

# The Voice

The Voice

VOICE OF THE EDITOR

Kimberly Steinhauer

## HYDRATION AND VOICE: GOT WATER?

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**T**his issue of our newsletter addresses a hot topic *boiling* over in voice training & life: hydration. How does hydration impact the entire voice production system from respiration to phonation to resonance? I asked our leading experts to *shower* our readers with their latest clinical experience and research data to answer this and other questions.

- What is the best fluid for hydration?
- If we are vocal athletes, shouldn't we be looking at electrolyte replacement as well as water for lubrication AND energy in high level performance?
- How much of that fluid do we need to intake daily to make a difference in voice production?

- How long does it take that fluid to reach the mucosa and make an impact on lubrication?
- What are the data supporting the effects of hydration on respiration, phonation, and resonance?

All of us advise our patients and students to *pee pale and sing (or speak) clear*. But, did Enrico Caruso, Maria Callas, and Martin Luther King sip water daily or tote the water bottle to every vocal performance? Our authors from around the world include scientists, physicians, clinicians and dietitians who will “whet” and “wet” your appetite for more of their stimulating research. So, *soak in* this Voice Foundation Newsletter highlighting the latest on hydration and voice.



## VOCAL FOLD HYDRATION: WE HAVE A LOT TO LEARN

By Thomas L. Carroll, MD and M. Preeti Sivasankar, Ph.D., CCC-SLP

**D**espite claims of superior electrolyte replacement by sports drinks and the soothing coating action of certain teas, water remains

the best hydration substance for maintaining healthy vocal fold physiologic function. This is a reflection of two things: first, the other substances have not been studied in any depth regarding their rehydration abilities as they pertain to the vocal folds and two, most of us encourage hydration with



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plain water for our patients and students. Thus, tradition and practicality drive research involving nature's gift. The take-home message from both in vitro animal and in vivo human research in regards to vocal fold hydration is that dehydrated vocal folds do not

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## Welcome Dr. Hamdan

We are pleased to announce the addition of Abdul-latif Hamdan, MD, EMBA, MPH,  
FACS to the Board of Directors of The Voice Foundation.



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MK-442 Rev. A

## Vocal Fold Hydration: We Have A Lot To Learn, continued

*(Continued from page 1)*

function physiologically as well as hydrated vocal folds. Additionally, hydrated vocal folds need a lower lung pressure to initiate vibration and thus function more efficiently.

The ability of the vocal folds to maintain hydration homeostasis is complex, involves both systemic and superficial water, and is incompletely understood to say the

**“Fluid compartments that are interconnected within the vocal folds and the presence of directional water movement suggest a signaling pathway linking superficial and systemic hydration.”**

least. A complex dance between epithelial cell ion transport, specialized ‘pores’ that allow water flow directly through the epithelial cell membranes and the resultant concentration gradients that bring water in and out of the vocal fold epithelium, and secretion from glands all lead to changes in vocal fold hydration. Within the vocal folds, proteins,

electrolytes, and extracellular matrix macromolecules such as hyaluronan regulate internal hydration. Fluid compartments that are interconnected within the vocal folds and the presence of directional water movement suggest a signaling pathway linking superficial and systemic hydration.

The truth is clear: we have basic information and few concrete answers in regards to water and its role in vocal fold physiology. Research has not demonstrated how long it takes when one drinks water to feel or demonstrate the benefit in the vocal folds. There is also no scientific evidence that a certain amount of water daily leads to better vocal health. Nor has it been demonstrated that direct surface hydration (inhalation of steam) provides any effect beyond obvious transient surface lubrication and decreased lung pressure for speaking. But many questions remain: How much steaming is helpful? How long should one steam? Are there any proven downsides? We don’t have good evidence to say.

All is not lost. Both bench and human subject studies provide growing evidence to the effects of hydration and dehydration on vocal fold physiology and voice production. In vitro studies demonstrate that hydration treatments optimize vocal fold biomechanical proper-

ties. These studies used excised animal laryngeal tissue to demonstrate increased lung pressure for speaking when the tissue is placed in a dehydrated state. In vivo studies reveal that the beneficial phonatory outcomes of current hydration treatments (e.g. increasing water intake, humidifying ambient air, nebulizing solutions into the airway) demonstrate positive trends. However, the improvements in vocal function, mostly studied as phonation threshold pressure (lung pressure needed to start vocal fold vibration), with these systemic and/or superficial hydration treatments have typically been highly variable, of small magnitude, and of transient duration.

Water, therefore, remains the hydration solution of choice for the vocal folds based on all the evidence we have to date. Further research should continue to add to the understanding of how and why vocal fold hydration is so important to voice physiology.

