What public health challenge(s) does Monell’s research address?

Test your knowledge on this question and those throughout this report. Find the answers at monell.org.
The Monell Chemical Senses Center is an unrivaled multi-disciplinary nonprofit research institution leading the world to a better understanding of taste and smell.

Every day, Monell scientists make discoveries about how our bodies detect and respond to chemical molecules in the worlds within and around us. Our work guides policies and inspires products that enable healthier diets, safer environments, and more powerful ways to meet pressing health challenges — from obesity to infectious diseases to Alzheimer’s dementia.

At Monell, we create and share knowledge to guide real-world advances in policy, practice, and behavior.

On the eve of Monell’s 50th anniversary, Newton’s words resonate. For half a century, Monell researchers have defined a legacy of discovery and world leadership in the chemical senses, building on the knowledge of our predecessors and advancing scientific discovery to expand our understanding of how the primal senses of taste and smell are intricately interwoven with human health.

Today, Monell scientists continue on this mission, asking new questions and bringing diverse disciplinary perspectives and approaches to address significant global public health issues. As you’ll see in the following pages, this was an exciting year of advances with the potential to touch millions of lives, worldwide. We explored how and why a child might find certain medicines bitter or otherwise unpalatable with the goal of developing new approaches to help oral medications go down a little more easily, whether to save a child in sub-Saharan Africa from the ravages of HIV infection or malaria, or to reduce the fever of a young neighbor here in Philadelphia. Expanding our foundational work in the odor signatures of disease, we took great steps toward developing a method to detect ovarian cancer in its earliest stages, when it is most treatable. We ignited the spark of discovery in the next generation of researchers through our Postdoctoral Training and Science Apprenticeship Programs. These promising young scientists will stand on our shoulders and look farther into Monell’s next 50 years of discovery. We shared our expertise with artists associated with the Pew Center for Arts and Heritage who are interested in building taste and smell into their public engagement projects, and we also hosted smell training workshops for individuals recovering from anosmia.

Multi-disciplinary collaboration — bringing the right partners and approaches together to ask new questions — is a hallmark of Monell’s success. Partnerships enable progress. Monell scientists value our strong, productive alliances with academic researchers across the United States, the United Kingdom, France, Sweden, China, Japan, and the Middle East and actively partner with more than 40 leading corporations in the U.S. and abroad. These collaborations translate new knowledge about the chemical senses into better clinical practice and consumer products, and help strengthen global public health policy.

Our progress toward a safer, healthier future is only possible because of you and your strong support of Monell. We achieved great successes over the past year in the face of a challenging decline in federal funding for research, and are developing new partnerships to ensure our strong future. Now, more than ever, your support is vital to our mission. We are deeply grateful to have all of our partners — our donors, sponsors and collaborators — with us on our journey of discovery.

As we celebrate 50 years of biomedical breakthroughs, we look ahead with new perspective and ask tomorrow’s questions. How can we harness odor and taste receptors throughout the body to fight obesity, diabetes and hypertension? What will it take to restore smell through transplanting nasal stem cells? Can we develop sensory strategies that will lead people to choose a healthier diet?

From atop the shoulders of giants — our predecessors and our partners, old and new — Monell is sensing the future and accelerating the pace of discovery. We value your participation and invite you to join us in supporting our pioneering endeavor.

Thank you for being part of our enterprise. As partners, we are Changing the World.

ROBERT F. MARGOLSKEE, MD, PhD
President and Director
Monell Chemical Senses Center

DWIGHT R. RISKEY, PhD
Chairman of the Board
Monell Chemical Senses Center
Potential Causes for a Rare Odor-Producing Disorder

Genetic research provided new insight into the causes of the rare disease trimethylaminuria (TMAU), characterized by the accumulation of a chemical that smells like rotting fish. "We now know that multiple genes may contribute to TMAU. These new genes may help us better understand the underlying biology of the disorder and perhaps even identify treatments," said Danielle Reed, PhD.

