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Eating Well by Breathing Well

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About the Authors



David A. Edwards, Ph.D. is a scientist who explores new ways of improving human health and wellness by the air we breathe and the food we eat. Professor of the Practice of Bioengineering at Harvard University (2001-2019), he is a member of US and French national academies of engineering and recipient of many national and international awards and distinctions. His healthcare inventions have led to new pharmaceutical products, such as inhaled L Dopa (Inbrija) for Parkinson's treatment, and consumer health products, such as FEND, for airway hygiene. His food inventions have led to new food companies, such as Foodberry, and innovation restaurants in France and the US, including Cafe ArtScience. He has written several books on the creative process including *ArtScience: Creativity in the Post-Google Generation* (Harvard Press 2008) and *Creating Things That Matter* (Holt 2018), winner of the Nautilus Book Award in the category of creativity. His work has been widely reported in the media, including the *New York Times*, CBS, CNN, BBC, *Le Figaro*, among others. Photo: © Adam DeTour. [LinkedIn](#).



Touré Roberts is a bestselling author of *Purpose Awakening: Discover the Epic Idea that Motivated Your Birth, Wholeness: Winning in Life From the Inside Out, and Balance — Positioning Yourself To Do All Things Well*, released in April of 2022. Touré's work has been featured on most major news outlets including CBS, MSNBC, Good Morning America, *Success* magazine, and *Entrepreneur* in addition to guest appearances on the Discovery Channel, OWN, and BET. Touré is most widely known for being the founder of one of the most influential faith and empowerment congregations in the world, ONE. (Formerly One Church LA). [LinkedIn](#).

Eating Well by Breathing Well



The original Whaf by French food designer Marc Brethillot in collaboration with David A. Edwards in 2010 at Le Laboratoire in Paris. © Phase One Photography

Eating habits are the hardest to change. That's because our food cravings are hard-wired into our brains. Some of our food cravings, as in our natural preference for the sweet versus the sour, trace back to human evolution, and in this case, the body's need of carbohydrates to stay active. Some we develop over a lifetime of flavor education. We may love a diet of poor nutritional value, not because our bodies respond well to this way of eating, but because our brains have programmed the pleasure of the gratifying experience of this diet with a flavor palette we remember, and have a hard time forgetting.

Over the last 75 years, while the hospitality industry has grown to a global market size of over \$6 trillion dollars, cardiovascular disease has become the principal cause of death and morbidity in the world. Famine has fallen precipitously over this timespan, while nutrition access per fed soul has gone in the other direction. Our nutrition crisis is not only driven by what we serve on our plates. It is programmed into our brains — and in a way that is unfairly distributed based on economic status, place of birth, and race. The poor and those of color eat less well and have less opportunity — or craving — to eat well, than everyone else.

There are many things to be done within the hospitality industry to improve nutrition access. As coauthors who have actively participated in the industry across this nutrition access divide — one (David Edwards) as a restaurant owner in largely white Cambridge Massachusetts and the other (Touré Roberts) as the leader of one of the largest black and brown religious communities in the world — we believe something positive (even delicious) can be done that is equally good for the industry and healthy for us all.

What can be done is as simple as the air we breathe.

We assess air quality in various ways. One important measure is by the number of particles that are so small you breathe them into your lungs. These are referred to in the Air Quality Index (AQI) as PM 2.5 — that is, airborne particles that are smaller than 2.5 μm , which is about a 50th of the diameter of a hair on your head. Such small particles you cannot see, and indeed not until around 25 years ago did scientists even begin to realize that these invisible particles around us (over 80% of the particles in the air are smaller than 1 μm !) are the very worst form of particulate pollution of all. Science has since that time shown a correlation between the level of fine particles in the air and obesity. Perhaps less surprisingly, it has also shown a correlation between fine particulates in the air and asthma, COPD, allergies, sleep apnea, and infections by influenza and COVID-19.

Breathing lots of small particles kills us. It also alters flavor perception. We experience flavor differently when the air is dirty relative to when it is clean. Dirty air interferes with our olfactory receptors, confusing them. Science has also shown that we live shorter lives when our perceptions of scent and flavor diminish.

Another way to assess air quality is by the amount of water in the air. This is generally reported as a relative humidity value, which is the amount of water in the air at a particular temperature. As the air temperature goes down, the amount of water that can be held by the air goes down, too. The relative humidity on a very cold winter day may be 80%, while walking indoors on that same day, and into a room with a comfortable temperature, the same amount of water is in the air as was in the air outdoors, while, since the air is warmer and can hold more water, the relative humidity falls, and might be as low as 10%.

This amount of water in the air is critical to nutrition access, too. Why? We perceive flavor better when the air is moist than when it is dry. This is because the tissue inside our noses is covered by water, while flavors produced by odorants do not solubilize in water easily. So these aromas, which contribute over 80% of our brain's perception of flavor, benefit by "docking proteins" (called olfactory binding proteins) that shuttle the

flavors from the air inside our noses to olfactory receptors (in our noses these connect to olfactory neurons that shuttle signals to our brains) in order that we can perceive them. So as our noses dry out, these docking molecules denature and cease to work so well. We appreciate nutritious tasty food less when our noses are dry than when they are wet — simply because our flavor sensitivity is dialed down. Dry olfactory tissue (what we mean by “dry noses”) can also be caused by dehydrated bodies, and, when it comes to eating, dry food.

