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AVANT Institute Symposium



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agenda



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senses & essence

fragrance and flavors across personal & home care formulations

Ashland 1041 U.S Highway 202/206 - Bridgewater, NJ, USA

- 8.30 - 9.00am** registration/breakfast
- 9.00 - 9.10am** opening remarks
Linda Foltis, vice president, care specialties R&D, Ashland, USA
- 9.10 - 9.55am** predicting human olfactory perception from molecular structure: from molecules to mixtures
Joel Mainland, associate member, Monell Chemical Senses Center, USA
- 9.55 - 10.15am** new encapsulation technology for fragrance delivery
Abdul-wahab Hussain, research scientist, Ashland, UK
- 10.15 - 10.35am** applications and sensory performance of acrylate based fragrance encapsulation
Ben Sales, business development manager encapsulation and new product leader encapsulation technologies, Ashland, UK
- 10.35 - 10.55am** break/posters
- 10.55 - 11.40am** human body odors: the influence of ethnicity, genetics and age
George Preti, member, Monell Chemical Senses Center, Philadelphia and adjunct professor, Department of Dermatology School of Medicine, University of Pennsylvania, USA
- 11.40 - 12.00pm** Robertet home of nature
Arnaud Adrian, vice president sales and Stephen Dente, senior vice president R&D, Robertet USA
- 12.00 - 1.00pm** lunch
- 1.00 - 1.20pm** new and unique flavors. do consumers really want them? Insights from extended home use and behavioral measures
Ratapol Teratanavat, senior director of consumer insights and market research, Takasago International Corporation, USA.
- 1.20 - 1.40pm** new technology to deliver long lasting fragrance from shampoos
Manuel Gamez-Garcia, research fellow, Ashland, USA
- 1.40 - 2.00pm** the role of polymers on fragrance retention, release and sensory perception from surfactant rich rinse-off cosmetics
Martin Vethamuthu, principal scientist, Ashland, USA
- 2.00 - 2.20pm** break/posters
- 2.20 - 3.05pm** the role of odor-evoked memory in psychological and physiological health
Rachel Herz, adjunct assistant professor in the Department of Psychiatry and Human Behavior, Brown University, USA
- 3.05 - 3.25pm** how do sensory receptors participate in alerting skin when under environmental stresses?
Karine Cucumel, senior team leader, evaluations and scientific communication, Ashland, France
- 3.25 - 3.30pm** closing remarks
Linda Foltis, vice president, care specialties R&D, Ashland, USA

abstracts



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Predicting human olfactory perception from molecular structure: from molecules to mixtures

Joel Mainland, Associate Member at the Monell Chemical Senses Center, USA

In 2006 the perfumer and chemist Charles Sell predicted that "...our ability to predict odor properties of molecules will not improve significantly in the near future." Here we argue that this problem is now tractable, as demonstrated by two recent models. First, the DREAM Olfaction Prediction Challenge predicted the intensity ($r = 0.78$, $p < 0.001$), pleasantness ($r = 0.71$, $p < 0.001$), and odor character ($r = 0.55$, $p < 0.001$) of single molecules in external validation, closely approaching the test-retest correlations for these same properties. Second, the angle distance model developed quantitative rules for predicting the odor character of complex mixtures based only chemical structure, but only for cases where all component molecules in a complex mixture are diluted to have equal perceived intensity. In combination, these models suggest that our ability to predict odor properties from molecular structure has now advanced to the point where progress is limited more by data collection than by modeling techniques. These predictive models have to the potential to allow us to replace ingredients that become unavailable, simplify ingredient palettes to streamline supply, and identify previously unexplored areas of olfactory perception.

New encapsulation technology for fragrance delivery

Abdul-wahab Hussain, Research Scientist, Ashland, UK

Fragrances are used in our everyday consumer products whether it is air fresheners, body washes, soaps or laundry detergents. However, these scent materials by nature are composed of volatile components which can limit the longevity of their olfactory performance. In order, to prolong the freshness and scent experience of fragrances in consumer products, these materials are encapsulated in polymer microcapsules.

