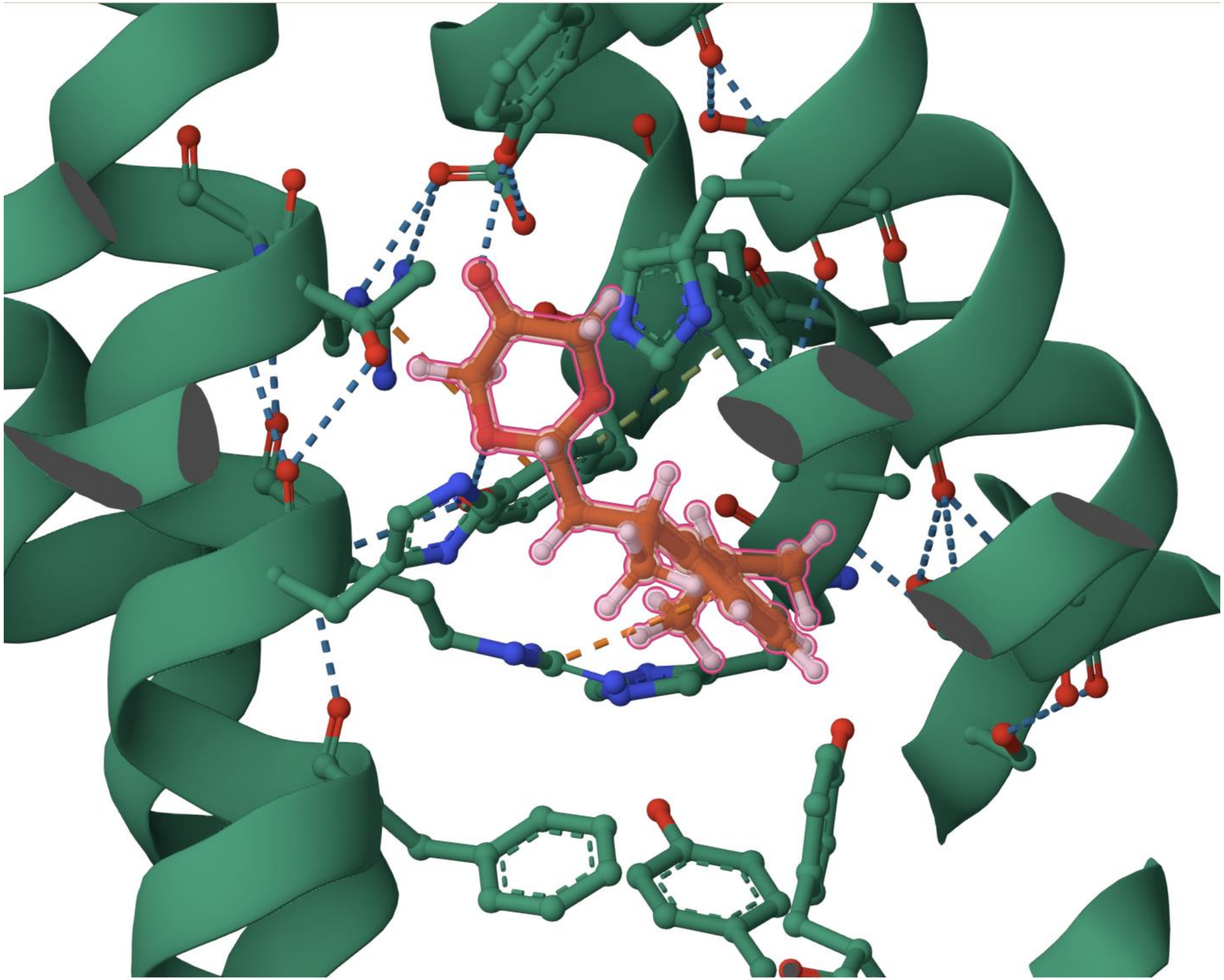
Sean Raspet

Olfactory RGB



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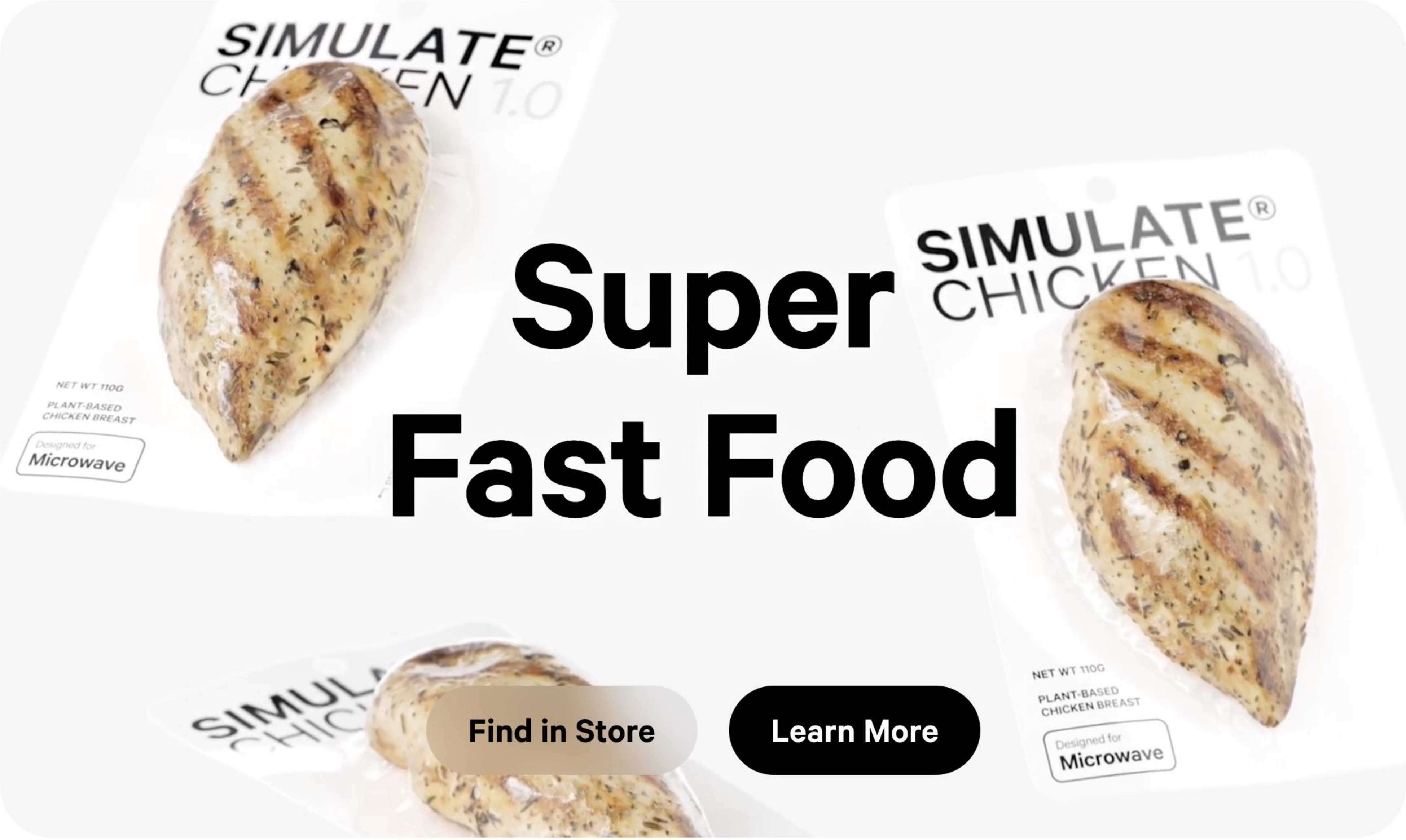
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FIGURES

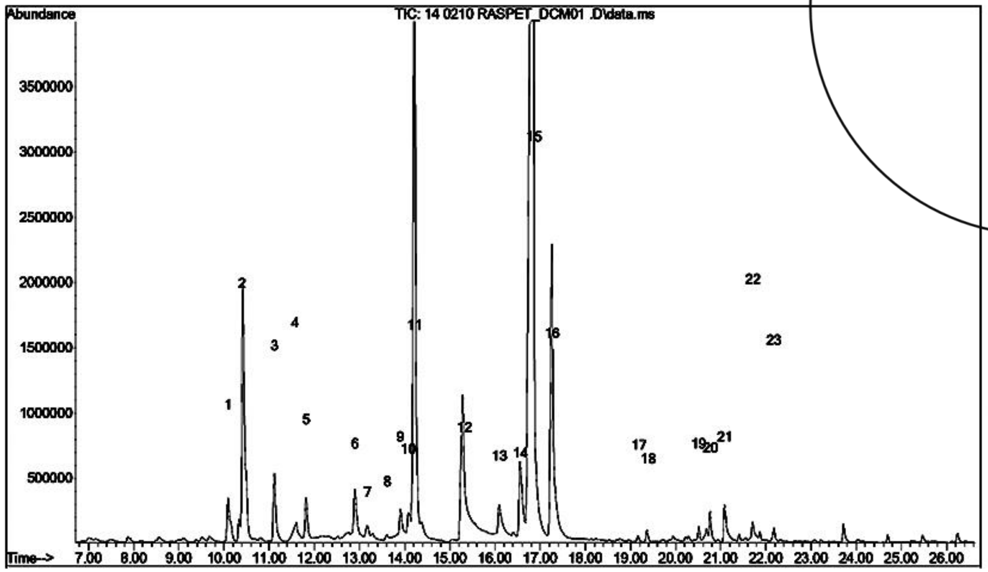
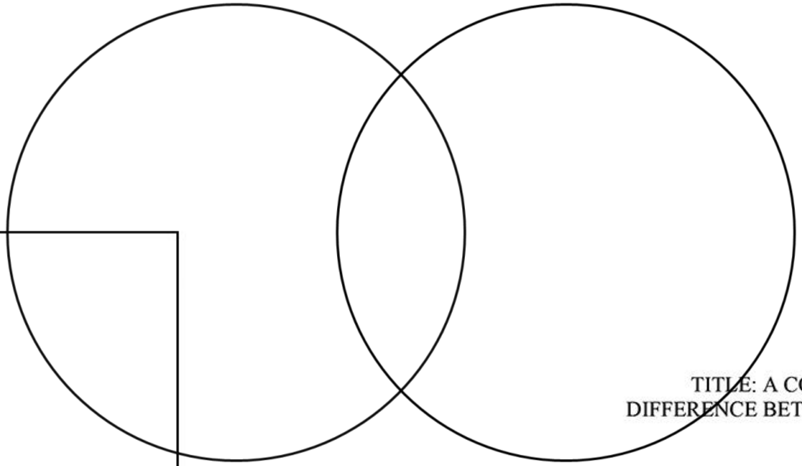


Figure 1.

Gas Chromatography-Mass Spec analysis of flavor profile of Compositionα, Coca-Cola®

1 eugenol
2 limonene
3 alpha-pinene
4 pentanoic acid
5 (+)-4-Carene
6 terpinenol
7 isopulegol
8 isoborneol
9 4-terpineol
10 thymol
11 alpha-terpineol
12 2-furancarboxaldehyde, 5-(hydroxymethyl)-
13 cinnamaldehyde
14 1,4-cineol
15 eucalyptol
16 eucalyptol
17 caryophyllene
18 alpha-bergamotene
19 alpha-cedrene
20 beta-bisabolene
21 myristicin
22 dodecanoic acid
23 hexadecanol



Patent Application

For

TITLE: A COMPOSITION OF MATTER CONSISTING OF THE DIFFERENCE BETWEEN TWO COMPOSITIONS OF MATTER

CROSS-REFERENCE TO RELATED APPLICATIONS Not Applicable

FEDERALLY SPONSORED RESEARCH Not Applicable

SEQUENCE LISTING OR PROGRAM Not Applicable

ABSTRACT:

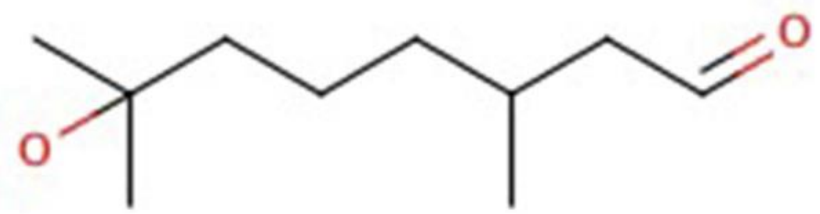
This invention (hereafter the “Composition”) refers to a composition of matter related to soft drink formulations and a method for calculating and producing the same. The Composition consists of the material difference between two soft drink formulations—Coca-Cola® and Pepsi Cola® (hereinafter the “Primary Formulations”). Several methods for determining and subsequently manufacturing the difference between the two Primary Formulations are disclosed herein. The Composition may take on various embodiments based upon the method of manufacture and calculation that is utilized.

