FLAVOURINGS & FRAGRANCE COMPOUNDS & THEIR COMPLEXITIES

- Where they are used – Let’s start at the end!
- How they are used.
- Why they are needed.
- What they are made of.
- How they are created and by whom.
- How they are regulated.
- Considerations

Where
Flavourings and Fragrance compounds
are used

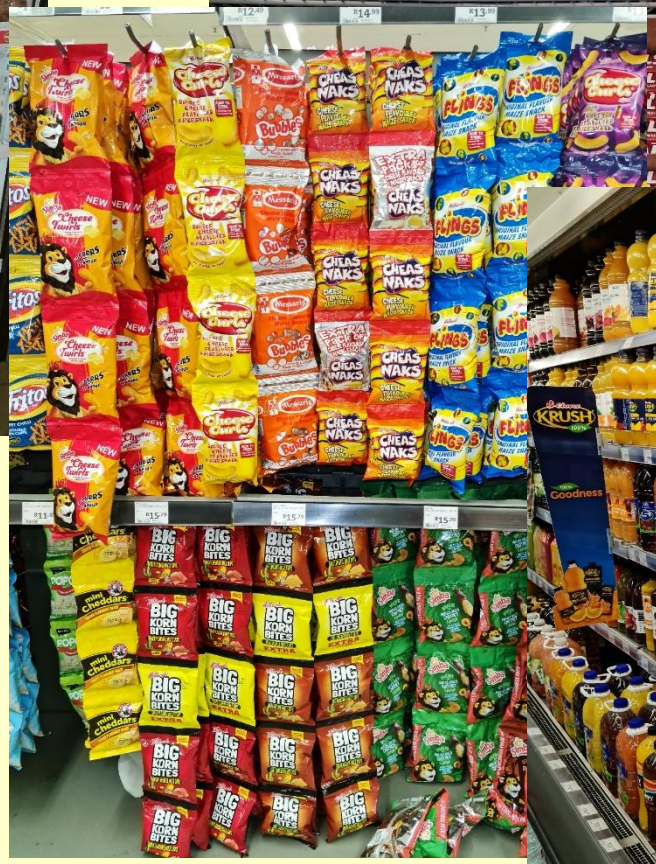
Consumer Products …

Household products; Soap; Cosmetics; Toiletries; Sanitizers; Air fresheners; Wipes; Atmospheres; Industrial uses and so on

… and Industrial Products too

Carbonated, still and powder drinks; Puddings; Ice Cream; Sweets; Cakes; Biscuits; Chewing gum; Milk products; Jellies and so on.

Pharmacuticals; Toothpaste; Oral Care & hygiene.



Snacks; Cheese; Spreads; Soup; Sauces; Gravies; Dressings; Meat & Fish products and so on.

How flavourings and fragrance compounds are used.

- Flavourings and Fragrance compounds are a very small part of the consumer product (one of many ingredients that go into making the product)
- The manufacturer of the consumer product (a Unilever, Nestle, Tiger Brands for example) buys many raw materials, processes them to make the consumer product, packs and sells it to distributors and/or wholesalers around the world, who then offer it for sale to the general public (the end consumers).

As an example

Ingredients:

Glucose Syrup.
Sugar,
Starch,
Gelatine,
Acids (Malic Acid, Acetic Acid),
Colours (Anthocyanins, Vegetable Carbon, Paprika Extract, Lutein, Curcumin),
Flavourings (1 g in a kilo of sweets)
Vegetable Oils (Palm Kernel, Coconut, Sunflower)

Why fragrance compounds are needed

Branding – doesn't the smell of Cobra polish bring back vivid memories?

Unique Selling Point (USP)

Variety and differentiation

Make more enjoyable and more interesting

Mask unpleasant smells of bases

Without this, the human race would die out!

Why flavourings are needed

Medical

Digestion
Palatability
Metabolism

Unique Selling Point (USP)

Technical

Compensate for losses in processing
Mask unpleasant tastes or smells of bases

Social/Urbanisation

Make more enjoyable and more interesting
Convenience
Variety and differentiation

From 

A.M.

to 

P.M.