Currently encapsulation technology based on Melamine-Formaldehyde (M/F) chemistry is used for delivery fragrances from laundry products. However, this technology has inherent defects such as containing residual formaldehyde impurities, anionic surface changes and limitations on capsule design. This presentation will introduce a new encapsulation technology that Ashland has developed based on acrylate chemistry. This technology involves formation of microcapsule polymer shell by inner phase polymerization where the monomers are dissolved in the fragrance oils. The resulting fragrance microcapsules are analyzed and characterized by several analytical techniques, this includes particle size analysis, thermal analysis and residual monomer contents. Also, the release mechanism by mechanical pressure will be illustrated by microscopic examination.

Applications and sensory performance of acrylate based fragrance encapsulation

Ben Sales, Business Development Manager Encapsulation and New Product Leader Encapsulation Technologies, Ashland, UK

Fragrances can stimulate emotive responses from everyday products. They can give the perception of wellness, freshness and cleanliness. Personal and home care products strive to achieve long lasting fragrance to engage the consumer and increase these emotive responses.

Fragrance encapsulation in various forms have been used in personal care and household products for many years to give long lasting fragrance as well as fragrance activation on demand. Fragrance release on demand can revive the emotive response and enhance the consumer experience. However existing and benchmark technologies each have certain drawbacks in terms of stability, performance, and global acceptance. This presentation will demonstrate how the latest acrylate based fragrance encapsulation technology can deliver results that surpass that of current benchmarks, using globally acceptable materials. The data presented is based on expert consumer panels showing sensory performance and demonstrates performance verses benchmarks in both home care and personal care applications.



Human body odors: the influence of ethnicity, genetics and age

George Preti, Member at the Monell Chemical Senses Center, Philadelphia and Adjunct Professor, Department of Dermatology School of Medicine, University of Pennsylvania, USA

Research in my lab has focused on the nature, abundance and biogenesis of odors produced by the human body. We have investigated various odor-producing areas including the groin, underarm, oral cavity, ear canal and non-axillary skin.

Body odors are the focal point for a multi-billion dollar consumer product industry and academics interested in human scent. Consequently, research has focused upon (a) the odors produced in the underarm and (b) underarm (axillary) secretions and odors as a source of human pheromones. Despite the fact that deo-products have been around for more than 100 years, the identity of the compounds which produce underarm odor (commonly referred to as "body odor") have only been known since 1991 when research from our lab identified many of the volatile odorants which characterize the axillae, and how they arrive on the skin's surface. Consequently, we now know that the volatile organic compounds which characterize the axillae are a complex mixture of C6-C12 normal, branched, unsaturated, and hydroxy-organic acids as well as smaller amounts of olfactory potent thio-alcohols. The acids, in particular (E)-3-methyl-2-hexenoic acid are present in microgram quantities in many individuals. They arrive on the skin surface bound to proteinaceous precursors: e.g., apolipoproteinD.

Recent studies link a genetic variation in ABCC11 to different types of axillary odorant and earwax (cerumen) production. Ethnic diversity in ABCC11 exists: The A allele is seen frequently (80-95%) in East Asian populations (e.g., Japanese, Korean, and Chinese) but is quite rare (0-3%) among individuals of European and African descent. Our current research addresses the role of ethnicity and genetic variation in axillary and cerumen odor production. We have examined differences in axillary odor among individuals of European, East Asian, and African descent. Volatile compounds were analyzed in axillary sweat collected from donor-worn T-shirts as well as from the external auditory canal. Our results reveal that the level of odorants produced by East Asians differs markedly from Caucasian or African American individuals. All differences were quantitative and no "ethnic-specific odorants" are produced.

We have also examined and compared the relative amounts of axillary and non-axillary skin odorants in young and older individuals within ethnic groups. Here too we find no qualitative differences between young and older individuals. Significant differences in both axillary and non-axillary skin odorants were found and contrary to some folklore, older individuals produce less odor than their younger counterparts.