In the preferred embodiment, the Composition consists of the difference between the Primary Formulations’ chemical compositions. In other embodiments, the definition of each of the Primary Formulations is expanded to include additional matter and material processes that are relevant to the functional definition of the Primary Formulations, such as the manufacturing processes, supply infrastructure, advertising parameters, corporate structure and financial operations, persons and behaviors that pertain to the products.

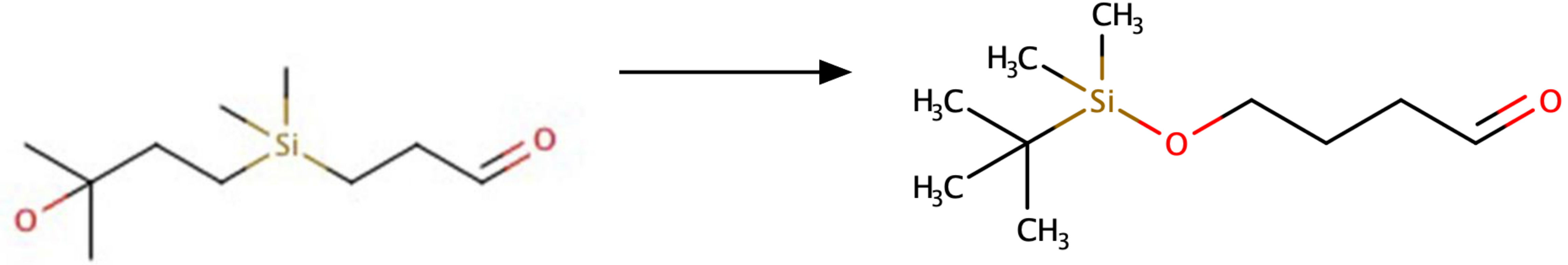
New Flavors and Fragrances, 2014

METHYL METHANOATE	METHYL ETHANOATE	METHYL PROPANOATE	METHYL BUTANOATE
ETHYL METHANOATE	ETHYL ETHANOATE	ETHYL PROPANOATE	ETHYL BUTANOATE
PROPYL METHANOATE	PROPYL ETHANOATE	PROPYL PROPANOATE	PROPYL BUTANOATE
BUTYL METHANOATE	BUTYL ETHANOATE	BUTYL PROPANOATE	BUTYL BUTANOATE

Figure 1. IUPAC Nomenclature



7-hydroxycitronellal



3-[(3-hydroxy-3-methylbutyl)dimethylsilyl]propanal

(Siladroxyllal-014®)

4-[(tert-butyldimethylsilyl)oxy]butanal

Figure 7. 7-hydroxycitronellal and Siladroxyllal-014®

Hyperflor at the Okayama Art Summit, 2019

CAS Solutions

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Substance Identifier "2346499-11-2 " > substances (1) > 2346499-11-2

SUBSTANCE DETAIL

Return

CAS Registry Number 2346499-11-2

$C_{11}H_{12}O_3$

1,3-Dioxan-5-one, 2-(phenylmethyl)-

Molecular Weight

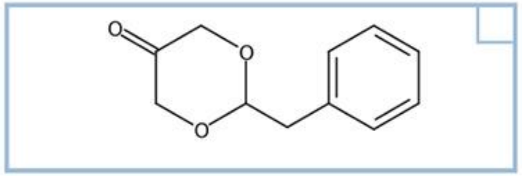
192.21

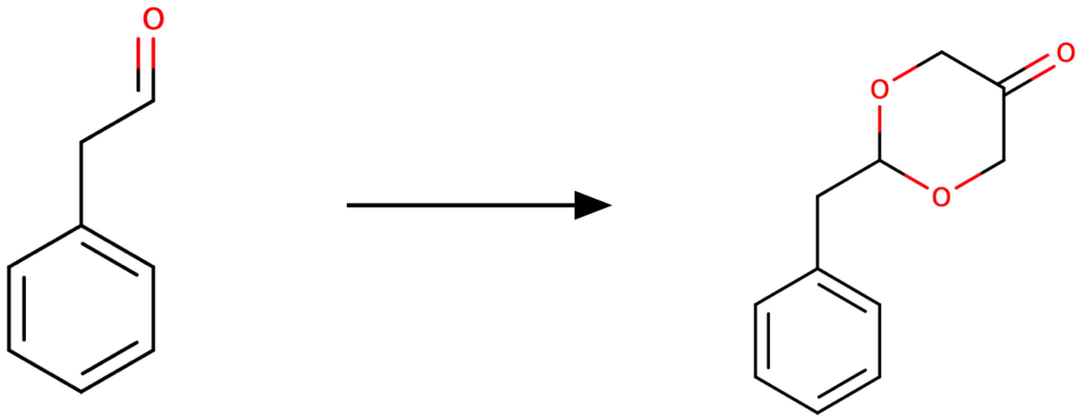
Boiling Point (Predicted)

Value: 323.4±32.0 °C | Condition: Press: 760 Torr

Density (Predicted)

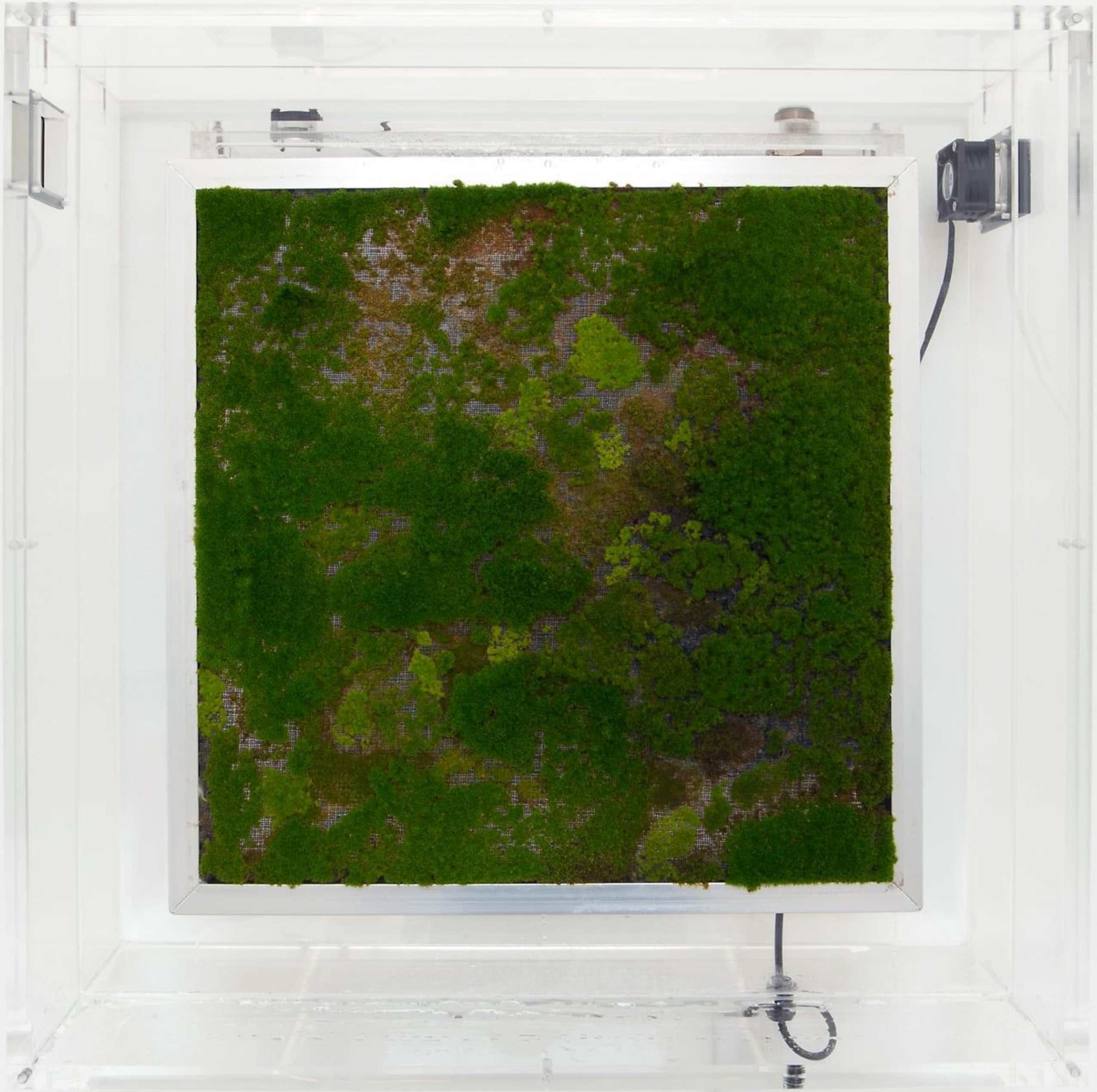
Value: 1.176±0.06 g/cm3 | Condition: Temp: 20 °C Press: 760 Torr

