryland Medical Center (UMMC) has compiled an overview addressing the health benefits of tea. The list from Table 3 summarizes UMMC's information; for more information or to see UMMC's complete overview, see www.umm.edu/altmed/articles/green-tea-000255.htm. A few more health benefits from consuming tea may be found in Table 4.

MEDICINAL CONSIDERATIONS

The medicinal use of tea has a long tradition of recognition, both in treatment and prevention.[25] Despite such overwhelming evidence that the chemical properties of tea might contribute to improvements in general health, a thorough literature search on the effects of polyphenols, flavonoids, or catechins on vocal fold tissue or phonation reveals no such research exists. Therefore, one must apply reason and caution when making direct arguments for the positive properties of tea on the voice. Additionally, there are active substances in tea that could interact with other supplements and medications and potential tea consumers should take care to check with their health practitioner before incorporating it into a wellness regimen. The Natural Medicines Comprehensive Database (naturaldatabase.therapeuticresearch.com) offers an extensive compendium of medications and treatments that could interact with tea and its constituents. Some of the more common drug interactions include:

- adenosine (a medication often administered for an irregular heart rhythm);
- beta-lactam antibiotics (includes penicillin derivatives);
- benzodiazepines (medication commonly used to treat anxiety);

TABLE 3. Effects of Tea on Selected Health Conditions.*

Health Condition	Effect of Tea Consumption
Atherosclerosis	Population-based clinical studies indicate that the antioxidant properties in green tea may help prevent atherosclerosis (hardening of the arteries), and particularly coronary artery disease. Studies show that black tea has similar effects. Researchers estimate that the rate of heart attack decreases by 11% with consumption of three cups of tea per day.
High cholesterol	Research shows that green tea lowers total cholesterol and raises "good" cholesterol in both animals and people.
Cancer	Several population-based studies have shown that both green and black teas help protect against cancer. Emerging clinical studies suggest that the polyphenols in tea, especially green tea, may play an important role in cancer prevention. Researchers also believe that polyphenols help kill cancerous cells and stop their progression. Tea has shown activity with bladder, breast, ovarian, colorectal, esophageal, lung, pancreatic, prostate, skin, and stomach cancers. It is important to point out that some of these studies have conflicting results, and a few (stomach and esophageal) had data stating that green tea consumption was associated with an increased risk of carcinogenic activity.
Inflammatory bowel disease (IBD)	Green tea may help reduce inflammation associated with Crohn's disease and ulcerative colitis, the two types of IBD.
Diabetes	Green tea has been used traditionally to control blood sugar in the body. Animal studies suggest that green tea may help prevent the development of type 1 diabetes and slow the progression once it has developed.
Liver disease	Population-based clinical studies have shown that men who drink more than ten cups of green tea per day are less likely to develop disorders of the liver. Animal studies have shown that green tea helps protect against the development of liver tumors in mice.
Weight loss	Clinical studies suggest that green tea extract may boost metabolism and help burn fat. One study confirmed that the combination of green tea and caffeine improved weight loss and maintenance in overweight and moderately obese individuals. Some researchers speculate that polyphenols, specifically the catechins, are responsible for the green tea's fat-burning effect.

*From "Nutrition and Healthy Eating: Caffeine Content for Coffee, Tea, Soda, & More," Mayo Clinic; http://www.mayoclinic.com/health/caffeine/AN01211, 6.

- blood thinning medications (including warfarin and aspirin);
- chemotherapy medications;
- clozapine (a medication with antipsychotic effects);
- ephedrine (commonly used as a stimulant and appetite suppressant);
- lithium (a medication used to treat manic depression);
- oral contraceptives;
- phenylpropanolamine (an ingredient used in many over-the-counter and prescription cough, cold medications, and weight loss products).

But What About Chamomile?

Officially, tea is defined as being derived from the Camellia sinensis plant, but the infusions created from botanicals such as flowers and herbs are also being allowed into the tea class with the use of the label "herbal tea." Herbal teas are classified into four categories: single herb tea blends, such as chamomile; herb blends that combine two or more herbs; functional blends with herbs combined for a specific purpose like promoting weight loss or energy; and, finally, crossover herb blends that combine tea and herbs, such as black tea

TABLE 4. Effects of tea on selected health conditions.*

Health Condition	Effects of Tea Consumption
Arthritis	Antioxidants in green tea may prevent and reduce the severity of arthritis by diminishing inflammation. The compound EGCG inhibits the production of several molecules in the immune system that contribute to inflammation and joint damage in people with rheumatoid arthritis.
Skin disorders	Green tea constituents may be useful topically for promoting skin regeneration, wound healing, or treatment of certain skin conditions such as psoriasis and rosacea.