Robertet home of nature

Arnaud Adrian, Vice President Sales and Stephen Dente, Senior Vice President R&D, Robertet USA

In this presentation, Arnaud Adrian will highlight the rich history of Robertet, the Home of Nature™, and its vertically integrated approach to ingredient sourcing and fragrance and flavor creation. By owning its own fields and partnering with various growers specializing in specific naturals all over the world, Robertet is able to follow a continuous and traceable link from grower of the source ingredient to the final creation to the consumer. This approach is created with today's consumer in mind, who is increasingly seeking naturally-inspired, fully transparent consumer products.

New and unique flavors – do consumers really want them? Insights from extended home use and behavioral measures

Ratapol Teratanavat Senior Director of Consumer Insights and Market Research at Takasago International Corporation (USA).

Every year, many consumer packaged goods companies come up with new and exciting flavors to expand their product portfolio with the goal of increasing their market share within the category. Marketers and Sales always look for the next big flavor hit. Two questions then emerge – do consumers really want something new or do they just stay with what they like. Consumers may be excited to see something new and try it but it is not clear whether these flavors are going to stick with consumers over time. The second question is at what point these additional flavor offerings become too overwhelming to consumers. This presentation will show how an extended product research approach can help address these questions. We will explore and compare traditional measures such as overall liking, preference, and purchase interest, which are generally collected from consumers before and after short term product evaluation (i.e., pre-trial and post-trial). While these measures have been widely used, some challenges that many product researchers encounter are how well these measures can accurately predict consumer behavior long term and whether these new products are likely to succeed in the marketplace. We will discuss initial responses on concept and product trial from potential consumers and measure how consumers' reactions with product change over time through behavioral measures. These insights can help the product team identify early barriers and triggers as well as form hypotheses that can be validated when the products are launched in the market place.

New technology to deliver long lasting fragrance effects from shampoos

Manuel Gamez-Garcia, Research Fellow, Ashland, USA

Achieving long lasting fragrance effects from shampoos not only requires overcoming antagonistic processes related to cleansing but also to be able to maintain shampoo stability while providing good hair and shampoo aesthetic properties. A known technique used by formulators to enhance deposition of actives, which are water insoluble, usually involves coacervate/droplet floc formation triggered by shampoo dilution. Unfortunately, this technique cannot be used for fragrance deposition because the fragrance as a droplet is not stable in the shampoo and therefore becomes solubilized and transported by the surfactant micelles. Consequently, most of the fragrance is washed away leaving behind a very small amount of fragrance deposited by micellar/hair interaction. A new technology to enhance fragrance deposition from shampoos based on the design and formation of a structured polymer emulsion will be presented. The technology allows for fragrance separation from the surfactant micelles by forming stable structured micro or nano droplets in the shampoo. The polymer emulsion also provides a barrier that contain and depresses fragrance diffusion away from the micro droplets. The overall result is shampoo and micro droplet stability, better coacervate/floc formation and a substantial fragrance long lasting effect in hair after shampooing.

The role of odor-evoked memory in psychological and physiological health

Rachel Herz, Adjunct Assistant Professor in the Department of Psychiatry and Human Behavior at Brown University, USA

I will explain the unique characteristics of odor-evoked memory and review recent research showing that odors that evoke positive autobiographical memories can increase positive emotions, decrease negative mood states, disrupt cravings, and reduce physiological indices of stress, including systemic markers of inflammation. I will then explain how, instead of anecdotal "pharmacological" claims for aromatherapy, there is a scientific basis to how odors impact psychological and physiological health through experimentally validated mechanisms of odor-associative learning and the privileged neuroanatomical relationship that exists between olfaction and the neural substrates of emotion and memory.

The role of polymers on fragrance retention, release and sensory perception from surfactant rich rinse-off cosmetics

Martin Vethamuthu, Principal Scientist, Ashland, USA

Fragrance is a critical component in most personal care and household products. Fragrance release and perception is an essential product attribute that influences the consumer at the point of sale and, when truly successful in use, encourages re-purchase and eventually builds brand loyalty. The emotive effects of fragrance are such that it can even contribute to the user's perception of a product's functionality, even if there is no factual basis for such a judgment¹.