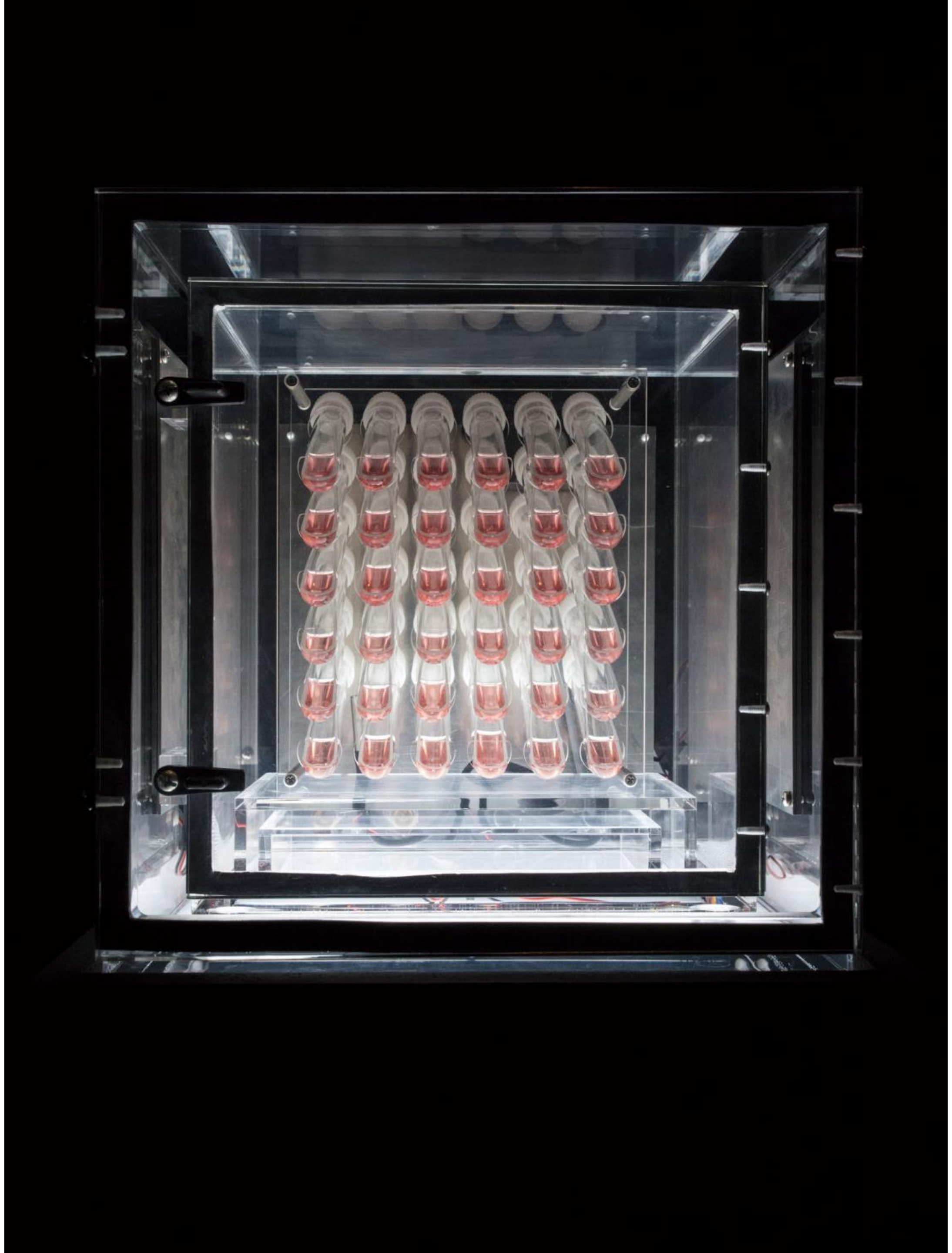




phenylacetaldehyde

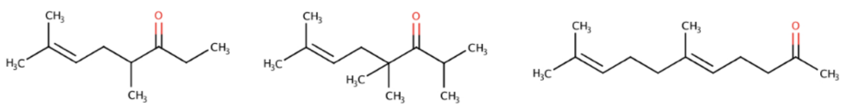
Hyperflor

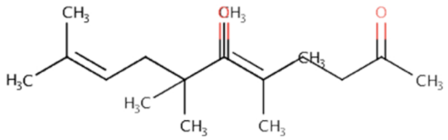



Receptor-binding variations, 2018

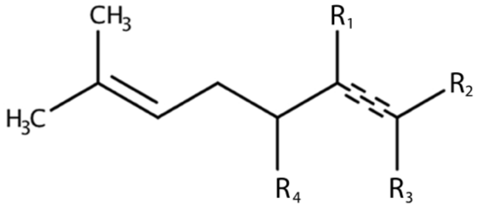
1.



components



superimposition



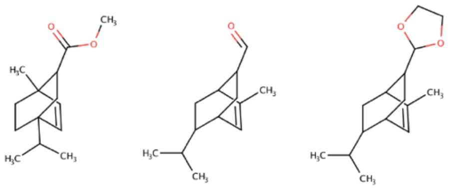
sub-structure

R1 or R2 = or contains ketone

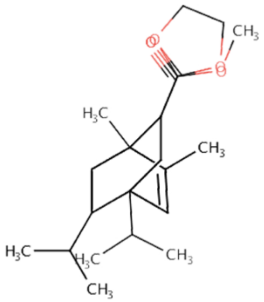
2L13	30.68
52D1	**55.20**
2W1	58.02
1G1	79.34

OR activity

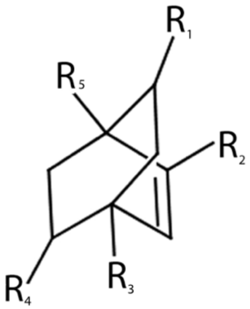
3.



components



superimposition



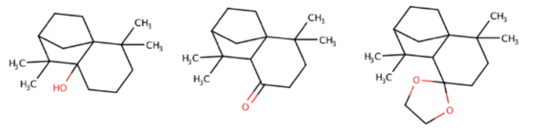
sub-structure

one R = carbaldehyde, methyl ester, or dioxalane

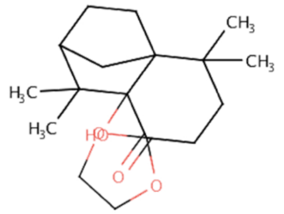
7D4	57.16
2W1	58.19
7A2 (P)	58.79
1D2	59.20
2L13	94.69

OR activity

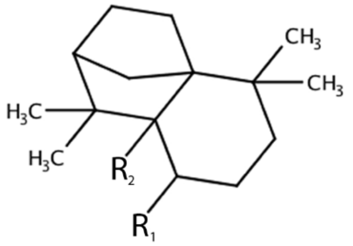
4.



components



superimposition

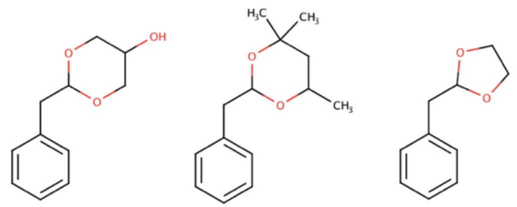


sub-structure
one R = ketone, alcohol, or dioxalane

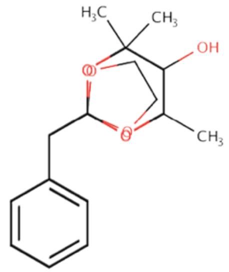
1J2	80.91
8K3	81.06
2L13	82.78
7G3	84.82

OR activity

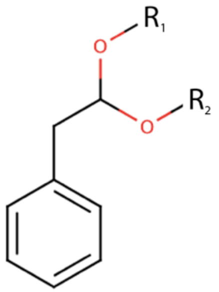
6.



components



superimposition

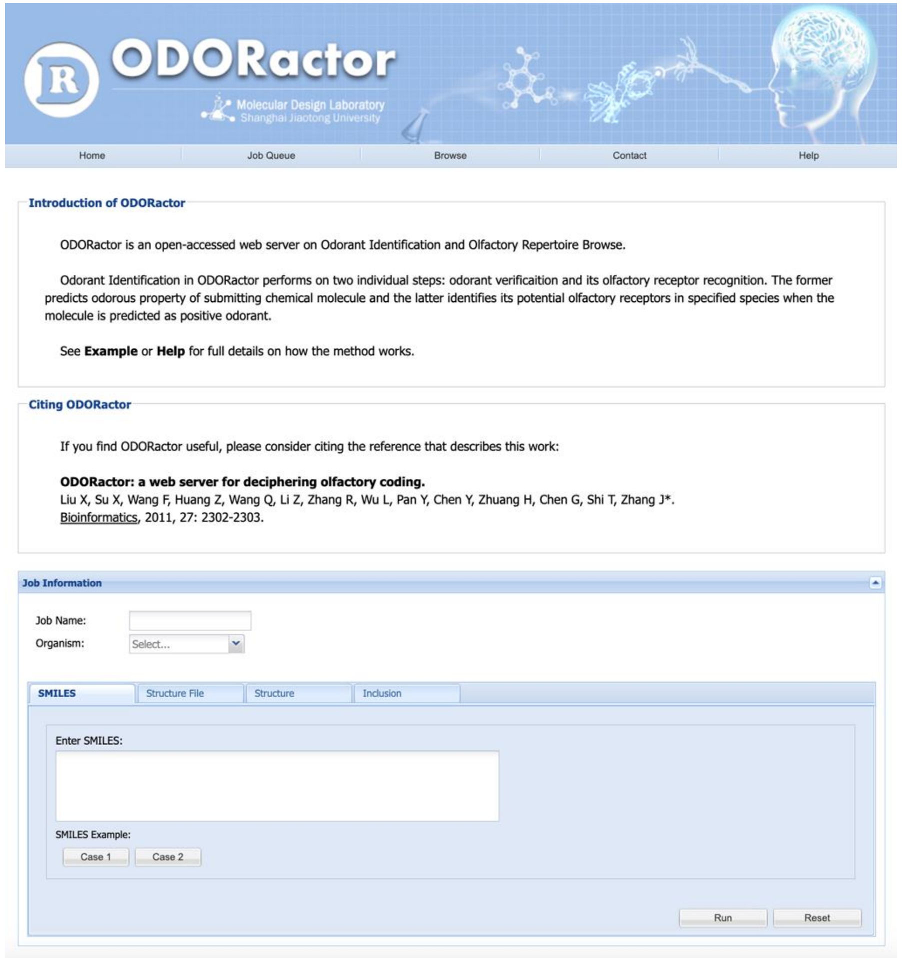


sub-structure
R1 and R2 close to form cyclic structure

7A10	43.44
4C6	43.94
1A1	45.46
2W1	47.03
2L5	52.15
5F1	54.61
2L13	82.01
1D2	86.16

OR activity

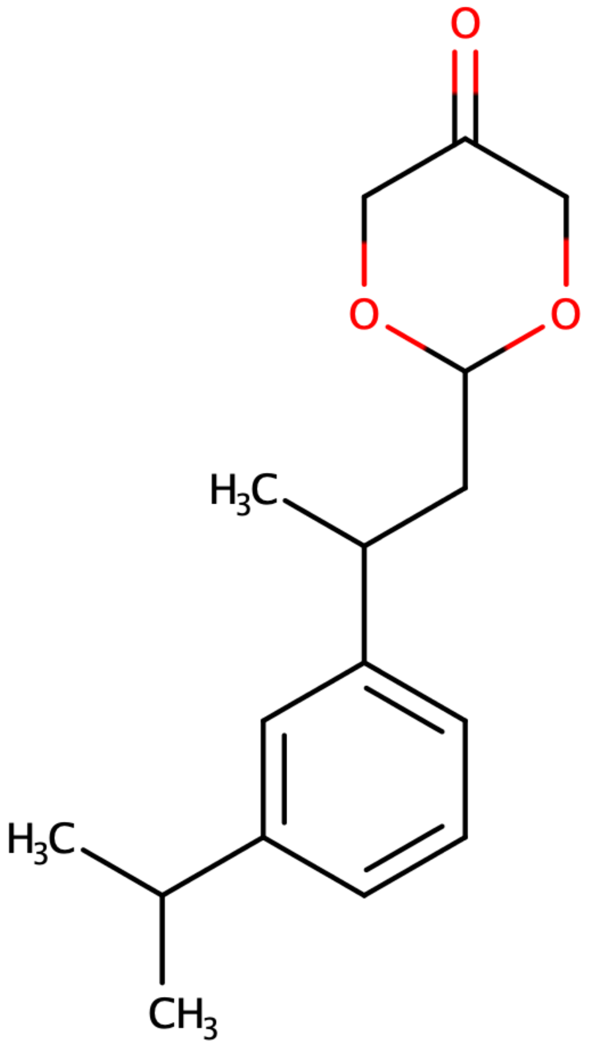
Composite Olfactory Receptor Activity										
	1	2	3	4	5	6	7	8	9	10
Olfactory Recptor										
1A1						**45.46**				
7G3				**84.82**						
8K3				**81.06**						
1J2				**80.91**						
3A1		**80.87**								
2AE1		**57.78**								
5F1						**54.61**				
4C6						**43.94**				
7A10						**43.44**				
10R2								**41.64**		
1A2					**41.03**					
2V2							**40.08**			
2V1							**39.07**			
7D4			**57.16**							
52D1	**55.20**									**61.82**
2L5						*52.15*	*70.57*		*33.08*	
1D2		*83.56*	*59.20*			*86.16*	*39.62*			
7A2 (P)			*58.79*		*41.39*			*79.39*	*34.53*	
1G1	*79.34*				*66.91*		*76.95*	*84.73*	*70.54*	
2L13	*30.68*		*94.69*	*82.78*	*72.45*	*82.01*		*48.92*	*38.93*	
2W1	*58.02*	*85.72*	*58.19*		*63.53*	*47.03*		*46.44*	*35.96*	
B = Specific Receptors										
i = General Receptors										