After-Shave
Beverages
Cosmetics
Dehydrated Foods
Eau de Parfum
Frozen Foods
Grooming Products
Household Products
Ice Cream
Juice
Ketchup
Lotions
Margarine
Nail Care Products
Oat Products
Pharmaceuticals
Quark
Rose Water
Sweets
Teas
Underarm Deos
Vegetable Products
Waters
Xylitol in chewing gum
Yoghurt
Zero-sugar foods

We now turn to what fragrance compounds & flavourings are made of.

Flavourings & Fragrance compounds
=
Tastes & Smells

2 of the 5 senses

(Touch, Sight, Hearing, Taste & Smell)

A Simple Demonstration

Please hold your nose (breath through your mouth!) and pop a sweet into your mouth.

Chew for about 10 seconds, consider what you are tasting.

And then let go of your nose.

5 Basic Tastes

=

Sweet, Sour, Salty,
Bitter & Umami

But there is much more to it than just the 5 basic tastes…

…AROMA

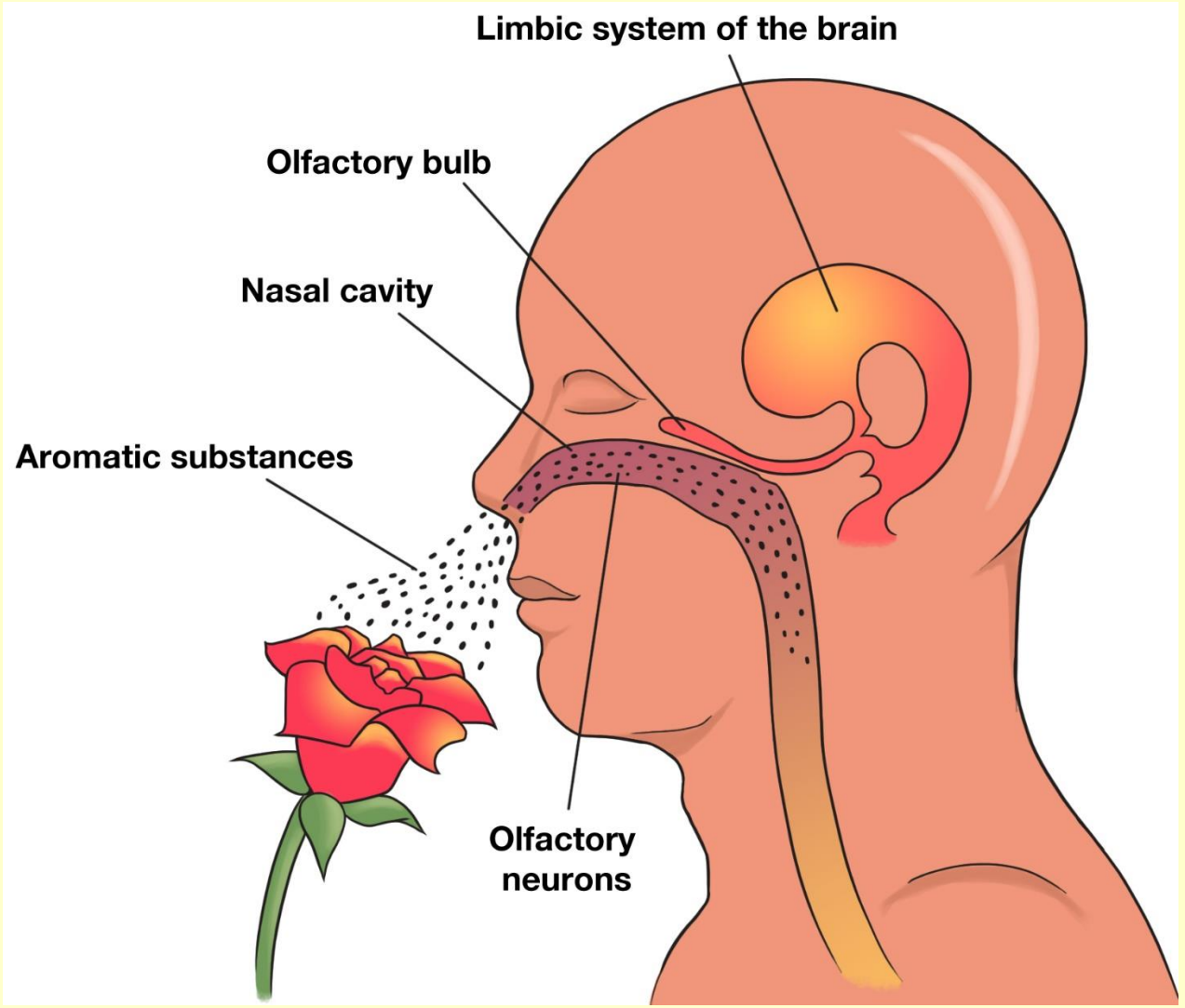
The crowning glory

Flavourings
and
Perfume Compounds
are all about
AROMA

Aroma, perfume, scent, bouquet,