The first part of this study discusses an effective in-vivo methodology, validated by expert sensory evaluation, of fragrance release from surfactant rich rinse-off cosmetics by a non-invasive method for dynamic head space sampling of the volatile fragrance components deposited from a cleanser after rinse-off. The twister bar headspace sorptive extraction (HSSE) method used for sampling the vapor phase was introduced with the aim of increasing the concentration capability of the solid phase micro extraction (SPME needle) method.² After dynamic sampling of washed skin for 15 minutes the twister bar is placed in a glass tube and transferred to a thermo-desorption system where the recovered analytes are thermally desorbed and analyzed by GC-MS.

This novel approach has been used for quantitation of fragrance headspace components or perfume notes retained on skin.

The second part of this presentation focuses on the results of using this method to screen how different polymers impact this fragrance deposition on skin. Polymer chemical composition, charge density, molecular weight distribution and hydrodynamic size are key variables that have been investigated to differentiate performance with respect to the various perfume notes retained and released on skin after rinse-off.

In conclusion, the headspace GC instrumentation coupled with the appropriate twister bar methodology can monitor the time dependent release/ retention profiles of volatile fragrance components from the skin. The results from these studies show that polymeric deposition technology provides a novel approach to significantly improving fragrance delivery and perception from rinse-off cosmetics.

How do sensory receptors participate in alerting skin when under environmental stresses?

Karine Cucumel, Senior Team leader, Evaluations and Scientific Communication, Ashland, France

The light, odor, and taste receptors located in our eyes, noses, and tongues give sensorial information about the world around us. But these same sensory receptors are located in other places in our body, where they serve a surprising range of biological roles. Although touch appears as the first sense of the skin, receptors associated with light perception, taste and olfaction were recently discovered in the skin.

Opsins are photoreceptors mediating phototransduction in the eye. These G protein-coupled receptors (GPCRs) are also implicated in non-visual biological and behavioral effects such as circadian regulation, melatonin secretion, alertness and mood. As skin is on the first line of light perception, and is exposed to a wide range of light wavelengths, the expression of opsins by cells of the epidermis was recently emphasized (1).

Particularly, it was shown that keratinocytes and melanocytes express at least four opsins, three of which were described to be sensitive to blue light and another to UV light. Blue light (400-495 nm) represents a source of high-energy visible light with a growing impact, due to increased exposure to light-emitting diodes (LEDs).

Bitter taste receptors (TASRs) represent another group of GPCRs expressed in several organs of the body, including the gut, kidney, and skin. The main function of these receptors is still unknown but a growing body of evidences tends to indicate that these receptors are involved in protecting the organism against the ingestion of toxic substances (2). In the skin, although their role in the maintenance of epidermal homeostasis is still incompletely described, TASRs were shown to be associated with keratinocyte differentiation markers, suggesting a role in the skin's barrier function (3).

In the present study, we first investigated the localization of blue light-sensitive opsins and TAS2R38 in cultured keratinocytes and skin biopsies, and their variation following exposure to certain types of stimuli (blue light or indoor/outdoor pollution).