*From David Zieve and David R. Eltz, eds., "Medicinal Alternative Medicine Index: Green Tea," University of Maryland Medical Center; http://www.umm.edu/altmed/articles/green-tea-000255.htm.

with ginger.[26] A sampling of some of the more popular herbal botanicals may be found in Table 5. The consumer should be aware that many botanicals may have an impressive history for health promotion and medicinal benefits, but herbal manufacturers are not required to seek FDA approval. In addition, there are differing recommendations on dosages for tea consumption based on the specific research on a particular botanical blend. For example, research into some botanicals focus on the botanical's essential oils, or high concentrations of the leaves. Transferring their potential health benefits to tea infusions has to take into consideration that infusions are far weaker than the essential oil or concentrated leaf and may, in some cases, not be the appropriate carrier for the beneficial properties of that plant.[27]

TABLE 5. Selected herbs and potential benefits.*

Herb	Potential Health Benefits
Acai	Acai tea may help strengthen the immune system and fight against free radical damage.
Chamomile	Chamomile tea is considered one of the most popular herbal teas and is widely known to help usher in relaxation by soothing and sedating nerves.
Cinnamon	Cinnamon tea may help improve circulation and ease congestion. It may also have antidiabetic properties.
Echinacea	Echinacea tea is a very popular home remedy against coughs, colds, flu, and other congestive and respiratory problems.
Ginger	Ginger tea is a versatile drink that helps alleviate such diverse conditions as headaches, heartburn, inflammation, and nausea. It also may help lower the risk for cancer and neurodegenerative diseases by possessing additional chemical characteristics from those mentioned earlier.
Lemongrass	Lemongrass tea may be helpful in reducing cholesterol and uric acid levels. This may also be promising in the fight against cancer as it contains substances that may anticarcinogenic in addition to those mentioned earlier.
Peppermint	Peppermint tea is another popular herbal tea. It has soothing and refreshing qualities. It may help support good digestion and as such, may be a good after-dinner drink.
Slippery Elm	Slippery elm tea may be helpful in the treatment of coughs, colds, sore throat, and other lung and congestion problems.
Yerba Mate	Yerba mate tea is a South American brew believed to help lift energy levels, improve endurance, and enhance mental clarity

*From A. Huntley and E. Ernst, "Herbal Medicines for Asthma: A Systematic Review," *Thorax* 55, no. 11 (November 2000): 925–929.

TABLE 6. Chart of approximate amounts and steeping times*

Type of tea	Amount per serving (per 6–8 oz. of water)	Water Temperature	Steeping
Green	1 teaspoon	180°	2–3 minutes
Oolong	1 teaspoon	185°–200°	4–7 minutes
Black	1 teaspoon	206°	3–5 minutes
Herbal Blends	1 tablespoon	206°	5–7 minutes

*From "Brewing Art of Tea," Art of Tea; http://www.artoftea.com/learn_about_tea/steeptime.html.

TEA SELECTION AND PREPARATION

There are upwards of 2000 types of tea derived from 82 different species of C. sinensis.[28] With so much variety, the consumer can indulge personal taste and satisfaction as a guiding force in tea selection. Like other botanical products such as beer and wine, agricultural differences like climate, soil, and harvest can have an effect on aroma, taste, and appearance.[29] A visit to a local tea house or shop can dispense some rudimentary knowledge to a tea novice.

Elements of Preparation

Tea can either be prepackaged in tea bags or can be purchased loose-leaf. Generally, the larger the leaf the better the infusion for both taste and beneficial properties, and loose-leaf teas tend to offer a finer product since the leaf pieces are usually larger. Many tea drinkers prefer bagged teas for the portability and general convenience and there are quality bagged teas available. Still, preparing loose-leaf tea need not be a chore as long as the proper equipment is handy. A traditional teapot, infuser, French press, paper tea filter, or an Assam pot are all viable tea brewing devices.

The water temperature and steeping time varies depending on the type of tea (Table 6). Most quality teas can be re-steeped multiple times. The general rule concerning tea preparation is to brew tea in order to satisfy personal taste unless medically prescribed by a health care professional. Even different types of a specific tea variety can fluctuate in serving amounts and steep times. For instance, there are countless kinds of green tea cultivated globally. Each of these green teas will have a slightly different preparation requirement in order to bring out its optimal attributes. Even the type of water used can affect the taste; unfiltered tap water can possess other tastes and odors, eventually revealing themselves in a prepared cup of tea; therefore, filtered or bottled water is highly recommended.[30]

TEA AND SINGING

Research into the direct effect of tea of any variety on any aspect of vocal performance is nonexistent. Systematic scientific investigations into this would have to account for the overwhelming variables associated with tea in addition to the many factors that go into good singing, such as vocal fold mucosa integrity, muscular coordination, attention and concentration, and basic musicianship skills. Individual preference about the consumption of tea, or any fluid, before, during or after vocalizing may arise from time to time, but no systematic study exists about the optimal use of fluid consumption for vocal output. When addressing the issues of tea consumption in the context of vocal training, although not entirely comprehensive, there are some basic principles to follow in using tea as an aid to singing.