fragrance, smell

Airborne chemicals that stimulate the
olfactory system

It’s all thanks to the nose…
…and what lies behind it



Fragrance compounds & flavourings are airborne chemical messengers, for which the olfactory cells in the nose and tongue act as receptors

What are these airborne chemicals that stimulate our olfactory system?

CDS: Chemically Defined Substances

NCS: Natural Complex Substances

Well over 4000 aromatic ingredients

****

Aromatic chemicals (Natural/Non-natural)

Essential oils

Pomades

Concentrates

Concretes & Absolutes

Extracts

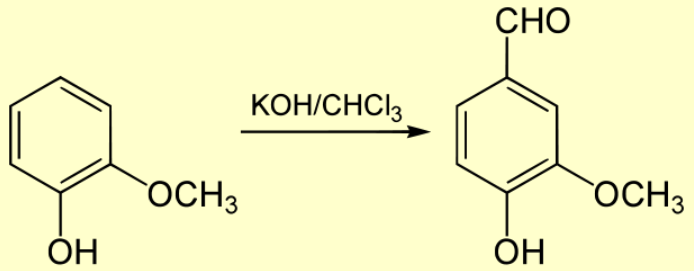
Oleo resins

Resinoids

Tinctures

Lauric Aldehyde (C12)
Ylang ylang
Leaf Alcohol (Cis-3-Hexen-1-ol)
Benzaldehyde
Star Anise
beta-ionone
Anethol
Maltol
Vanillin

Vanilla
(circa 1000 BC)
&



1 2

Vanillin (1874 AD)

1876: First industrial production of vanillin

1939: Nobel prize to Prof Leopold Ruzicka for his work on polymethylenes and higher terpenes