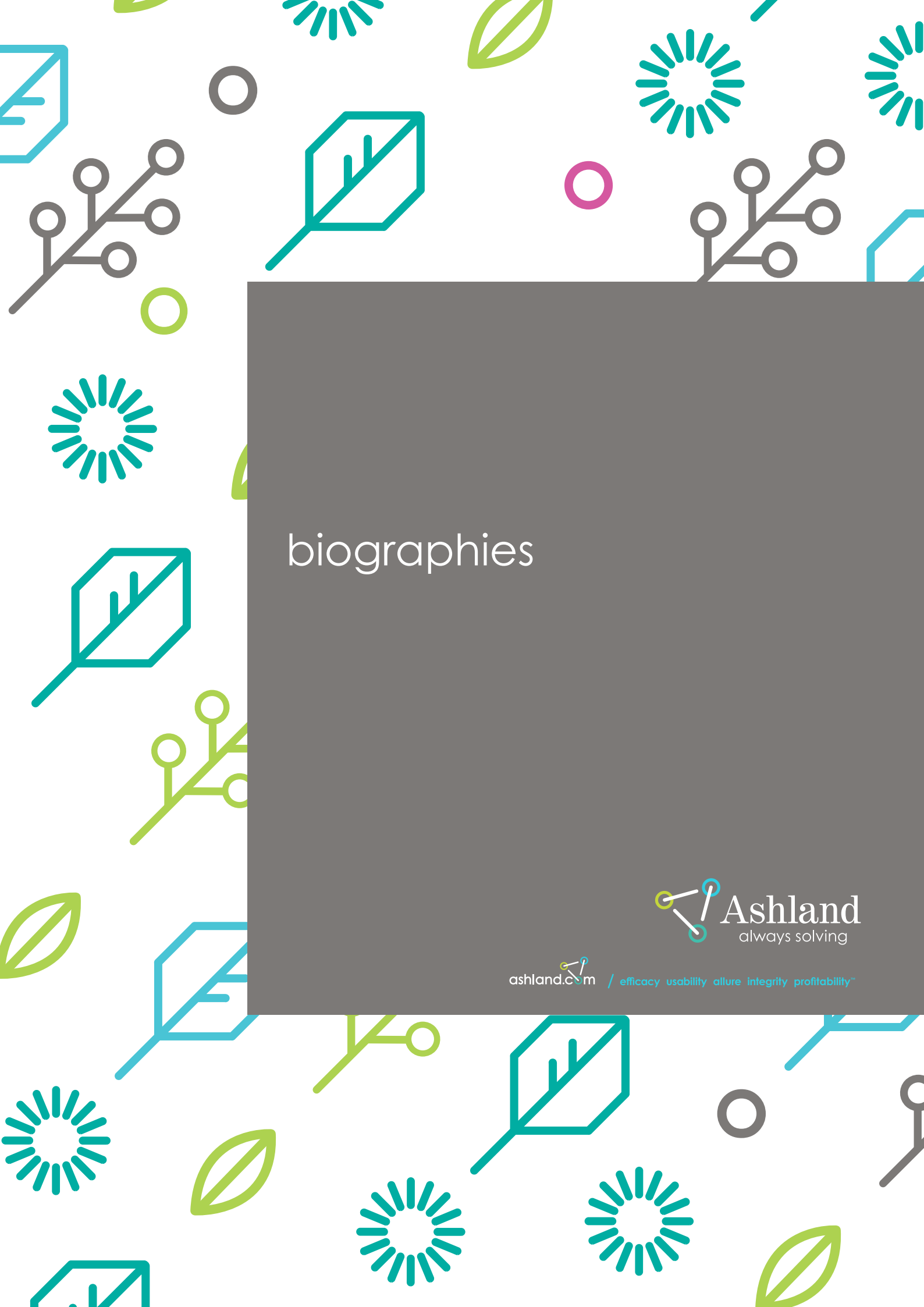
We then investigated the beneficial effect of 2 botanical extracts, a Cocoa porcelana and a Marsdenia condurango extracts on sensory receptors after blue light or cigarette smoke exposure. In the visible spectrum, blue light (400-495 nm) represents the High Energy Visible (HEV) portion of the spectrum that is associated with high photon energy. The majority of blue light comes from the sun, but it appears that we are more and more exposed to artificial light sources, including LEDs that emit significant amounts of blue light. Blue light has been the subject of many therapeutic approaches for the treatment of dermatological disorders, including psoriasis, atopic dermatitis and acne. However, the role of blue light overexposure on the physiological skin condition has been poorly described. In the present study we evaluated the effect of blue light exposure on Normal Human Keratinocytes (NHK) using LED irradiation. The level of oxidative stress was evaluated by fluorescent probes detecting cellular and mitochondrial reactive oxygen species (ROS). In these conditions, the levels of opsins OPN1 SW, OPN2 and OPN3 were observed to have decreased at specific wavelengths of blue LED exposure. We also pre-treated NHK with a peptidic extract of Cocoa porcelana and observed a partial preservation of keratinocyte photoreceptors after blue LED exposure.

In parallel, we investigated the role of taste receptors after exposure to certain types of pollution. Human skin is exposed routinely to UV radiation and environmental pollution, such as volatile organic compounds, cigarette smoke, ozone and particulate matter (PM). Our study demonstrated that exposure to these types of stimuli negatively impacted the skin cells and enhanced oxidative damage, leading to impacts to TAS receptors.