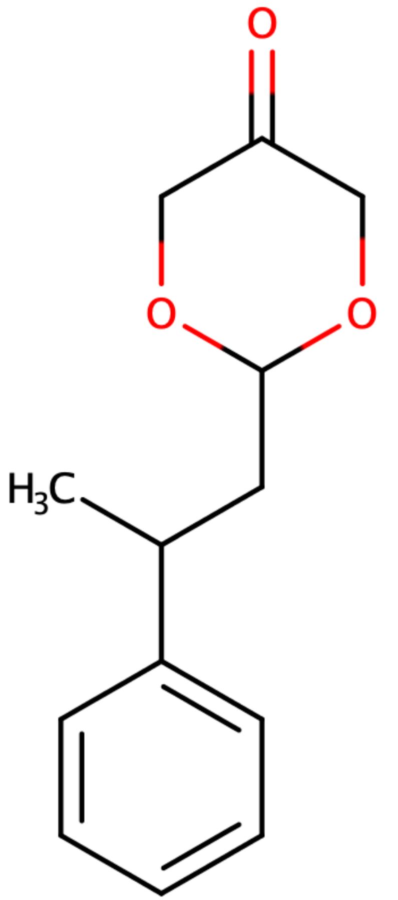


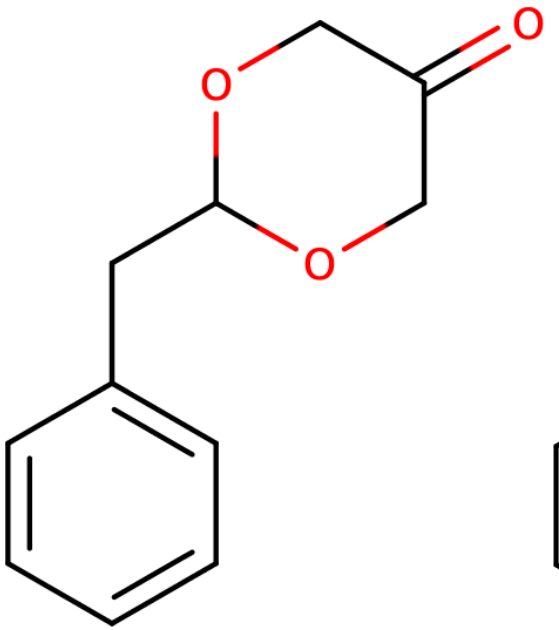
Citing ODORactor

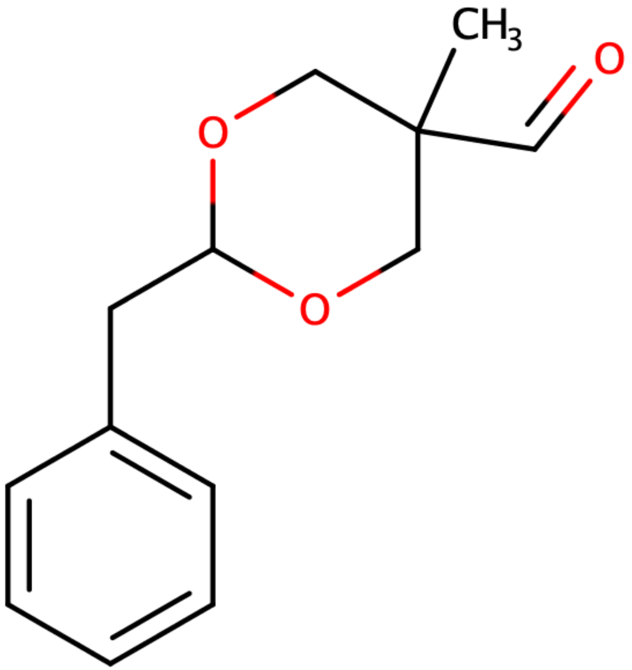
If you find ODORactor useful, please consider citing the reference that describes this work:

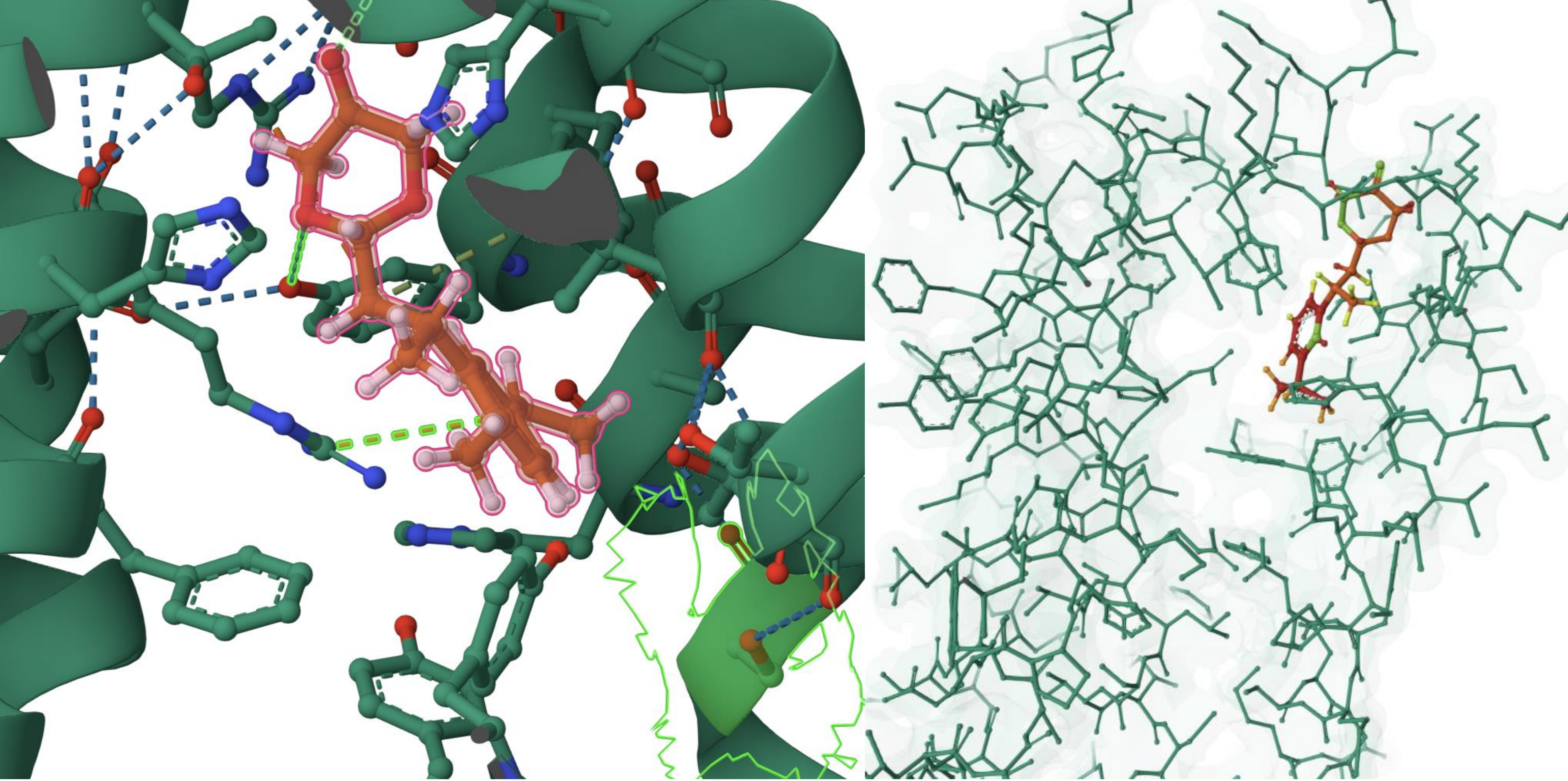
ODORactor: a web server for deciphering olfactory coding.
Liu X, Su X, Wang F, Huang Z, Wang Q, Li Z, Zhang R, Wu L, Pan Y, Chen Y, Zhuang H, Chen G, Shi T, Zhang J*.
Bioinformatics, 2011, 27: 2302-2303.