## B

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## VOICES OF SUMMER GALA 2013



MARIA RUSSO, HONOREES VY HIGGINSSEN AND DR. JOHN, ROBERT T. SATALOFF, CHAIRMAN



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## Vocal Fold Hydration: We Have A Lot To Learn, continued

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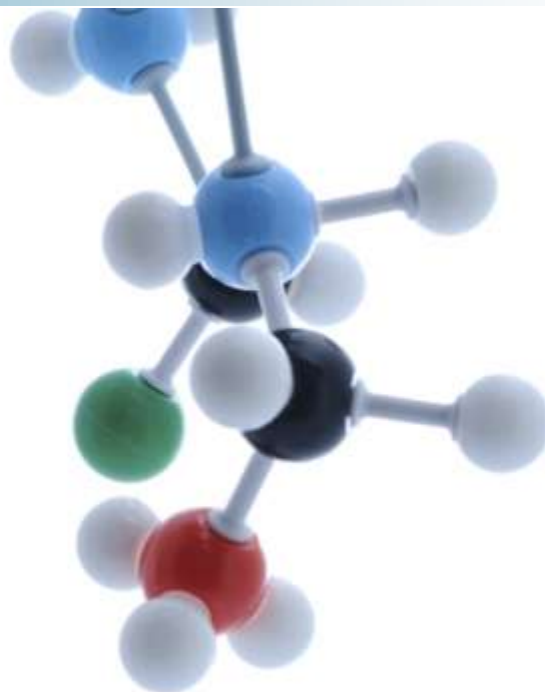
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## VOCAL FOLD HYDRATION: THE QUEST TO SUPPORT CLINICAL PRACTICE WITH EVIDENCE-BASED RESEARCH

Ciara Leydon, PhD,  
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**A**dequate vocal fold hydration is necessary to maintain optimal vocal fold health and function. However, challenges to vocal fold hydration occur daily. These challenges reduce efficiency of vocal fold vibration; increase perceived phonatory effort, discomfort, and fatigue; decrease pitch range; and reduce voice quality. To prevent, or alleviate, these effects, voice patients are frequently encouraged to maintain adequate hydration.

Both systemic and superficial vocal fold hydration are targeted by hydration interventions. Systemic hydration refers to internal bodily hydration. It is determined, in part, by the amount of fluid ingested and overall health. It can be compromised by medications and illnesses, medical interventions such as dialysis, emotional factors, and aging. Superficial hydration refers to fluid covering the vocal fold surface. It provides a physical and biochemical barrier protecting the underlying vocal fold mucosa from mechanical damage, irritation, and pathogen invasion. It is maintained by

water fluxes across the epithelium, the layer of cells lining the vocal folds (1), as well as by specialized mucus-secreting glands and cells in the supraglottic and subglottic regions. Superficial hydration can be compromised by behavioral challenges including mouth breathing or exercise, and environmental challenges such as increased temperature and deconditioned air.

Hydration intervention is a key component of vocal hygiene protocols (2). A variety of interventions are used clinically. They include techniques to increase systemic hydration by drinking water and other fluids, such as electrolytic drinks. Other interventions are used to increase lubrication of the vocal fold surface. These include administering nebulizing treatments, ingesting mucolytics or expectorants, increasing environmental humidity, and nasal breathing. Dosage and duration of interventions vary considerably across practices.

Clinical experience in treating professional voice users with voice disorders tells us that hydration interventions improve vocal outcomes. Perhaps surprisingly, clinical research has yielded equivocal results on the benefits of hydration treatment on vocal function. A meta-analysis of studies examining the effects of hydration on vocal function re-

vealed a tendency for hydration to improve ease of phonation, as measured by a reduction in phonation threshold pressure (3). However, there was substantial variation in findings across studies and the effect was not statistically significant.

Differences in findings across studies may be attributed to variations in the amount, type, and duration of treatments, phonatory tasks, and choice and elicitation of voice outcome measures. Other factors, such as the individual differences in physiology, vocal and general health status, and extent of professional vocal training, likely affect outcomes. For example, patients with vocal fold fatigue may be more susceptible to the deleterious effects of inadequate hydration on vocal function, than vocally healthy participants (4). Furthermore, in classically trained sopranos, a nebulized hydration treatment minimized perceived adverse vocal effects associated with laryngeal dryness (5). Interestingly, similar improvements were not observed when untrained subjects received the hydration treatments. Thus far, clinical research has been unable to offer conclusive support for the effectiveness of clinical hydration interventions on vocal fold function or provide general or personal-

(Continued on page 7)



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## VOCAL FOLD HYDRATION: THE QUEST TO SUPPORT CLINICAL PRACTICE WITH EVIDENCE-BASED RESEARCH

(Continued from page 6)

ized prescriptive protocols for best practice.