Altogether, our results showed that opsin expression was affected by blue LED exposure, and was associated with an accumulation of cellular and mitochondrial ROS in keratinocytes. TAS2R38 in skin biopsies was shown to be associated with enhancement of differentiation markers. We have observed that the application of a peptidic extract of Cocoa Porcelana could help protect opsin receptors against the effect of blue LED exposure in NHK. Furthermore, application of a cream containing 1% Marsdenia condurango could help enhance the presence of TAS2R38 in skin biopsies, in parallel with differentiation markers and antimicrobial peptide.

Conclusion

Although the role of opsin photoreceptors and bitter taste receptors in human skin is still incompletely understood, our results showed that certain environmental stressors could affect the sensory system of the skin. These results suggest a probable role of sensory receptors in mediating the cutaneous response to blue light and pollution and the possibility to target these receptors to help maintain the skin's response to environmental stresses.



biographies



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Joel Mainland, Associate Member at the Monell Chemical Senses Center, USA

Dr. Joel Mainland earned a Ph.D. in neuroscience from UC Berkeley, where he studied the effects of sniffing on olfactory perception. He then worked at Duke University where he studied the molecular biology of human olfactory receptors. Dr. Mainland is now an Associate Member at the Monell Chemical Senses Center, where his laboratory examines the relationship between molecular structure and olfactory perception.



Abdul-wahab Hussain, Research Scientist, Ashland, UK

Abdul-wahab Hussain is an Encapsulation Research Scientist at Ashland Specialty Ingredients, Bradford (United Kingdom). Mr. Hussain is one of the inventors of the new Acrylate encapsulation technology at Ashland. He began his career as an apprentice at Ciba Specialty Chemicals where he worked on research and development of many different polymer systems from 2001- 2010. He received a BSc in Chemistry and Chemical engineering from Huddersfield University.



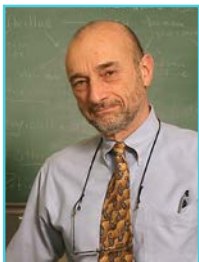
Ben Sales, Business Development Manager Encapsulation and New Product Leader Encapsulation Technologies, Ashland, UK

Ben Sales is the business development manager in the Encapsulation unit, global key account manager, and the new product leader for developing encapsulation technologies at Ashland Specialty Ingredients in the United Kingdom. He brings 20 years' experience in the field of encapsulation with principal areas of expertise in Complex Coacervation and Extrusion based technologies. Ben holds a BSc in chemistry from Exeter University in the UK and is a member of the Society of Cosmetic Scientists in the UK.



Arnaud Adrian, Vice President Sales, Robertet, USA

Arnaud Adrian, leads the ingredients division of Robertet USA. Born and raised in Marseille, Arnaud is the 4th generation of his family to work in the fragrance and flavor industry. His childhood in Provence, surrounded by its aromatic fields, helped develop his passion for natural ingredients. He spent his summers working in the fields, collecting and distilling botanicals, before officially joining the family's business in the mid-90's. Arnaud joined Robertet in 2010 and now lives in Northern New Jersey with his wife and daughter.



George Preti, Member at the Monell Chemical Senses Center, Philadelphia and Adjunct Professor, Department of Dermatology School of Medicine, University of Pennsylvania, USA

Dr. George Preti was born and raised in Brooklyn, NY. He received his B.S. in Chemistry from the Polytechnic Institute of Brooklyn in 1966 and his PhD in Organic Chemistry in 1971 from the Massachusetts Institute of Technology, with a specialty in Organic Mass Spectrometry in the laboratory of Professor Klaus Biemann. That same year he joined the Monell Chemical Senses Center in Philadelphia.

The Center, a non-profit research institute, is renowned throughout the world as a leader in multidisciplinary, basic research in olfaction and gustation. Dr. Preti is a Member of Monell and an Adjunct Professor in the Department of Dermatology, School of Medicine at the University of Pennsylvania. For more than four decades, his research has focused upon the nature, origin and functional significance of human odors.