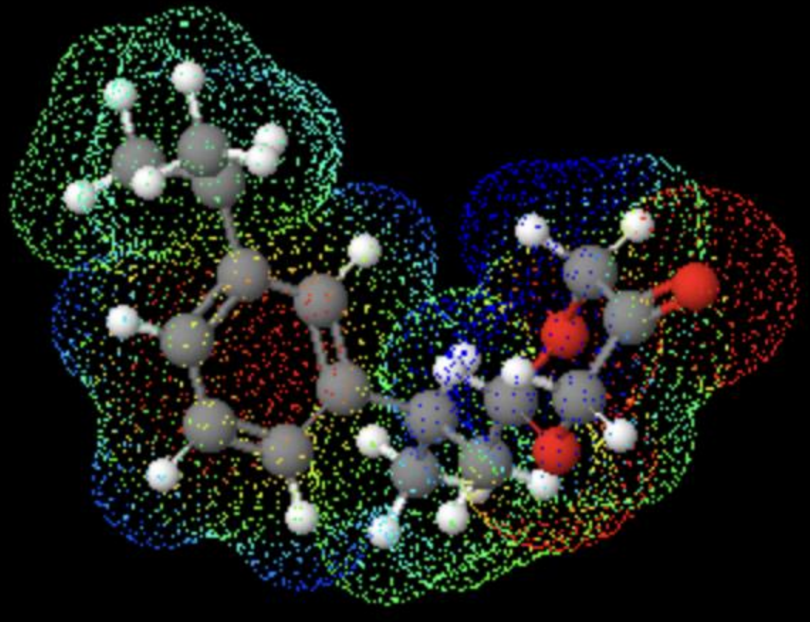


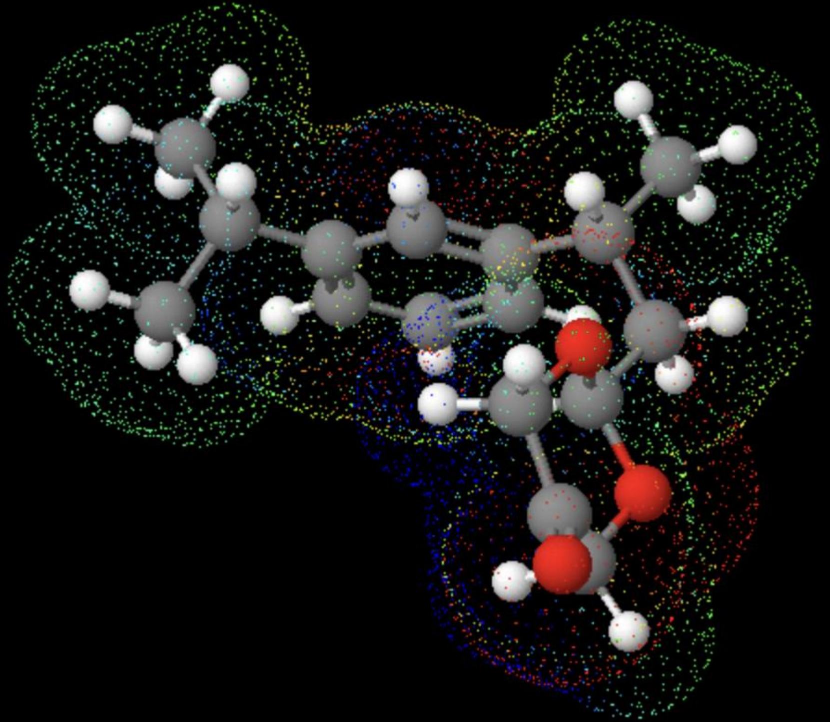




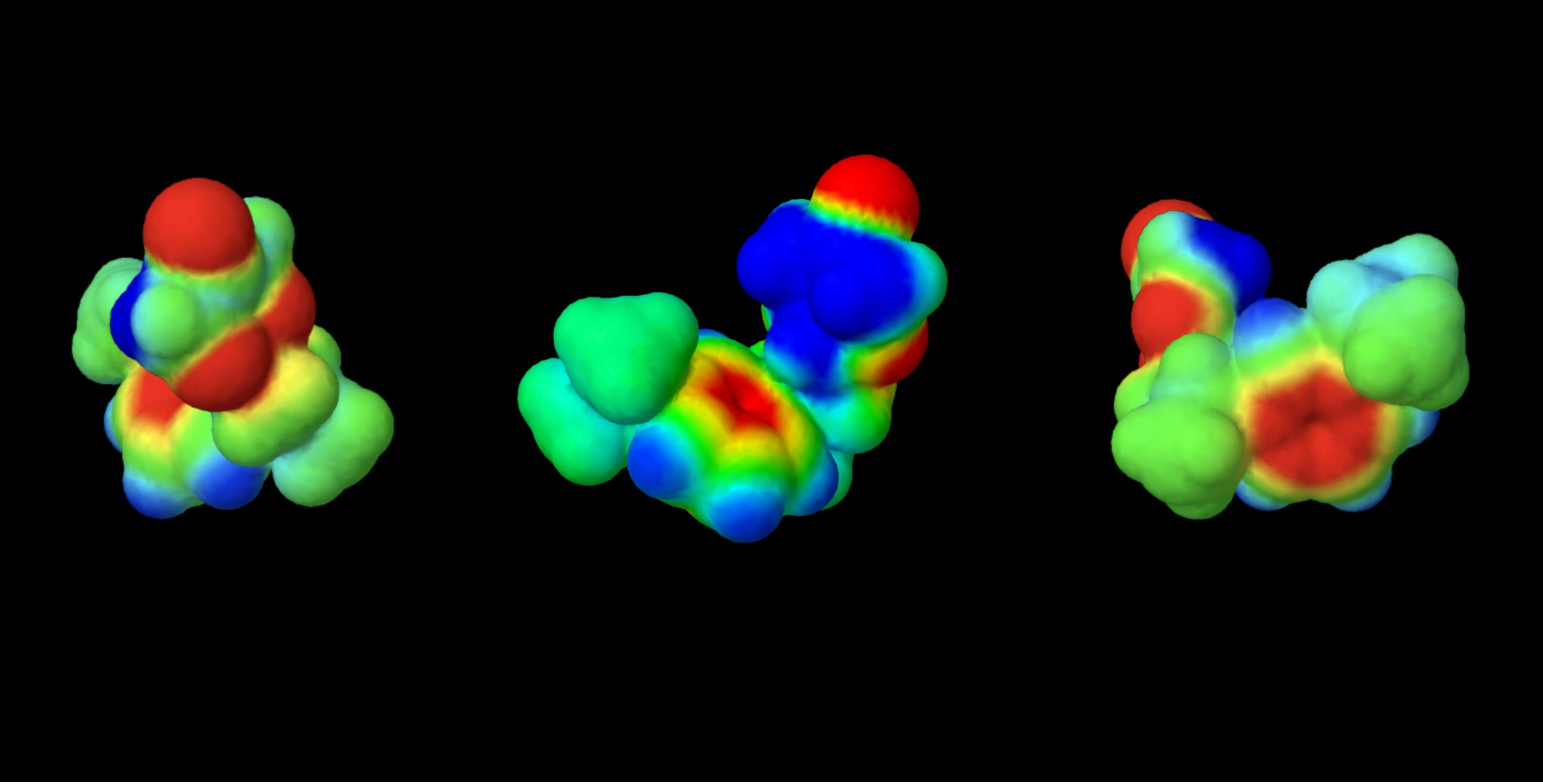


E12 molecule (orange) shown in simulation activating an olfactory receptor with potential links to the limbic system

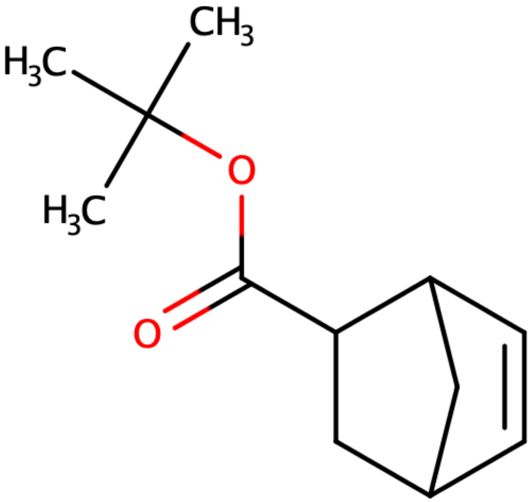


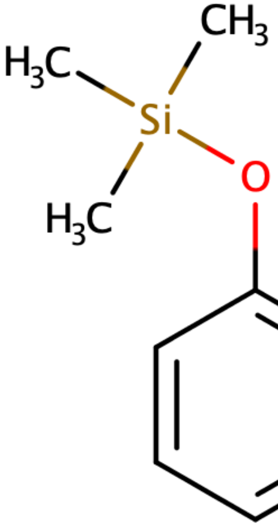


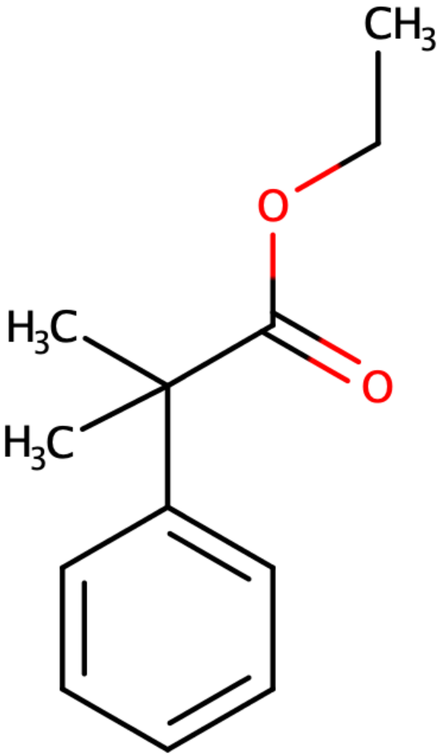
E12 molecule 3D structure

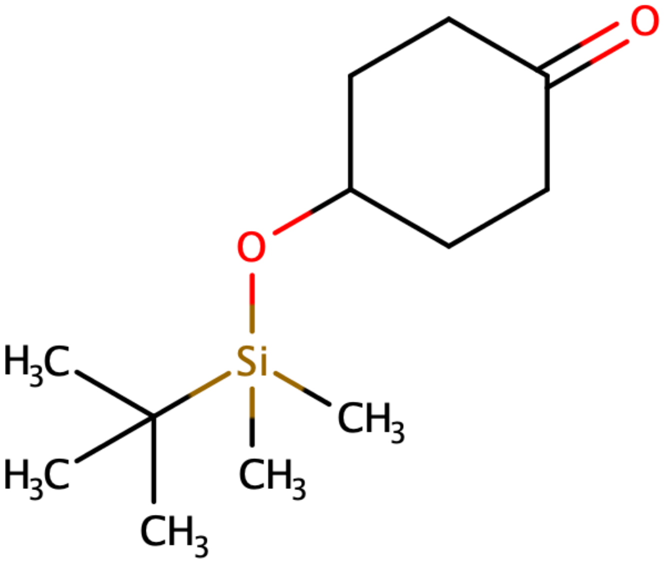


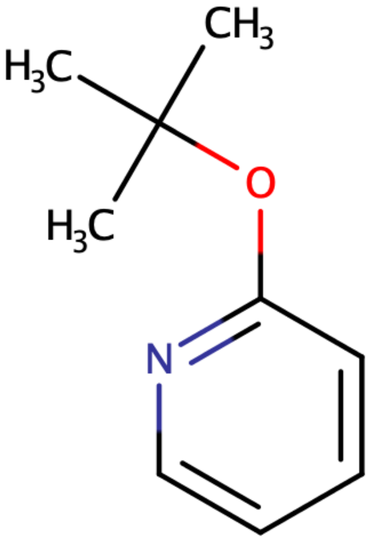
E12 molecule 3D structure with electrostatic potential visualized











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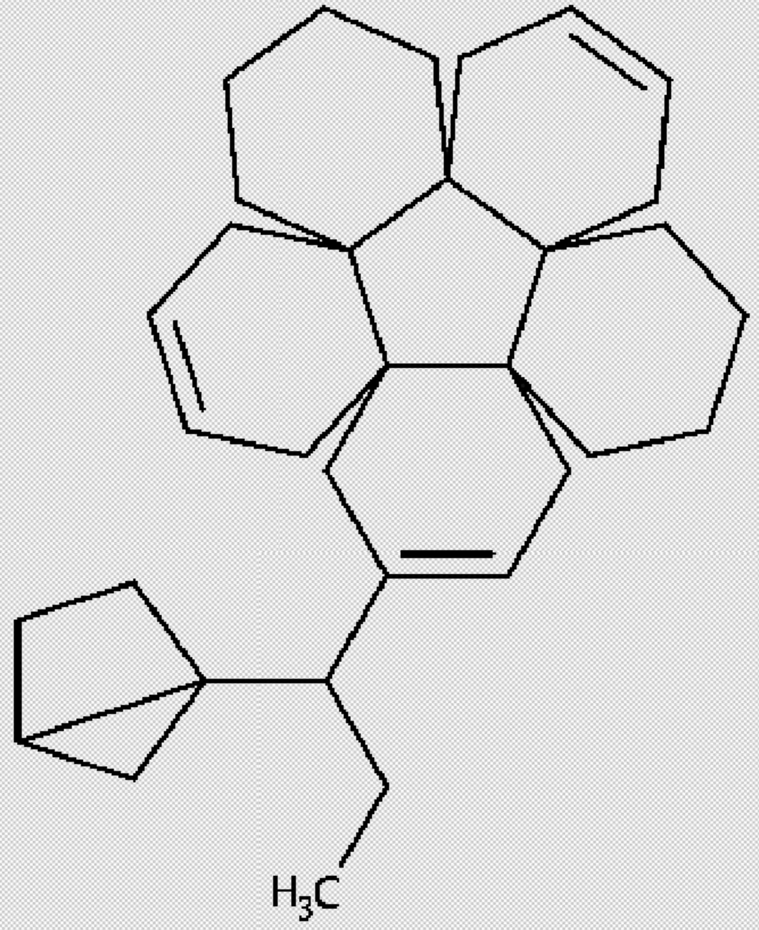
We are discovering the 'RGB' of our chemical senses along with new and better flavor & fragrance molecules.

By applying recent AI advances in drug discovery along with in silico modeling and machine learning, we are making rapid progress on this historically, very challenging problem.



4-(1-{bicyclo[2.1.0]pentan-1-yl}propyl)hexacyclo[$19.4.0.0^{1,6}.0^{6,11}.0^{11,16}.0^{16,21}$]pentacosa-3,8,18-triene patina

p a t i n a . e a r t h

T E A M

Sean Raspet
Cofounder

has spent over 12 years studying structure-odor relationships of small molecules with a goal towards systematizing scent. At Soylent he worked with programmers on some of the first applications of machine learning towards this problem.

He has extensive experience in new flavor and fragrance molecule design and formulation with multiple pending patents in the space. He was a cofounder of Nonfood and as CTO at Simulate he developed the company's fiber spinning technology, helped the company raise $57MM and steered the company through to acquisition.

Laura Sisson
Cofounder

has over 9 years experience in the software industry including Google and Talent.com. She has spent many years researching the applications of AI/ML towards understanding the sense of smell on a molecular level. Published papers in the field, include Deep Learning for Odor Prediction on Aroma-Chemical Blends in ACS Omega. Previously Founder and ML Lead at Smellotron

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Ectopic Olfactory Receptors

- Olfactory receptors expressed elsewhere in the body
- Have been discovered in nearly every organ where they have specialized functions (mostly uncharacterized)
- Generally unexplored/not understood by traditional pharmaceuticals, even though Ors make up the largest class of genes in the human genome
- Expand the possible applications of fragrance chemistry into cosmetics, supplements, and eventually pharmaceutical applications
- Examples include a molecule Patina is working on that targets receptors in skinthat are responsible for wound healing and skin rejuvenation

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Expression Profile of Ectopic Olfactory Receptors Determined by Deep Sequencing

Caroline Flegel, Stavros Manteniotis, Sandra Osthold, Hanns Hatt, Günter Gisselmann*

Department of Cell Physiology, Ruhr-University Bochum, Bochum, Germany

Abstract

Olfactory receptors (ORs) provide the molecular basis for the detection of volatile odorant molecules by olfactory sensory neurons. The OR supergene family encodes G-protein coupled proteins that belong to the seven-transmembrane-domain receptor family. It was initially postulated that ORs are exclusively expressed in the olfactory epithelium. However, recent studies have demonstrated ectopic expression of some ORs in a variety of other tissues. In the present study, we conducted a comprehensive expression analysis of ORs using an extended panel of human tissues. This analysis made use of recent dramatic technical developments of the so-called Next Generation Sequencing (NGS) technique, which encouraged us to use open access data for the first comprehensive RNA-Seq expression analysis of ectopically expressed ORs in multiple human tissues. We analyzed mRNA-Seq data obtained by Illumina sequencing of 16 human tissues available from Illumina Body Map project 2.0 and from an additional study of OR expression in testis. At least some ORs were expressed in all the tissues analyzed. In several tissues, we could detect broadly expressed ORs such as OR2W3 and OR51E1. We also identified ORs that showed exclusive expression in one investigated tissue, such as OR4N4 in testis. For some ORs, the coding exon was found to be part of a transcript of upstream genes. In total, 111 of 400 OR genes were expressed with an FPKM (fragments per kilobase of exon per million fragments mapped) higher than 0.1 in at least one tissue. For several ORs, mRNA expression was verified by RT-PCR. Our results support the idea that ORs are broadly expressed in a variety of tissues and provide the basis for further functional studies.