Now halfway through an 18-month project funded by the Bill & Melinda Gates Foundation, Monell researchers think the answer is, "Yes!"

All three conditions are treatable with life-saving, cost-effective medicines, but children often reject them due to their bad taste. Seeking to translate Monell’s broad, multi-disciplinary taste expertise, the Gates Foundation reached out to ask for potential solutions.

"Even the best drugs are not effective if children won’t take them," notes Monell Director Robert Margolskee, MD, PhD, a molecular neurobiologist who leads the research team. "This important project leverages Monell’s collective strengths in sensory science and taste cell technology to reduce the awful tastes of life-saving oral medications."

Focusing on four commonly-used medications, Monell’s initial proof-of-principle approach combines human sensory testing and cell-based taste screening assays. Thus far, the sensory testing has revealed that the medicines produce the expected bitterness — and also sensations of astringency, sourness, and nausea. These findings indicate the need to go beyond blocking bitter receptors to effectively counteract all the undesirable sensory properties.

Supporting the sensory findings, research using Monell’s human taste cell cultures has identified multiple types of sensory receptors that appear to be stimulated by the medications. Still other studies have identified specific human bitter receptors that may be activated by the medicines, providing potential targets for the development of bitter-blocking compounds.

Moving forward, the research team will continue its work to identify effective solutions to the problem of bad-tasting medicines impeding pediatric compliance, with the broader goal of using taste biology to improve the palatability and effectiveness of oral medications worldwide.

A MATTER of TASTE

Identifying Practical Solutions to a Deadly Problem

Can four Philadelphia taste scientists help save the lives of millions of children in sub-Saharan Africa and other developing regions who die each year from malaria, parasitic infections, and diarrhea? And can that knowledge be used to help children, everywhere?

Cold and Bubbly: The Sensory Qualities that Best Quench Thirst

Oral perceptions of coldness and carbonation help to reduce thirst, the uncomfortable sensation caused by the need to drink fluids. "We have a decent understanding of what turns thirst on, but need to better understand what turns it off so we can motivate the elderly and other at-risk populations to keep drinking their fluids," said Paul A.S. Breslin, PhD.
Imagine if humankind had an accurate and reliable screening test for early stage ovarian cancer. This is Preti’s objective, and it is within reach, as he seeks to identify the distinctive odor signature of early stage ovarian cancer.

Informed by reports of dogs that have detected cancer in their owners and in the laboratory, Preti teamed with scientists from the University of Pennsylvania’s Nano/Bio Interface Center, Ovarian Cancer Research Center, and Penn Vet Working Dog Center to identify the unique smells produced by ovarian cancer—smells that are undetectable to the human nose.

In early studies, funded entirely by private donations, the team collected blood plasma samples from small groups of ovarian cancer patients, most of whom had advanced disease. Preti, a world-recognized expert on the chemistry of human body odors, isolated the unique chemical mixture associated with the cancer-related odor.

Now, with a grant awarded this past year from the Robert J. Kleberg, Jr. and Helen C. Kleberg Foundation, Preti and colleagues are extending their focus to identify the chemical composition of odor signatures from patients with early stage ovarian cancer. Associated studies will determine which chemical odorants provide the most specific and sensitive biomarker information for the different stages and subtypes of ovarian cancer. The ultimate goal, within reach in the next five years, is to use the odor information to customize a portable screening device capable of diagnosing the deadly disease at early, treatable stages.
Starting even before birth, good nutrition underlies a child’s health, promoting growth and cognitive development and protecting against diet-related disease. But why does one child demand nothing but sweetened cereal while her next door neighbor loves to chomp down on spinach salad? And, once we know, can we apply this knowledge to influence healthy choices for a nutritious lifetime?