First, any recommendation to employ tea as an aid to singing needs to be tempered. Although tea may prove useful to soothe pharyngeal mucosa and help loosen tight muscles in some, a singer having chronic problems in any area always warrants appropriate referrals to a healthcare provider or singing technical expert. In addition, *any* recommendation as to the type of tea from the Camellia sinensis or other botanical should be done with extreme caution as there are licensed professionals in the area of botanical medicine who may construe innocent suggestions as practicing their form of medicine without a license. Caution and tact in recommending the specific use of tea to aid in singing is highly recommended.

Second, if a vocalist is invested in the use of tea as an aid to singing, furthering a base of knowledge will not only help him or her be more informed, it will also be enjoyable. There are numerous training seminars around the country about tea, and accessing the Tea Association of America's website (www.tea.usa.com) would be a first step in learning about furthering education in this area. Additionally, aligning with medical professionals specializing in botanical medicine may also prove useful in a personal education and will also provide the singer with a referral source if needed.

Finally, engaging in simple empirical testing on the effects of tea on an individual's singing performance may help a person determine more definitive effects of tea on phonation. For example, an individual may choose to keep a log that specifically addresses the use of tea and singing, recording details such as of how long the voice takes to warm up, ease of phonation, or facility of challenging material as well as details about tea consumption prior, during, or after singing. Over time, a pattern could arise that may help in determining that individual's personal response to drinking tea. To be sure, this is not a bias-free experiment, but it can lend more control to personal observations about the effects of tea on singing. The use of tea in the context of singing will probably never fully be understood but increasing the basic knowledge of tea and integrating this with diligent technical awareness may provide more clarity and less superstition.

CONCLUSIONS

Tea is consumed world wide by millions of people every day and has the caché of being a drink of pleasure as well as health promotion. Tea is a rich source of polyphenols which possess significant antioxidant properties, and these biologically active compounds have been associated with activity in the treatment and prevention of a wide variety of diseases. Although there are numerous scientific studies regarding the health benefits of tea, the results are wide ranging and at times inconclusive. Continued research must be done to determine a more defined prescriptive use of tea as a medicinal asset.

Because caffeine is a component of tea, it is easy to artificially supplant the effects of caffeine for those of tea; however, research indicates that the level of caffeine in tea is low enough to afford a few servings a day and still remain at a low to moderate daily caffeine intake. Caffeine has a long history of singer avoidance, but current research shows that caffeine is not the detrimental compound as was formally thought. Singers can drink caffeinated tea with the understanding that caffeine sensitivity is an exclusive awareness that only the consumer can ascertain.

Tea, herbal teas, and blends are beverages widely accepted as positive constituents for health promotion and general well-being. As with any medicinal treatment, the consumer should first consult with his or her care provider before incorporating tea into a personal wellness regimen. Whether the consumer is drinking it for pleasure or for medicinal advantages, there are few vocal drawbacks to indulging in a beverage that has such an ancient and revered past and such a promising future.

NOTES

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Alissa Deeter, a nationally recognized performer with firm footing in both classical and music theater circles, is currently serving as treasurer for the Mid-Atlantic region of the National Association of Teachers of Singing. Dr. Deeter is an Associate Professor of Applied Voice and Vocal Pedagogy at the University of North Carolina Charlotte, and is the coordinator for the Graduate Certificate in Voice Pedagogy. She received her undergraduate degree in Vocal Performance with a theater minor in from Central Michigan University, and both a Masters of Music in Opera Performance and a Doctor of Music in Vocal Performance from Florida State University. Understanding human physiology and anatomy has always been a cornerstone of knowledge for Dr. Deeter, and during her doctoral work at Florida State she also attended the Core Institute of Massage Therapy in Tallahassee to better integrate those studies with her singing and teaching methodologies. She has become a leader in optimizing a "form follows function" approach to singing, has been published in the *Journal of Singing*, and is a regular presenter at conferences and academic institutions nationwide. Dr. Deeter wrote the liner notes for the recently released CD, *From The Heartland* (Albany Records-TR1349), as well as appearing on the duet "It Was a Lover and Her Lad." Her new book, *The Mélodies of Francis Poulenc: A Study Guide*, is scheduled to be available in early 2014 by Scarecrow Press.

Miriam van Mersbergen is Assistant Professor in the Allied Health and Communicative Disorders Department at Northern Illinois University in DeKalb, Illinois. She began her academic career studying music and communication arts at Calvin College. After a brief career in music, she returned to academia and studied speech language pathology and vocology at The University of Iowa and continued with doctoral studies in speech language hearing sciences and psychology at the University of Minnesota. Her research areas include psychological influences in voice production with an emphasis in emotional processes. She uses psychometric, behavioral, and psychophysiological methods to investigate influences of affect and cognition on voice production.