Citation: Flegel C, Manteniotis S, Osthold S, Hatt H, Gisselmann G (2013) Expression Profile of Ectopic Olfactory Receptors Determined by Deep Sequencing. PLoS ONE 8(2): e55368. doi:10.1371/journal.pone.0055368

Editor: Johannes Reisert, Monell Chemical Senses Center, United States of America

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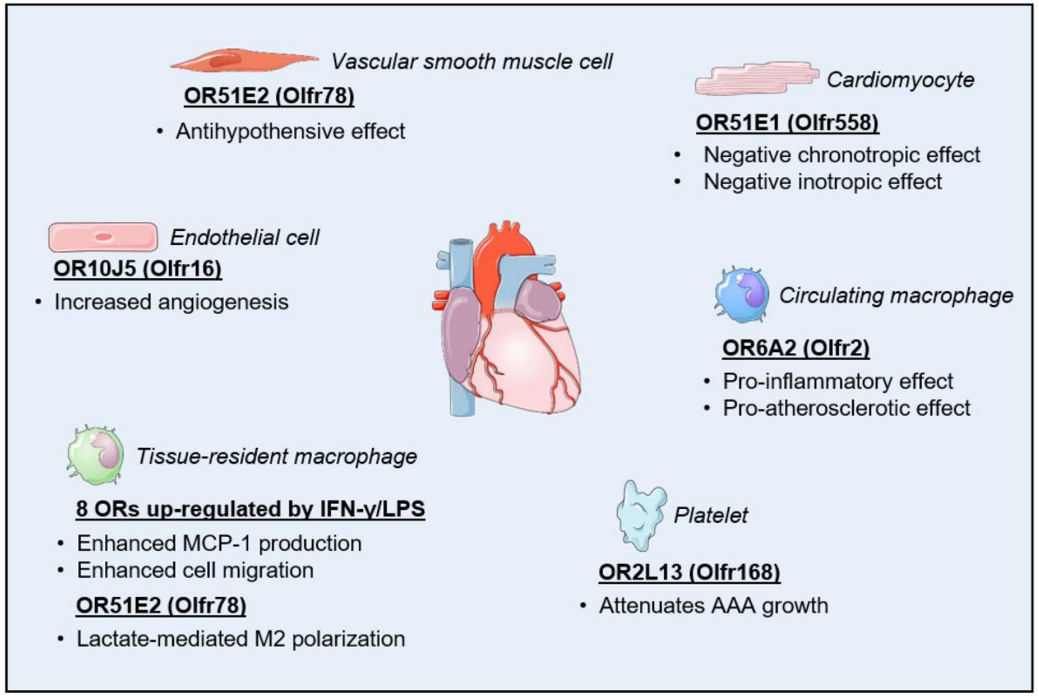
Competing Interests: The authors have declared that no competing interests exist.

* E-mail: Guenter.Gisselmann@rub.de

Introduction

Olfactory receptors (ORs) detect volatile odorant molecules in the environment. In 1991, Linda Buck and Richard Axel identified a supergene family that encodes G-protein coupled receptor proteins (GPCRs) in olfactory epithelium of the rat [1]. These authors postulated that ORs are exclusively expressed in the olfactory epithelium, where they are located in the cilia of olfactory sensory neurons. In 1998, Zhao et al. showed that ORs serve as neuronal odorant sensors [2]. The superfamily of ORs in humans represents the largest gene family known; about it contains approximately 400 functional OR genes and approximately 600 non-functional OR pseudogenes [3,4]. OR genes are found throughout the human genome except on chromosome 20 and the Y chromosome [4,5]. They are usually organized in clusters that are found mostly in telomeric regions [6]. Most OR genes have an intron-free reading frame of approximately 1000 nucleotides that encodes ~330 amino acids [1,5,7]. Some ORs, including MHC-linked ORs, have splice variants in the 5′ untranslated gene regions (5′UTRs), suggesting that the transcription of these genes involves an unusual and complex regulatory mechanism [8,9].

Recent studies have shown that expression of receptors encoded by the OR supergene family is not restricted to the olfactory epithelium. In 1992, only one year after the discovery of ORs, Parmentier and colleagues reported that mammalian ORs are also expressed in a non-olfactory tissue (testis) [10]. Later, Spehr and colleagues demonstrated the functional expression of an OR in human spermatozoa [11]. Activation of OR1D2 in spermatozoa by the odorant bourgeonal influences the swimming direction and swimming speed of spermatozoa. The expression of more than 50 ORs has been detected in the testes of several species including human, dog, mouse and rat [10–14]. The well characterized OR51E2, also known as PSGR, is highly expressed in prostate [15,16]. Activation of this receptor by its specific ligand inhibits the proliferation of prostate cancer cells [17]. Moreover, odorants reaching the luminal environment of the gut may stimulate serotonin release via ORs present in enterochromaffin cells [18]. These examples illustrate the importance and some of the possible function of ORs outside the olfactory epithelium. Although many past studies have focused on the expression of ORs, most have only studied expression in a single mammalian tissue. Expression of individual OR transcripts in various tissues, including the autonomic nervous system [19], brain [20–22], tongue [23,24], erythroid cells [25], prostate [15], placenta [26], gut [18] and kidney [27], has been described. So far, only a few systematic studies have analyzed the entire olfactory subtranscriptome in a variety of different human tissues. These studies were performed using EST data and microarray analysis [28,29]. The results of



CRITICAL REVIEWS IN FOOD SCIENCE AND NUTRITION
https://doi.org/10.1080/10408398.2021.1885007

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REVIEW

Human ectopic olfactory receptors and their food originated ligands: a review

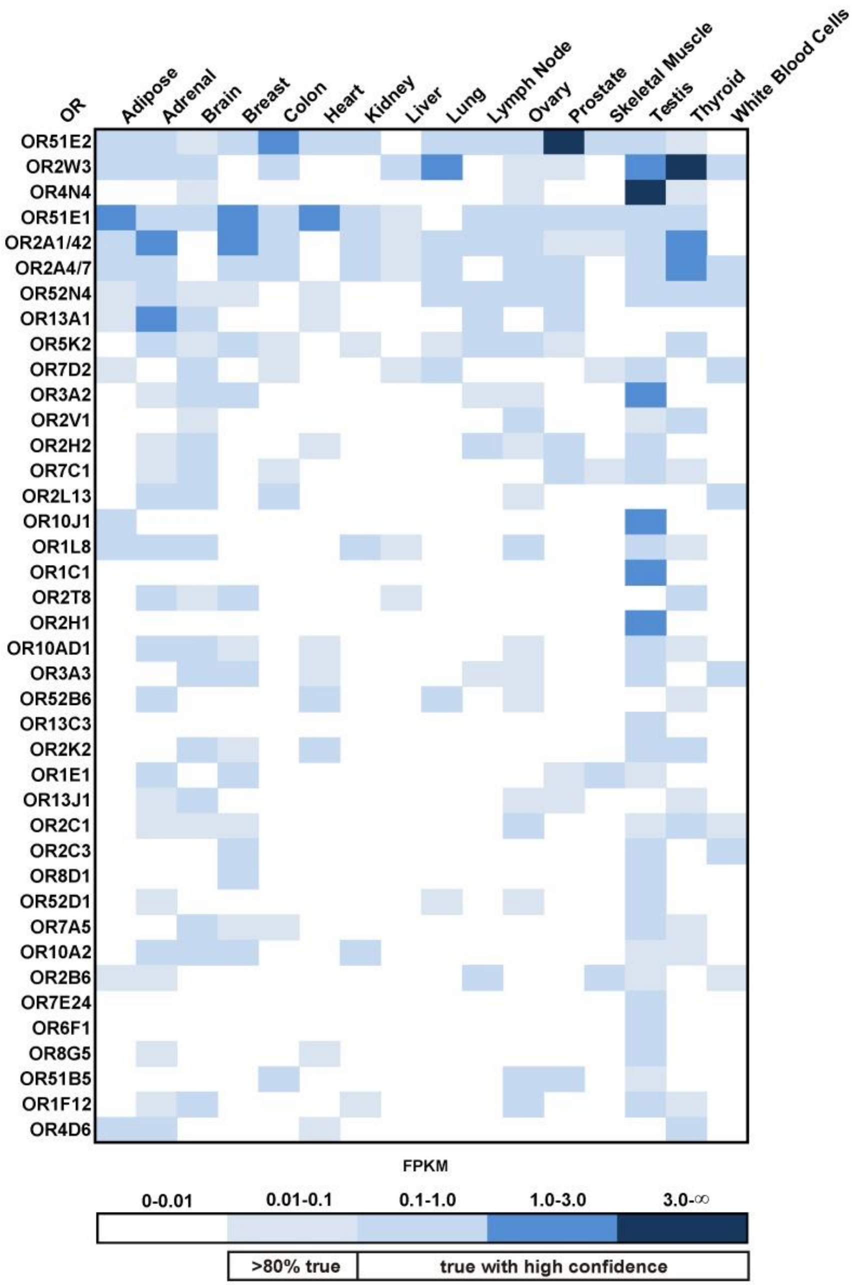
Rifat Nowshin Raka[a,b,c,d,e], Hua Wu[a,b,f], Junsong Xiao[a,b,c,d,e], Imam Hossen[a,b,c,d,e], Yanping Cao[a,c], Mingquan Huang[a,b], and Jianming Jin[a,f]

[a]Beijing Technology and Business University, Beijing, China; [b]Key Laboratory of Brewing Molecular Engineering of China Light Industry, Beijing, China; [c]Beijing Engineering and Technology Research Center of Food Additives, Beijing, China; [d]Beijing Laboratory for Food Quality and Safety, Beijing, China; [e]Beijing Advanced Innovation Center for Food Nutrition and Human Health, Beijing, China; [f]Beijing Key Lab of Plant Resource Research and Development, Beijing, China