One of the very interesting recent scientific findings of flavor perception is that aromas do not need to be volatile for us to perceive them. That’s because they move from our mouths to our noses in the form of tiny droplets or food aerosols. When our food is dry, as in a potato chip versus a fresh orange, our brains have less chance of perceiving what’s going on in our mouths, that is, of flavor perception. Dryness in the air as in our bodies and as in our foods is therefore generally bad for nutrition.

Maybe more surprisingly, dry air also increases risks of asthma, COPD, allergies, sleep apnea, and infections by influenza and COVID-19.

There is an unfairness of nutrition access across the line that divides the rich and the poor, the colored and the non-colored. There is also an unfairness of air quality and hydration status across this same divide. These inequalities are linked — since dirty air and dry air (or dry food, dry bodies) work in the same way to harm our eating experience.

We believe the hospitality industry has a champion role to play in the redesign of the air we breathe to help us all eat better and live longer. Simple measures of food design, environmental design, and food rituals can measurably improve nutrition access without harming the bottom line (in every sense of the expression). And because the air we breathe is less easily partitioned by the walls and national frontiers we put up around us, we believe this opening of access can be an opening for us all.

We should obviously do what we can to clean the air. The recent pandemic has pointed the industry in this direction, and efforts to keep our air clean should continue. Open windows where we can to avoid the accumulation of toxic air that occurs when a room is inhabited, and otherwise good air circulation with HVAC filtration systems are the basics of effective indoor air cleansing. Our restaurants tend to be cool and dry. And when they are humid they tend to be too humid. It is found that the optimal humidity for respiratory health — is between 40-60% relative humidity. Lower than this and our olfactory tissues dry out, while higher than this and we tend to breathe into our airways, and our noses, fomites and airborne particulate matter that can hurt us (and deaden our

sense of smell). We should serve food that is well-hydrated. A banana, lettuce, and a tomato are comprised of 75% to 95% water by mass. Beef and fish are about 70% water. A potato has around 75% water by weight, while a french fry has about half this much water, and a potato chip has only around 2% to 3% water. The same is true of other processed foods, like breakfast cereals or cookies. Ultra-processed foods tend to have very low water content. The more natural, fresh, unprocessed our foods, the more hydrated they are, the more we actually taste them, and the more our brains pay attention, guiding us to crave what is nutritious.

Given what we know today of the power of olfaction, we can begin to design new, exciting food rituals that hydrate and flavor educate. In our Brain Food experience at MIT during the Cambridge Science Festival in October 2022, we served the public mists of water droplets containing hydrating salts and chocolate, coffee, and french fry aroma. We did this, in one case, by melting dark chocolate and mixing it with salty water, then placing the chocolate solution in a hand-held nebulizer that made droplets that floated in the air (too large to get into your lungs while small enough to get into your nose) and allowed you to smell these droplets. This is what Ellen Langer calls Mindful Chocolate. We placed espresso directly into the hand-held nebulizer so that people could whiff the powerful aroma of hydrating coffee. We then served up chocolate and coffee — without calories, without ingested caffeine — to delight everyone, inclining them to the experience of chocolate and eventually satiating them, energizing them without any ingested calories. These experiences hydrated their olfactory bulbs, helping everyone perceive flavor better than they might have. They also changed metabolism. Smelling enough of the chocolate cloud might satiate you, while smelling enough of the coffee, did wake you up. On the other hand, smelling enough of the french fry aroma raised your blood sugar, a less desirable outcome for the evening, while an illustration of the storytelling richness of flavor when it is placed in the air and separated from the food we ingest.

Science has shown that when children smell strawberries, they tend to more readily choose to eat a strawberry than a chocolate bar. When we smell broccoli, we tend to choose to eat broccoli more readily than, say, sliced bread. Science has also shown that when we breathe into our noses droplets of salt water, with salinity near to the salinity of the ocean, these droplets not only hydrate our noses, they actually pull water out of the tissues of our noses so that our noses are properly hydrated, even though the air around us is dry, or we are dry, as many of us (and most children in America) actually are.

Odorants in the air we breathe can help us in many other ways. When we smell the aroma of freshly cut grass, we tend to feel a sense of joy. When we smell citrus or

peppermint, we tend to awaken. And when we smell lavender or palm oil, we tend to relax. These sensations are dose-dependent, meaning that if we walk into a room of fresh-cut grass smell, we feel the sensation most powerfully in the first minute, less powerfully in the fifth minute, and probably not at all in the 10th minute. If by the power of scents and aromas in the air we wish to bring joy, condition appetite, and generally benefit those who walk into our lobbies or sit inside our restaurants, we need to treat the air we breathe less as a room we paint, and more as a bonbon or a coffee, olfactory sensations we serve up.

These experiences are easy to share, do not cost much or require special infrastructure. They can be theatrical and very pleasurable, and they can be part of the rites we introduce to help us all eat better. We believe that the hospitality industry can, in the short and the longest run, grow best by helping each of us, wherever we are, whoever we are, eat well, to be well, and we suggest that a good place to start is by breathing well.