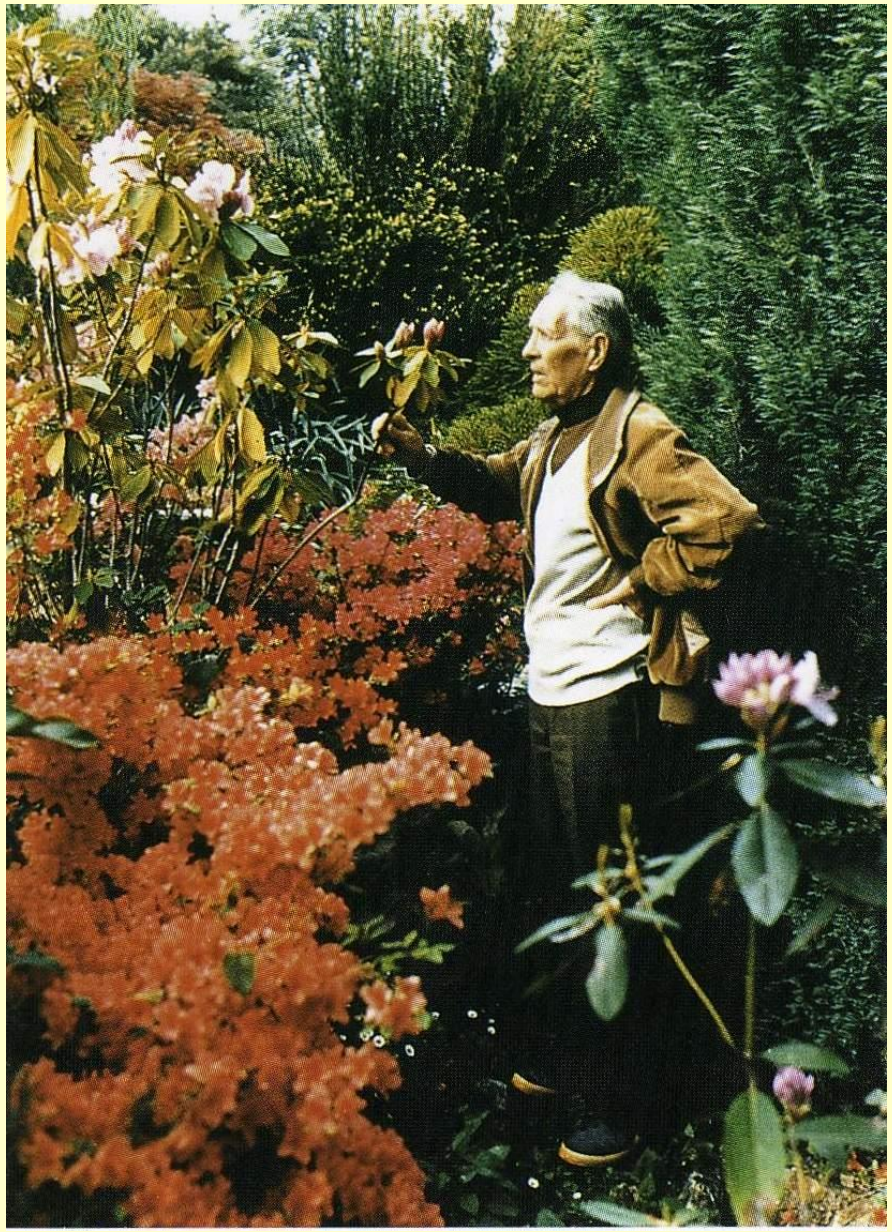
1946: Synthesis of Ambergris

(Ambroxan)

We will now look at how fragrance compounds & flavourings are created and by whom.

In my opinion, a perfumer can be liken to a composer of music. Their work is in the realm of the imaginary or the abstract. A perfumer transforms an idea or a concept into olfactory images.


NEW



Edmond
Roudnitska
1905-1996

Dior’s Diorissimo (3yr)
Madam Rochas (3½yr)
Dior’s Eau Sauvage (7yr)

INGREDIENT	TYPE OF NOTE	QUANTITY % By Wt.
Aldehyde C-12	Top Note	0.50
Aldehyde C-16	Top Note	1.25
Aldehyde C-9	Top Note	1.25
Alpha Ionone	Middle Note	16.00
Citral	Middle Note	0.50
Citronellol	Top Note	20.00
Eugenol	Middle Note	2.50
Geraniol	Top Note	10.00
Geranium Oil	Middle Note	2.00
Geranyl acetate	Middle Note	2.50
Labdanum Resinoid	Base Note	0.50
Linalool	Top Note	4.50
Nerol	Top Note	14.00
Palmarosa Oil	Top Note	1.50
Phenyl Acetaldehyde.	Base Note	0.50
Phenyl Acetic Acid	Base Note	0.50
Phenylethyl Alcohol	Top Note	20.00
Rose Crystal	Base Note	0.50
Rose Otto	Middle Note	1.50

Fragrance Regulations & Safety

Self-regulating system of the fragrance industry:

- Based on risk assessments carried out by an independent expert panel
- GOAL – safe use of fragrance ingredients
- Globally accepted and recognized risk management system

RIFM = Research Institute for Fragrance Materials

RIFM is… read the slide

- Scientific arm of IFRA
- Expert panel that instructs IFRA to issue a standard
- Comprehensive dossiers on the fragrance materials
- Expert panel: dermatology, toxicology, pathology and environmental sciences
- Approximately 200 substances are either banned, have specifications or are restricted in their use in fragrance products
- The 49th Amendment has introduced new methodologies such as QRA2 and aggregate exposure model for systemic toxicity

The IFRA Categories

- Restrictions are specific to product categories
- Different products have different exposure risks
- Started in 2006 with the 40th Amendment
- Latest is the 49th Amendment
- Before the 40th – simply either leave on or rinse off
- Fragrance materials are evaluated for their Quantitative Risk Assessment (QRA) for each category