His current studies center upon human odors which are diagnostic of disease, examining the effect of genetics and ethnicity on body odor, a bioassay-guided approach to the identification of human pheromones, malodor identification and suppression. In addition to having published numerous peer-reviewed papers and reviews, Dr. Preti holds more than a dozen patents related to deodorancy, odor-mediated control of the menstrual cycle and the use of odors in diagnosis. His unique area of research has resulted in hundreds of clinician-directed referrals of patients with idiopathic body- and oral malodor production problems. His efforts in this area have revealed a large, undiagnosed population of people suffering from trimethylaminuria, an odor-producing genetic disorder. In addition his research has resulted in frequent citations and coverage in print and electronic media throughout the world. His research on human and agricultural odors was featured in the New York Times Magazine section on 10/15/00 ("The War on Stink;" see below) as well as described in a feature article about Monell's research done by Chemical and Engineering News (C&E News): 1/7/02 issue. More recently his laboratory's research into the volatile organic compounds associated with skin cancer was the subject of articles in the Philadelphia Inquirer (8/21/08), C&E News (9/22/08) as well as electronic and print media around the world. In addition, C&E News described his on-going research into human odor signatures on 10/12/09: "You Stink."

Several television segments have also described his research into body and oral odors, including appearances on "CBS Sunday Morning" which discussed his research into human primer and modulator pheromones found within axillary secretions (it was the subject of world-wide press coverage) and ABC's "Primetime-Medical Mysteries" series which featured Dr. Preti and two of the individuals he has diagnosed with Trimethylaminuria, a genetic, odor-producing disorder "CBS This Morning" and Fox News Health report (<http://www.foxnews.com/health/2013/10/07/woman-best-friend-dogs-being-trained-to-sniff-out-ovarian-cancer/>) have recently described his current research aimed at identifying the odor signature of ovarian cancer. This unique research effort was also detailed in the New York Times Magazine (http://www.nytimes.com/2013/11/24/magazine/what-does-cancer-smell-like.html?_r=0).



Stephen Dente, Senior Vice President R&D, Robertet, USA

Steve holds Bachelor of Science and Master of Science degrees in Chemistry. Steve went on to participate in various programs, including UPenn Wharton School's Finance for R&D Professionals, International Management Development, Strategic Management of R&D, and Applied Futures for Creativity. Prior to joining Robertet, he was employed with Pfizer and Reckitt Benckiser. Steve's product development career has been recognized through thirteen international patents. He has identified many new product opportunities

for Robertet's clients and has helped Robertet to be recognized as an industry leader for innovation and new technologies.



Ratapol Teratanavat, Senior Director of Consumer Insights and Market Research at Takasago International Corporation, USA

Ratapol Teratanavat is a Senior Director of Consumer Insights and Market Research at Takasago International Corporation (USA). He manages strategic and special consumer insights and market research projects for the Flavor Americas Division that covers US, Brazil, and Mexico. Ratapol has extensive consumer product research experience (13+ years) working in both the CPG company and the flavor industry and his consumer research expertise covers all aspects throughout product development process from early stage innovation, optimization, and commercialization. He holds a Ph.D. in Agricultural, Environmental, and Developmental Economics from the Ohio State University and an MBA from California State University, Fullerton.



Manuel Gamez-Garcia, Research Fellow, Ashland, USA

Manuel Gamez-Garcia is a Research Fellow at Ashland Specialty Ingredients. Previous experience includes the Pirelli Corporation in the field of physical and chemical properties of polymers, and positions at Croda, Dow/Amerchol Corporation, Firmenich, Ciba, and BASF. Dr. Gamez-Garcia received his Master's degree in Electrochemistry from the Tokyo Institute of Technology, Japan, and a PhD in Engineering Physics in the field of polymers from the Ecole Polytechnique, Montreal, Canada. He has authored numerous publications on hair including physical properties, damage, conditioning, and the delivery of actives from shampoos. Dr. Gamez-Garcia received the Society of Cosmetic Chemists Award in 2000, for the best published paper for his work on hair damage.