For the past three decades, Julie Mennella, PhD, has explored the question of why kids eat the foods they do. Her research focuses on the basic biology of taste in children and how they learn to like foods, with an eye toward understanding how individual preferences impact a child’s risk for disease. With over 175 scientific publications to date and hundreds of speaking engagements worldwide, Mennella is widely regarded as a go-to expert on the topic, often called upon to bring her knowledge to national and international organizations involved in formulating public health policy recommendations. This year, she served as a Nutrition Thought Leader on the National Institutes of Health Nutrition Research Task Force, which is charged with developing a strategic plan to guide NIH funding for research on nutrition-related diseases, and also on a similar panel for the Canadian government.

A sampling of Mennella’s recent publications demonstrates how she and her busy lab tease out the diverse determinants of early nutritional programming – biology, learning, and genes – in developing children. Some of her findings:

- Building on earlier studies showing that infants begin learning to like the taste of foods their mothers eat during breastfeeding, a randomized clinical trial found that learning to like vegetables starts as early as two weeks after birth.
- By analyzing how infants communicate hunger and fullness during bottle-feeding sessions, Mennella’s group established an experimental approach to help identify bottle-fed babies most at risk for overeating and excess weight gain.
- Several studies examined liking for sweet taste in school-aged children, who not only like higher levels of the natural sugars sucrose (table sugar) and fructose (in fruits) than their parents, but also have a heightened liking for non-nutritive sweeteners, in part modulated by their taste genes. “While non-nutritive sweeteners reduce added sugars and the associated calories, they still teach children to expect high levels of sweetness in their foods and beverages,” commented Mennella. The combined findings reveal why children are particularly vulnerable to overconsuming sweet-tasting foods and beverages.
ASPIRATION AND ACTIVISM IN AFRICA

Armed with determination and fortitude, Shadrack Frimpong is personally changing the world.

Born in the impoverished village of Tarkwa Breman in Ghana, he made his way to the University of Pennsylvania, where he found himself overwhelmed and soon began to doubt himself. Frimpong found his answer in the summer of 2012, working with Hakan Ozdener, MD, PhD, as a participant in Monell’s long-standing Monell Science Apprenticeship Program (MSAP). In Ozdener’s lab, Frimpong found himself challenged not only to become a productive scientist, but also someone who could make a difference.

“WOW, for the first time in life someone believed that I could take on anything on my own! This seed of faith and belief you sowed in me has been the springboard of where I am today,” Frimpong wrote to Ozdener in March 2015, the day after it was announced that he was one of five recipients of Penn’s $150,000 Presidential Engagement Prize.

After Penn, Frimpong returned to Ghana, founding Cocoa360 (initially known as the Tarkwa Breman Community Partnership), and using his prize money to establish a school for girls, who historically lack educational options, and open a medical clinic. Recognizing that women scientists were critical to Africa’s ability to contribute to emerging technologies and medical innovation in the developing world, he went on to found the African Research Academy for Women, an organization devoted to encouraging STEM careers in African women.

Not yet 25 years old, this remarkable young man continues to aspire to make the world a better place for those in need. Recognizing the importance of staying connected to his mentors, he recently returned to Monell to share his story at a MSAP fundraiser. With the career goal of becoming a physician-scientist who can tackle problems of infectious disease in underserved communities, Frimpong next plans to attend medical school in the U.S. One can only imagine what he will do after that.

DEVELOPING SCIENTIFIC LEADERSHIP

Sensory neuroscientist Sanne Boesveldt, PhD, exemplifies how Monell’s postdoctoral fellows integrate disciplines to forge the future of chemosensory research.

Now Assistant Professor of Sensory Science and Eating Behavior at the Wageningen University Division of Human Nutrition in the Netherlands, Boesveldt spent two years at Monell as a postdoctoral fellow in the lab of Johan Lundström, PhD. During that time, she co-authored nine papers, seven as first author, integrating her interests in olfactory perception, brain neurobiology, and human food choice.