Category	Product type
1	Products applied to the lips
2	Products applied to the axillae
3	Products applied to the face/body using fingertips
4	Products related to fine fragrance
5	Products applied to the face and body using the hands (palms), primarily leave-on:
5A	Body lotion products applied to the body using the hands (palms), primarily leave-on
5B	Face moisturizer products applied to the face using the hands (palms), primarily leave-on
5C	Hand cream products applied to the hands using the hands (palms), primarily leave-on
5D	Baby Creams, baby Oils and baby talc
6	Products with oral and lip exposure
7	Products applied to the hair with some hand contact
7A	Rinse-off products applied to the hair with some hand contact
7B	Leave-on products applied to the hair with some hand contact
8	Products with significant anogenital exposure
9	Products with body and hand exposure, primarily rinse off
10	Household care products with mostly hand contact
10A	Household care excluding aerosol products (excluding aerosol/spray products)
10B	Household aerosol/spray products
11	Products with intended skin contact but minimal transfer of fragrance to skin from inert substrate
11A	Products with intended skin contact but minimal transfer of fragrance to skin from inert substrate without UV exposure
11B	Products with intended skin contact but minimal transfer of fragrance to skin from inert substrate with potential UV exposure
12	Products not intended for direct skin contact, minimal or insignificant transfer to skin

A flavourist can, in my opinion, be liken to a painter with a palette of colours.
Most of their work is very tangible and aligned to things we know.

Flavour vs Flavouring

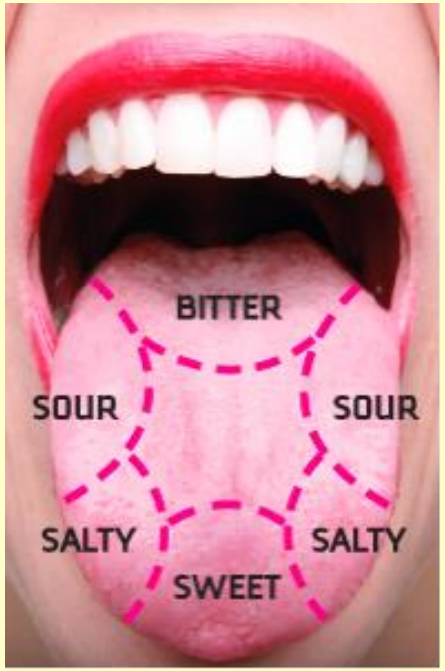
Flavour* is the experience given by the sum of the characteristics of any material taken into the mouth. It is perceived principally by the senses of taste and smell, but also includes the brain's interpretations of sensations from tactile and thermo receptors in the mouth.

* Codex CAC/GL 66-2008

Flavouring = one element of 'Flavour'

The others being: Taste, Mouthfeel, Thermo effects

Taste



Sweet
Sour
Salty
Bitter
Umami*

*The Japanese word “umami" translates as "pleasant to the taste, agreeable, good, mild, savory, delicious."

Mouthfeel

Tactile sensations
The way a food or drink feels in the mouth,
as distinct from its taste.

Thermo effects

Heat

Cold

A Flavourist hard at work!

Flavourings (and fragrances), in simple terms, are mixtures of airborne chemicals.

A flavourist combines them in such a way as to create the required flavouring.

Name:					VANILLA SUPREME		
Experimental Number:					123/3		
Commercial Number:							
Creator:					Joe Bloggs		
Date created:					2005-07-22		
Strength indication:					1:1000		
Reference Code	Status			RM cost/Kg	INGREDIENT	Grams	Cost in formula
011678-10	G	UL	IOFI	R 34.76	Acetoin	5.00	R 0.17
085730-25	G	UL	IOFI	R 90.00	Heliotropin	20.00	R 1.80
298469-00	G	UL	IOFI	R 120.00	Vanillin crystals	30.00	R 3.60
036789-00	G	UL	IOFI	R 350.00	Ethyl Vanillin	50.00	R 17.50
134569-00	G	UL	IOFI	R 1 009.00	Maltol	2.50	R 2.52
042944-00	G	UL	IOFI	R 670.00	Di Hydro Coumarin	7.50	R 5.03
043457-10	G	UL	IOFI	R 45.00	Diacetyl	0.50	R 0.02
034445-00	G	UL	IOFI	R 56.00	Cinnamic alcohol	3.50	R 0.20
209934-00				R 3 056.00	Tonka bean extract	5.00	R 15.28
019964-00	G	UL	IOFI	R 50.50	Anisic Aldehyde	3.00	R 0.15
235568-00	G	UL	IOFI	R 0.05	Water	35.00	R 0.00
160093-00	G	UL	IOFI	R 40.23	Propylene Glycol	250.00	R 10.06
013008-00	G	UL	IOFI	R 10.50	Ethyl alcohol	588.00	R 6.17
TOTALS						1 000.00	R 62.50