Tissue research has provided us with important clues on the clinical benefit of hydration interventions. For example, the effects of hydration on the biomechanical properties of vocal folds have been studied using ex vivo models. Internal vocal fold hydration reduces phonation threshold pressure in excised larynges (6). Conversely, superficial and internal vocal fold dehydration increase vocal fold stiffness and viscosity (7), vibratory efficiency, and glottal airflow in these models (8). The cellular mechanisms underlying vocal fold surface hydration regulation have also been examined using ex vivo models. Epithelial cells contain a mechanism for regulating vocal fold surface hydration through ion and fluid fluxes (1). Through this tissue work, we are beginning to develop a theoretical foundation for understanding the clinical benefits of hydration on vocal fold physiology.

In conclusion, the benefits to vocal fold function, low cost, and accessibility of these treatments make hydration interventions popular. However, despite the well-accepted clinical practice of encouraging patients to ensure adequate hydration, many questions remain regarding

best practice for hydration intervention. For example, which interventions are most effective? What dosage should be recommended and for how long? How much liquid, and what type of liquid should our clients imbibe to maintain optimal vocal fold physiology? How long will benefits last? What roles do individual differences, such as health status and aging, play in mediating the benefits of hydration? Despite clinical and basic research in this area, we cannot yet provide definitive answers on best practice and often must rely on clinical experience to guide our patients.

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## World Voice Day April 16

[voicefoundation.org/events/world-voice-day/](http://voicefoundation.org/events/world-voice-day/)

[www.world-voice.day.org](http://www.world-voice.day.org)

## The Return of the Stroboscopy Oscars

### CALL FOR STROBES

You will be happy to know that 2014 marks **The Return of the Stroboscopy Oscars** at the 43rd Annual Symposium: Care of the Professional Voice. The format will include different categories and special prizes.

Please send your Strobe in an email to Mike Johns by April 15,

## STROBOSCOPY OSCARS 2012 FINALISTS



## PONDERING PERFORMANCE HYDRATION FOR VOICE: IS WATER BETTER?

By Annie McCoy, RD,  
CDE, LDN

**W**ater makes up about 60-75% of the body's weight and works as the transportation system for nutrients while lubricating body tissues and protecting them by acting as a shock absorber and a temperature regulator. Tissues, organs and cells are made up of mostly water; this is not a news flash. The vocal folds and vocal tract are tissues, organs and cells. In order to answer the questions surrounding proper hydration for vocal performance we must first understand proper hydration for daily living. A performer who is not hydrated for activities

nutrient; the daily requirement, sources and special needs and considerations for vocal performance.

Water is a vital link to life and therefore a vital link to vocal health. The human body requires about 1.5 to 3 liters of water a day depending on the reference; this is a wide reference range! The origin of the "at least eight – 8oz. glasses of water a day" rule is thought to come from a 1945 Food and Nutrition Board of the National Research Council recommendation which states 'A suitable allowance of water for adults is 2.5 liters. I find this hard to believe since 1 liter contains 33.8 oz.; this would equate to 84.5oz = 10.56 8oz. glasses of water a day. A more modern reference bases needs on the 'sedentary adult' which is more of a reality in 2013. This 2009 reference from the European Journal of Clinical Nutrition states that 'a sedentary adult should drink 1.5 liters of water a day; this is about 6 and 1/3 cups of water. The Institute of Medicine (IOM) published a Dietary Reference Intake for Water (actual fluid intake separate from the water we intake through foods) in February of 2004. The Adequate Intake (AI) for sedentary men and women 19 – 50 years old. is 3 liters (13 cups) and 2.2 liters (nine cups) a day respectively. References discussing absorption of water

say that the body cannot absorb more than about one cup of water every 20 minutes. The question remains - how much water should you drink to achieve proper hydration?

Hydration status can be measured in many ways; three common methods are body weight, serum osmolarity and urine indices. The most practical for a vocal performer is probably urine color. I don't think it is necessary to carry around a urine color chart that is sometimes used in nursing homes but rather use the common sense method of singers---"Clear pee = Clear voice." Athletes use the weight method which is simply replacing the weight lost during an event with an equal amount of water; vocal performance is exercise so this method could be considered. For every pound lost during a performance; the vocalist could replace the fluid loss with 16 oz. of water. Osmolarity is reserved for medical evaluation of hydration – perhaps this could be incorporated in research for vocal hydration. Hydration through the lifecycle of the vocalist must be considered. The thirst indicator in the brain is not as accurate as we age. Usually by the time we are thirsty we are experiencing mild dehydration. Mild dehydration is associated with mental confusion, mucosal dryness, hypotonia of ocu-

**"Hydration status can be measured in many ways; three common methods are body weight, serum osmolarity and urine indices."**

of daily living cannot expect to have proper hydration for proficient and powerful performance. While there are recommendations for maintaining a hydrated state, there are many variables involved that affect hydration. This article will review water as an essential



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# PONDERING PERFORMANCE HYDRATION FOR VOICE: IS WATER BETTER?, CONTINUED

lar globes, orthostatic hypotension and tachycardia. So if a vocalist feels anxious, forgets the words, and has a racing heart is it anxiety or mild dehydration? Many variables can contribute to these common performance challenges but vocalists can at least rule out dehydration as a cause if they are properly hydrated before the event. Again, I believe the most practical way to answer our personal hydration equation is with the color of our urine; clear urine = adequate hydration. Don't wait until the day of performance to try to obtain clear urine; aim for clear urine daily.