Martin Vethamuthu, Principal Scientist, Ashland, USA

Dr. Martin Vethamuthu is a Principal Scientist at Ashland Specialty Ingredients and an Adjunct Professor in Chemical Engineering at the University of Delaware. He has more than 19 years of experience in R&D including 14 years of research on skin cleansing applications at Unilever for the Dove, Axe and Lux brands. Dr. Vethamuthu's research focus is on complex formulation design, rheology and developing technologies for retention and release of benefit agents including fragrances on skin. He holds a PhD in Colloid Science from Uppsala University in Sweden and has authored or co-authored over 20 publications including book chapters and patents on skin cosmetic compositions.



Rachel Herz, Adjunct Assistant Professor in the Department of Psychiatry and Human Behavior at Brown University, USA

Rachel Herz, Ph.D. is a cognitive neuroscientist and leading world expert on the psychological science of smell. She has been conducting research on the sense of smell, emotion, perception, motivated behavior and cognition since 1990. Dr. Herz has published over 75 original research papers, received numerous awards and grants, co-authored several college textbooks, and is an adjunct professor in the Medical School of Brown University and part-time faculty in the Department of Psychology at Boston College. She is also a professional consultant to various industries regarding smell, taste, food and flavor, and is frequently called upon as an expert witness in legal cases involving olfaction.

Dr. Herz is the author of two popular science books, [The Scent of Desire: Discovering Our Enigmatic Sense of Smell](#), which was selected as a finalist for the "2009 AAAS Prize for Excellence in Science Books," and [That's Disgusting: Unraveling the Mysteries of Repulsion](#), which analyzes the emotion of disgust from culture to neuroscience, and has received numerous accolades from both popular and scholarly presses. Dr. Herz has a new book coming out in December called [Why You Eat What You Eat: The Science Behind Our Relationship with Food](#), which explores how our senses and psychology govern our perception of food, and the experiences and consequences of eating.



Karine Cucumel, Senior Team leader, Evaluations and Scientific Communication, Ashland, France

Karine Cucumel is the senior manager for global evaluation and scientific communication, Ashland Speciality Ingredients. She has more than 17 years' experience in research and product development in personal care and is currently leading several teams to deliver breakthrough innovation and also support customer service for biology in Ashland's skin research center in Sophia Antipolis, France. Karine received her PhD in pharmacology and molecular biology following her studies of physiology and biochemistry at the university of Nice Sophia Antipolis. Since 2000, her work in the personal care industry has specialized in histochemistry with image analysis to quantify various properties of skin and the development and launches of functional ingredient for cosmetics. Karine has authored and co-authored many peer-reviewed publications and abstracts and holds international patents. She is a member of the Society of Cosmetics Chemists, SID Society of Investigative dermatology and European society for dermatological research.



Linda C. Foltis, Vice President, Care Specialties R&D, Ashland, USA

Linda Foltis leads global R&D for personal and home care applications at Ashland Specialty Ingredients. She leads a talented team of scientific solvers located in laboratories in the Americas, Europe and Asia with a focus on the development of new ingredients, new applications and customer collaboration across personal care, home care, beverage and agriculture. Previous experience includes ISP, L'Oréal USA, Playtex (now Edgewell), and Unilever.

Foltis holds a MS in Chemistry from Seton Hall University, NJ, USA, with a minor in business. She is the author and co-author of several technical papers published in both scientific and cosmetic trade journals. She is a member of Society of Cosmetic Chemists, Cosmetic Executive Women, and Personal Care Product Council Scientific & Regulatory Forum. She served as a board member of Textile Research Institute (2008 -2014).



Mark Davies, Research Scientist, Ashland, USA

Mark Davies is responsible for in vivo measurement of deposition, penetration, and efficacy of skin care products and cosmetics at Ashland Specialty Ingredients. Previous experience also includes work at Unilever and L'Oréal. Mark received his BA in Chemistry from New York University. His PhD thesis was on Raman scattering by chiral molecules, directed by Professor Max Diem at the City University of New York. Postdoctoral work includes acyl chain conformational disorder in lipid bilayers with Professor Richard Mendelsohn at Rutgers University leading to his continued work as a research assistant professor in the biochemistry department at Georgetown University School of Medicine.



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