Boesveldt’s research interests led her to a focus on anosmia, loss of the sense of smell, a condition that until recently has received little attention from the scientific community. In 2015, she co-founded the Netherlands’ first center for taste and smell disorders, which combines scientific research with health care. She then convened a symposium on anosmia at the 2016 AChemS taste and smell research conference, integrating presentations from a patient, a clinician, and two research scientists to present a rounded snapshot of what currently is known about anosmia.

This year, she published a comprehensive review paper that identified knowledge gaps to guide future anosmia research, and co-authored with Lundström a study on the social consequences of smell loss.

Boesveldt credits her time at Monell as an influential step in her career. “Through Monell, I gained impressive credentials that add strength and value to my grant applications and professional interactions,” she said.

Looking to pay it forward and inspire the next generation of scientists, Boesveldt co-founded WIOS, Women in Olfactory Science, an international organization that seeks to advance women as scientific leaders. The organization’s first research conference takes place in October 2017 in Trieste, Italy.
Revenue for the Monell Center comes principally from three sources: competitive federal grants to our scientists; corporate sponsorships and sponsored basic research; and philanthropic gifts and grants from individuals and foundations. Federal grants have traditionally been the largest source of funding for Monell. However during this fiscal year and last, each of the three major sources of funding were critically important. Total revenues fell by 13 percent this fiscal year compared to last, while total expenses were 6 percent lower. Monell reserve funds were used to cover the shortfall. We expect federal grant revenue to rebound during the next fiscal year and anticipate a return to a balanced budget. The Center is grateful for the continued generosity of the Monell Foundation, the Center’s founding funder and largest private donor.

**TOTAL REVENUES:**
$12,333,561

- Corporate Sponsors: 22.7%
- Philanthropy: 29.7%
- Federal Grants: 26.8%
- Other: 10.8%

**TOTAL EXPENDITURES:**
$13,837,187

- Research Programs: 73.9%
- Administration: 19.5%
- Fundraising: 6.6%

**FINANCIALS**

For 50 years, Monell has been at the vanguard of academic-industry partnerships, leveraging basic scientific discovery into real-world solutions.

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**ENGAGEMENT**

Sponsors benefit from first opportunity to license Monell intellectual property, as demonstrated by a high rate of successful commercialization.

**2016 – 2017 MONELL IP ACTIVE DISCLOSURES**

- Licensed or Optioned by Sponsors for Commercialization: 25%
- In Commercialization: 11%
- Discussions with Sponsors: 29.7%
- Other: 10.8%

**GLOBAL REACH**

This past year, Monell scientists engaged with sponsors around the globe, leading the way to a healthier future for all of us.
One of our greatest pleasures is to thank you – the friends, alumni, employees, foundations, and businesses – who support Monell’s research mission through philanthropic gifts and grants. Below, we gratefully recognize your donations received between July 1, 2016 and June 30, 2017.

Many Thanks

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To view a full list of consistent, long-term support of the Monell Center, consecutive year donors, and donors by affinity group, please visit www.monell.org/thankyou.

Kerry I COMBINING TASTE, SMELL AND NUTRITION

Kerry is a global leader in taste and nutrition serving the food, beverage and pharmaceutical industries. Thirteen years ago we acquired J. Manheimer Inc and brought on board not only a thriving business but also the expertise of Stephen Manheimer, now an executive VP at Kerry. In 2014, Steve, a long-time Monell friend and advisor, brought us an opportunity to support Monell’s anosmia research. We were eager to invest and participate given smell and aroma are a large part of the taste experience. Millions of individuals worldwide experience loss of smell and many, including the elderly, do not eat a healthful and varied diet as a result of their anosmia. Monell is bringing the world closer to solutions each day through its anosmia research and Kerry is proud to support their efforts.

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Every effort has been made to ensure the accuracy of these lists.
If we have inadvertently misspelled or omitted your name, please accept our apologies and notify Jennifer Trachtman.
What public health challenge(s) does Monell’s research address?

Test your knowledge on this question and those throughout this report. Find the answers at monell.org.