The best fluid for hydration is usually water. However, sports nutrition research shows that moderate to high intensity activity longer than 60 minutes may require a sports drink with 6-8% carbohydrate for best hydration recovery. High sodium and po-

tassium losses can occur in some people during exercise; a salty pre-exercise meal or snack with high potassium fruit and/or vegetables may prevent this loss. Could a vocal performance have the same effect on the body as an endurance event? Could a grapefruit with a little salt be the perfect snack? What affect do sodium and potassium have on the vocal folds? There are so many unanswered questions.

In closing, hydration for the voice starts with hydration of the body. We need to start with the basics of drinking at least 6 – 9 eight ounce glasses of water a day. Our needs are as individual as we are; and our needs will vary depending on our age, sex, size, and climate, physical and mental health. There may be a benefit to using drinks with added sodium and potassium for longer performances. However, a combination of the weight

method (for every pound lost drink 16 oz. of water) and "clear urine = clear voice" is definitely the best starting point.



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Sports, Cardiovascular, and Wellness nutrition (SCAN)Nutrition Fact

"So if a vocalist feels anxious, forgets the words, and has a racing heart is it anxiety or mild dehydration?"

*drink more*

**WATER**

# VOICES OF SUMMER GALA- MORE!

DR. BARRY BITTMAN  
WITH VY HIGGINS  
AND AUDIENCE  
ENJOYING GOSPEL  
TEENS



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THIER



CAITRIONA MUNIER  
AND SON TIM



SINGING SCIENTIST:  
DR. ISABEL GARCIA-LOPEZ



MATTHEW EDWARDS, JERRY  
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## GREAT GALA MOMENTS



**DR THOMAS CARROLL, BRENDA SMITH,  
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**JEANIE LOVETRI, DEBORAH FEIJO  
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SAMANTHA WARHURST,  
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AND  
NANCY SOLOMON**

## VOICE FOUNDATION NEWS

## 43RD ANNUAL SYMPOSIUM HIGHLIGHTS

FRIDAY MORNING SESSION May 30, 2014

*Don't Take My Breath Away*

Moderator: Nancy Pearl Solomon

John Cohn, MD

Christine Sapienza

Brenda Smith

Amanda Gillespie

Leah Helou

Aaron Ziegler

Quintana Awardee: Fari Alipour, PhD  
*Tools for Modeling Phonation*

Keynote Speaker: David Huron, PhD

G. Paul Moore Lecture: Gayle Woodson, MD  
*Laryngeal Nerve Injury: The Larynx is Not a Toaster*

SUNDAY STROBOSCOPY OSCARS

## VAN LAWRENCE FELLOWSHIP

NATS AND THE VOICE FOUNDATION \* THANK YOU FOR YOUR SUBMISSIONS



*"... The fellowship also fostered wonderful collegial conversations with our leading voice researchers and scientists. Since the aerodynamic and acoustic measures were inconclusive but the self-perceptual assessment showed promise, further study is currently being designed. I will forever be indebted to the Voice Foundation and NATS for the Van L. Lawrence Fellowship and feel such gratitude to be in the company of my fellow recipients."*

Kari Ragan

DR. KARI RAGAN  
PRESENTING THE  
RESULTS OF HER  
VAN LAWRENCE  
FELLOWSHIP  
PROJECT

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### SUBMIT NEWS AND UPDATES

If you have an event or an update you  
would like to share in the newsletter,  
please email:  
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## [ MAY – JUNE 2014 ]

| SUN    | MON | TUE | WED                   | THU | FRI  | SAT |
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|        |     |     |                       |     | GALA |     |
| 1 JUNE |     |     |                       |     |      |     |
| SYMP   |     |     |                       |     |      |     |

### SCHEDULE OF EVENTS

- October 31, 2013 Abstract Submission Deadline
- October 31, 2013 Submit your intention letter for the Sataloff Award
- November 15, 2013—Van L. Lawrence Fellowship submission deadline.
- January 1, 2014—Registration for the 43rd Annual Symposium opens
- February 1, 2014—Submission Deadline for the Hamdan International Presenter Award
- March 1, 2014—Proposal Submission Deadline for New Investigator's Forum
- April 16, 2014—World Voice Day
- May 28–June 1, 2014 43rd Annual Symposium: Care of the Professional Voice
- May 30, 2014—Voices of Summer Gala