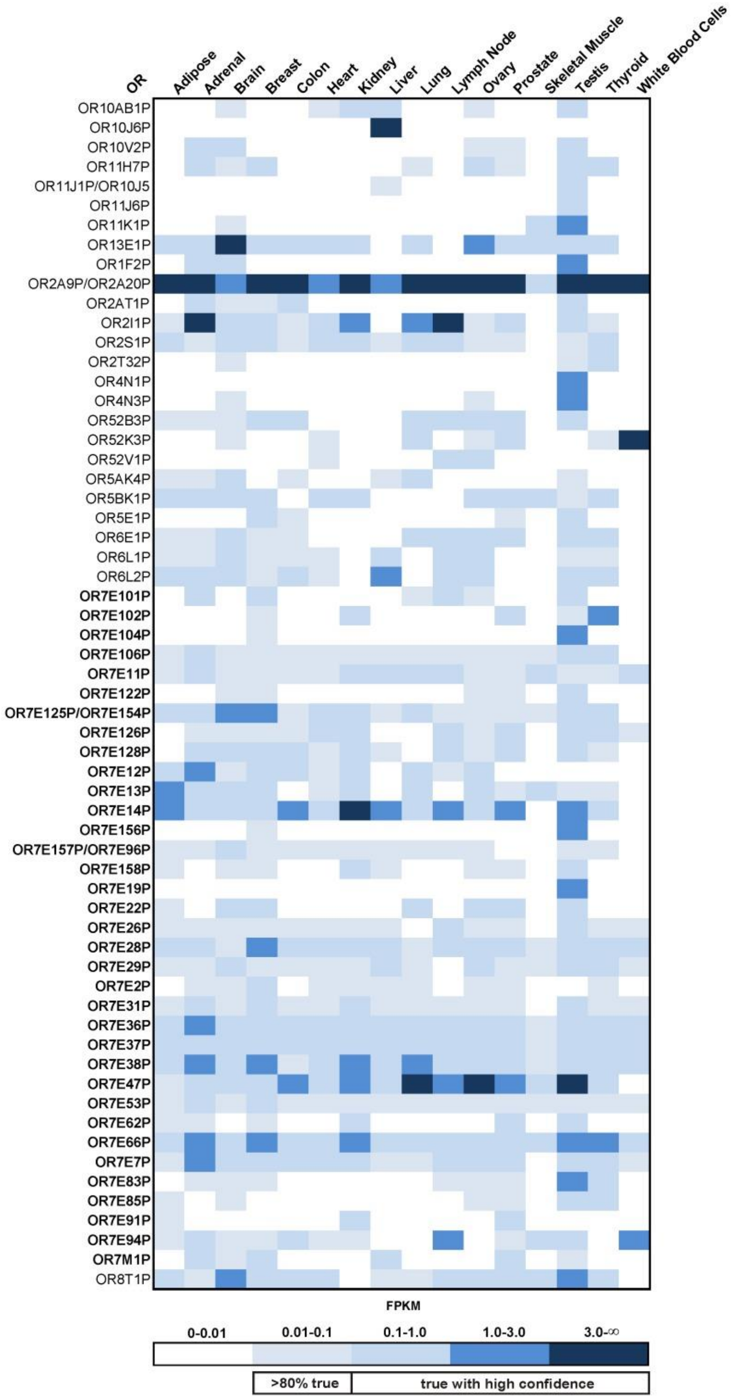
ABSTRACT

Ectopic olfactory receptors (EORs) are expressed in non-nasal tissues of human body. They belong to the G-protein coupled receptor (GPCR) superfamily. EORs may not be capable of differentiating odorants as nasal olfactory receptors (ORs), but still can be triggered by odorants and are involved in different biological processes such as anti-inflammation, energy metabolism, apoptosis etc.

KEYWORDS
Ectopic olfactory receptors; GPCR; odorants; ligands; essential oil; metabolites; biomarker; cancer



OR
Adipose
Adrenal
Brain
Breast
Colon
Heart
Kidney
Liver
Lung
Lymph Node
Ovary
Prostate
Skeletal Muscle
Testis
Thyroid
White Blood Cells
OR51E2
OR2W3
OR4N4
OR51E1
OR2A1/42
OR2A4/7
OR52N4
OR13A1
OR5K2
OR7D2
OR3A2
OR2V1
OR2H2
OR7C1
OR2L13
OR10J1
OR1L8
OR1C1
OR2T8
OR2H1
OR10AD1
OR3A3
OR52B6
OR13C3
OR2K2
OR1E1
OR13J1
OR2C1
OR2C3
OR8D1
OR52D1
OR7A5
OR10A2
OR2B6
OR7E24
OR6F1
OR8G5
OR51B5
OR1F12
OR4D6
FPKM
0-0.01
0.01-0.1
0.1-1.0
1.0-3.0
3.0-∞
>80% true
true with high confidence



OR
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Ovary
Prostate
Skeletal Muscle
Testis
Thyroid
White Blood Cells
OR10AB1P
OR10J6P
OR10V2P
OR11H7P
OR11J1P/OR10J5
OR11J6P
OR11K1P
OR13E1P
OR1F2P
OR2A9P/OR2A20P
OR2AT1P
OR2I1P
OR2S1P
OR2T32P
OR4N1P
OR4N3P
OR52B3P
OR52K3P
OR52V1P
OR5AK4P
OR5BK1P
OR5E1P
OR6E1P
OR6L1P
OR6L2P
OR7E101P
OR7E102P
OR7E104P
OR7E106P
OR7E11P
OR7E122P
OR7E125P/OR7E154P
OR7E126P
OR7E128P
OR7E12P
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OR7E26P
OR7E28P
OR7E29P
OR7E2P
OR7E31P
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OR7E53P
OR7E62P
OR7E66P
OR7E7P
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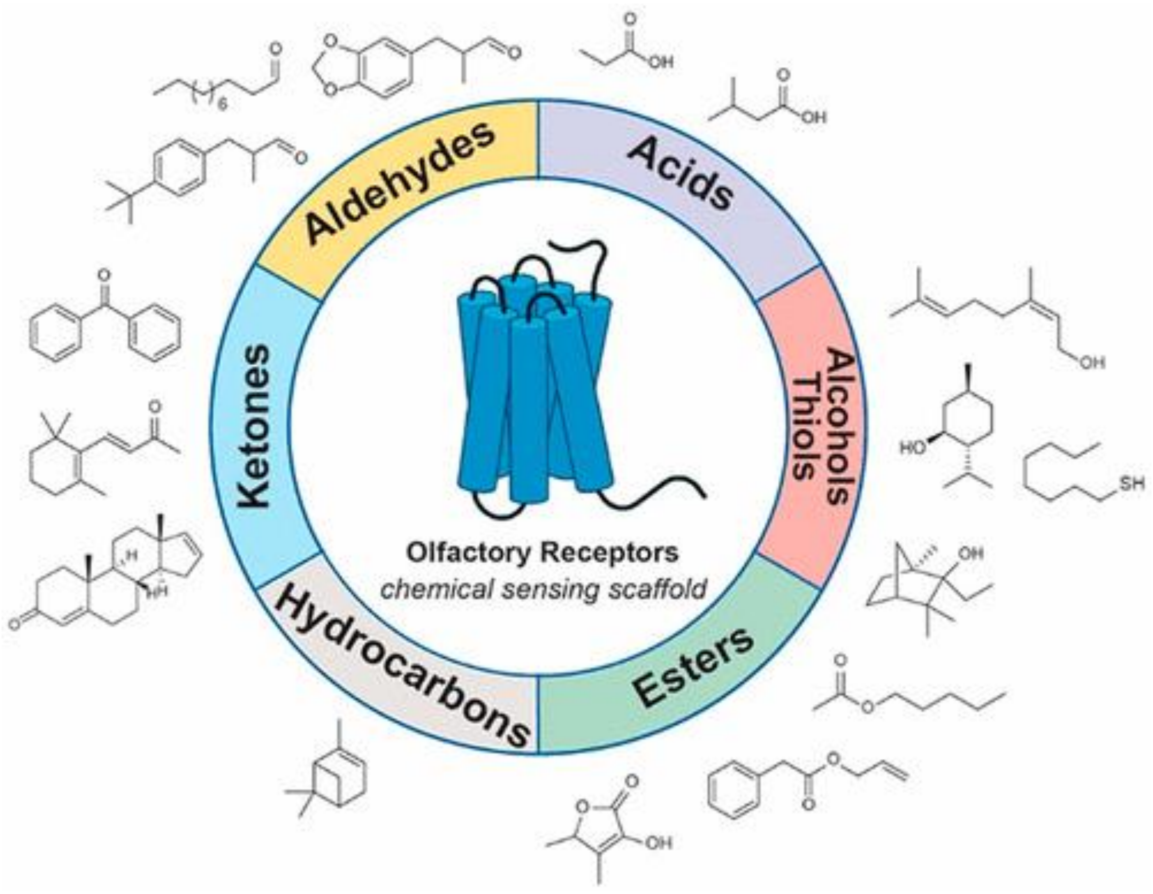
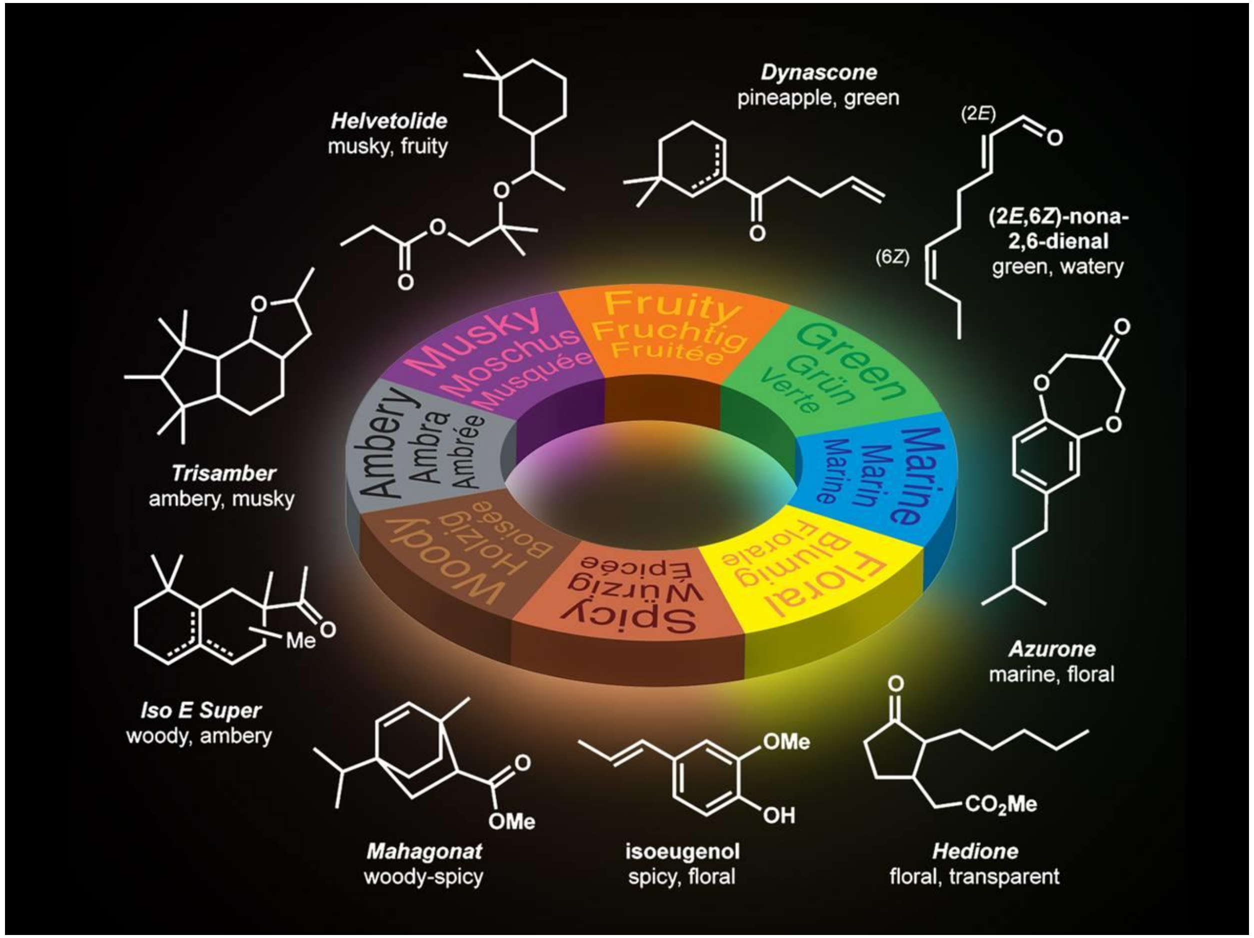
OR7E85P
OR7E91P
OR7E94P
OR7M1P
OR8T1P
FPKM
0-0.01
0.01-0.1
0.1-1.0
1.0-3.0
3.0-∞
>80% true
true with high confidence

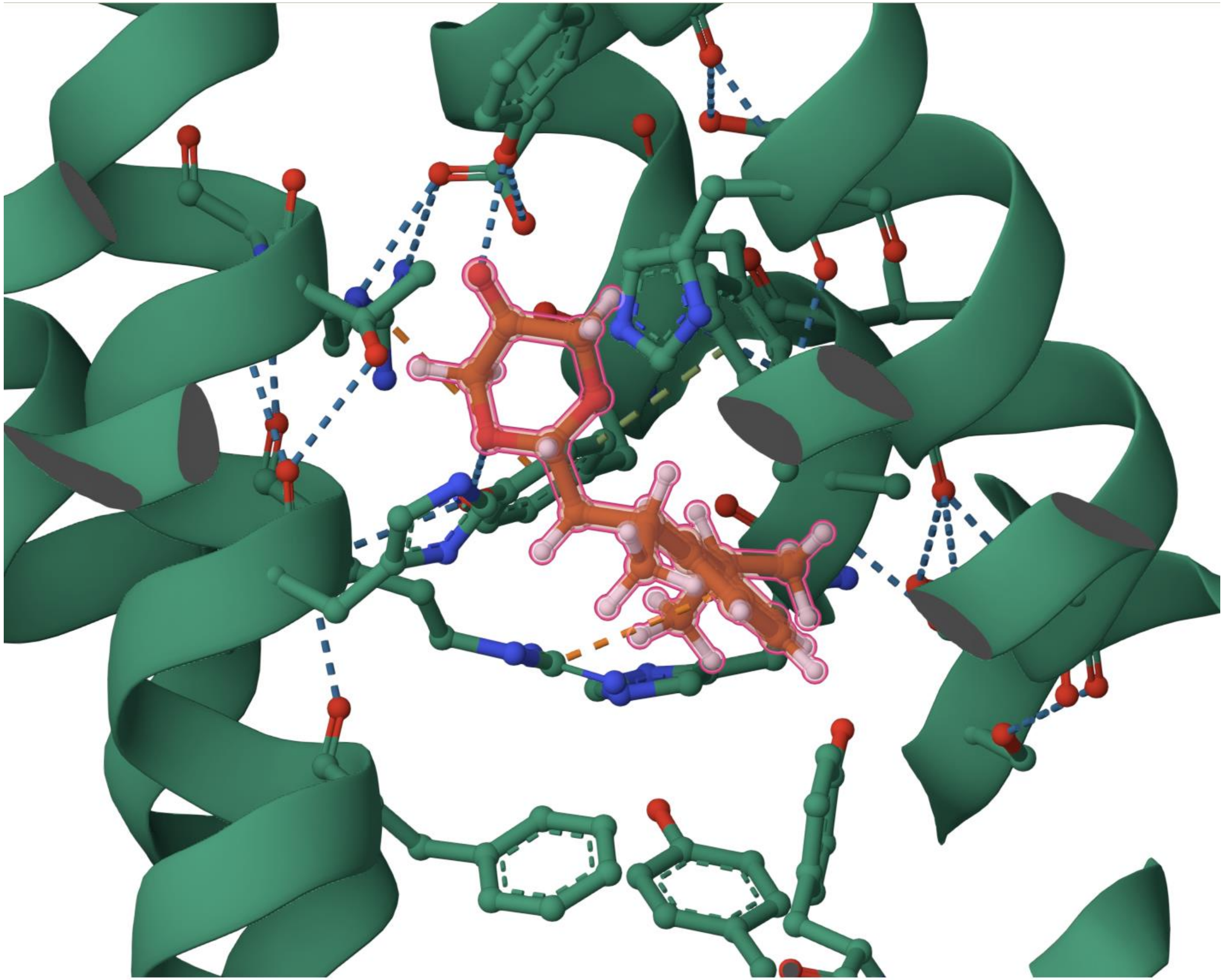
The Discovering the 'Primary Colors' of scent has broad applications for the future of human health





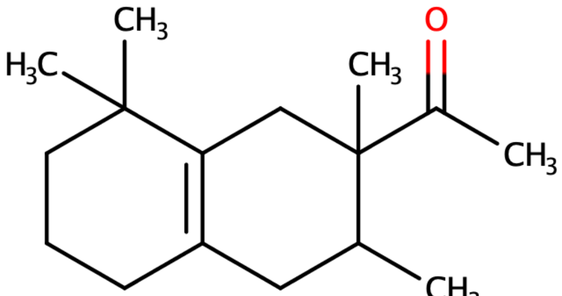
Sean Raspet

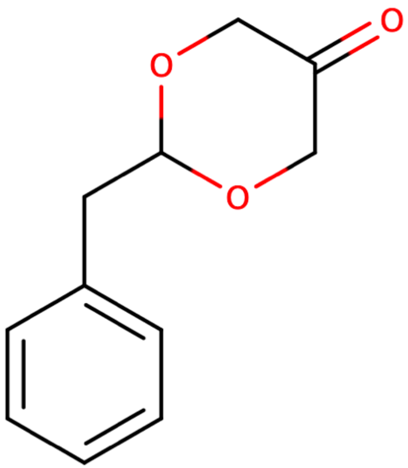
Recent Molecules

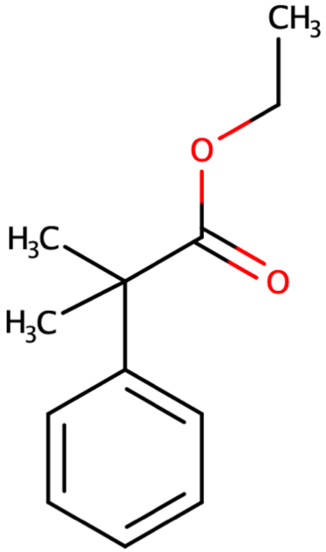


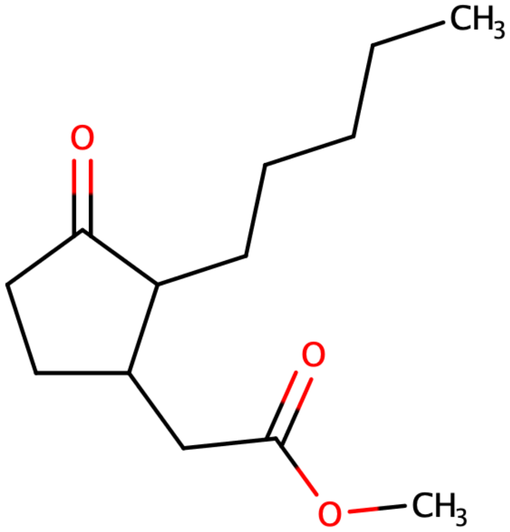
Patina.earth

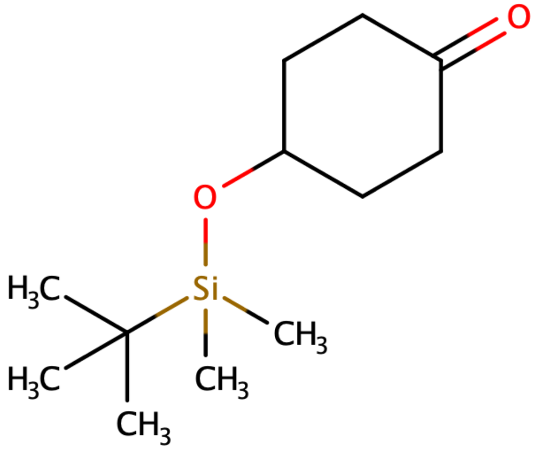
sean@patina.earth

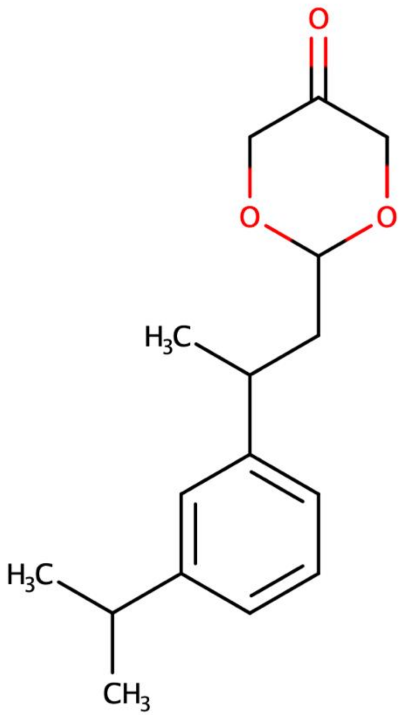


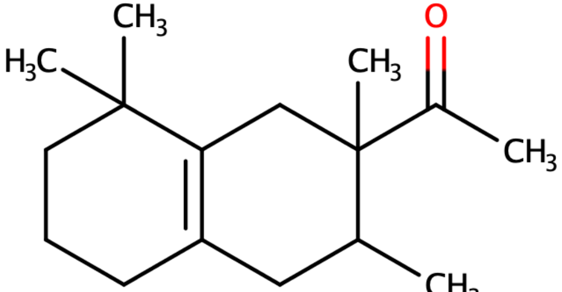


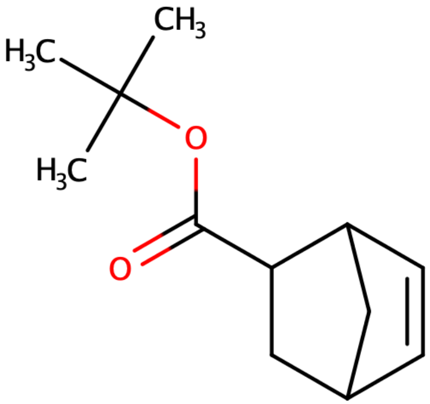


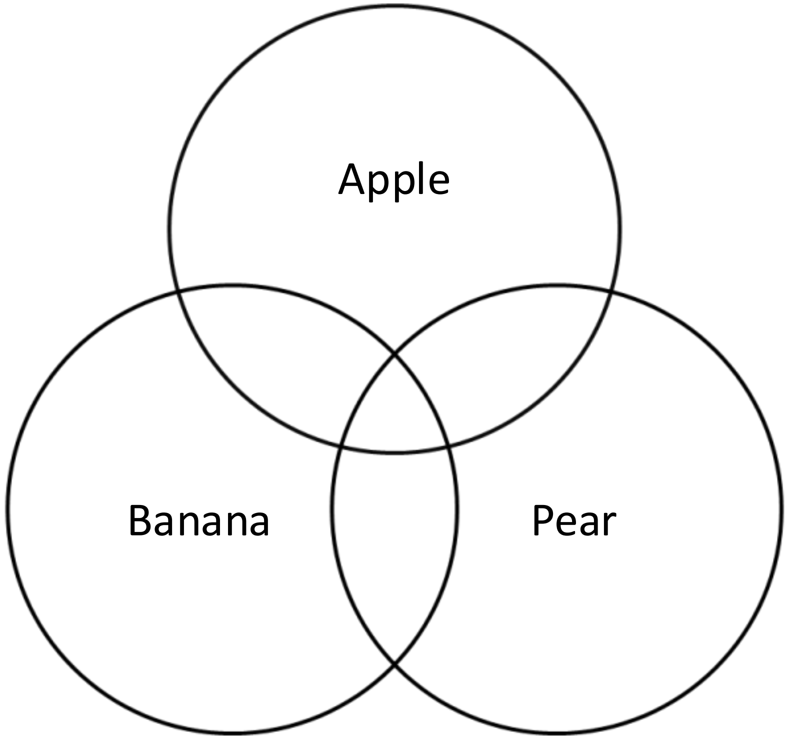












3.

Fruit Intersection Average: (Apple ( ) Pear)

Propyl acetate, butyl acetate, isoamyl acetate, 1-butanol, pentyl acetate, 2-methyl-1-butanol, hexyl acetate, 1-hexanol, hexyl butanoate

Fruit Intersection Average: (Pear ( ) Banana)

Propyl acetate, 2-methylpropyl acetate, butyl acetate, 2-methyl-1-propanol, isoamyl acetate, 1-butanol, hexyl acetate, 3-methylbutyl 3-methylbutanoate

Fruit Intersection Average: (Banana ( ) Apple)

Ethyl acetate, 2-methylpropanol, 1-butanol, 2-methylpropyl acetate, hexanal, butyl acetate, (E)-2-hexanal, 2-methylpropyl butanoate, butyl butanoate, hexyl acetate, 3-methylbutyl butanoate, 1-hexanol

2013 – 2014, dimensions variable; 5 litres of each formulation displayed