How flavourings are regulated

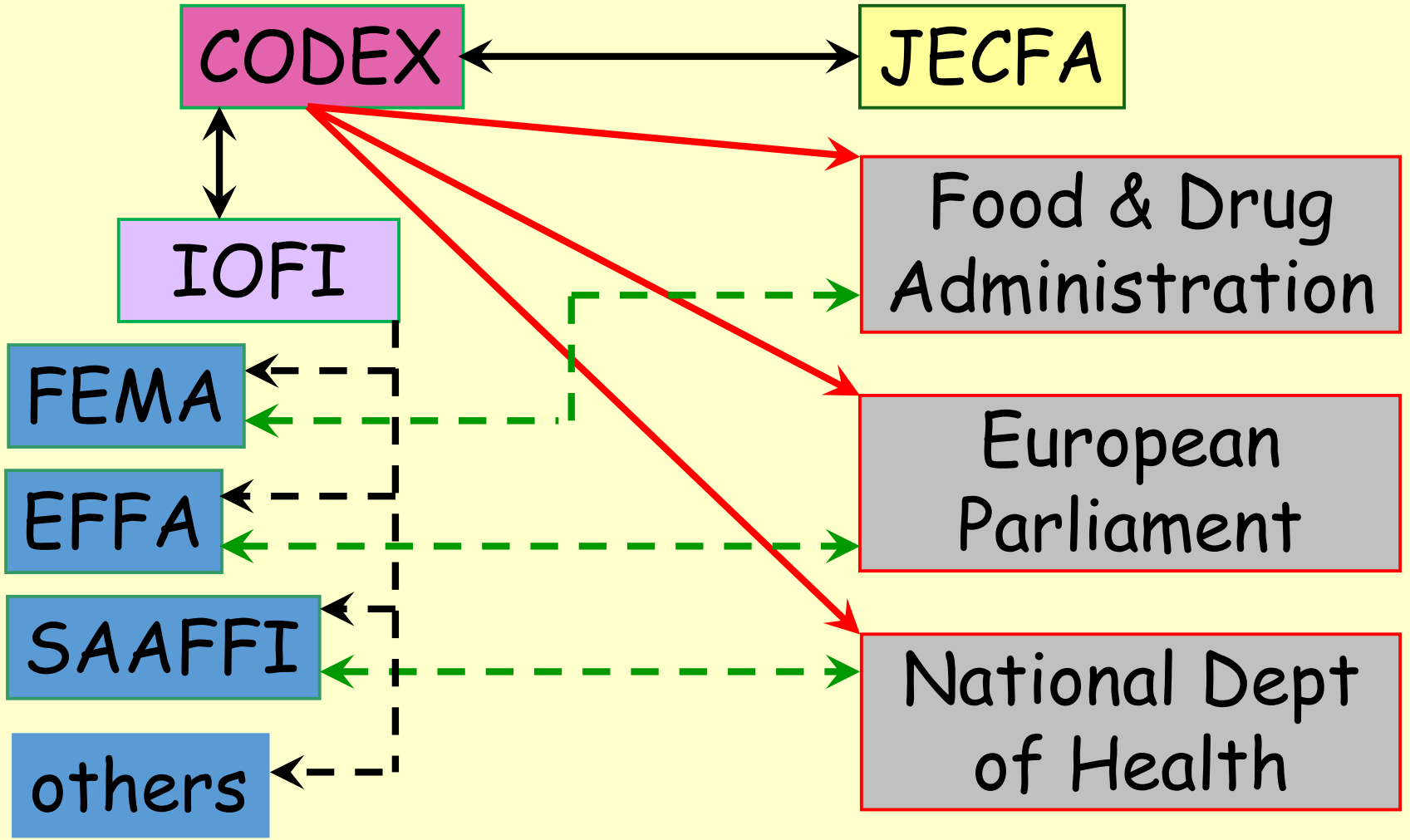
Consider the following:

Assuming there are globally 1000 flavour companies, and each has a portfolio of 15’000 flavourings, this would mean more than 15 million different recipes (BOMs).

To have each of these individual flavourings go through an approval process, which is a common false impression, would be a nightmare and an impossibility

Thus the control is based on the safety status of each individual aromatic substance.


POSITIVE LIST
NEGATIVE LIST
SCIENCEphotoLIBRARY


CODEX
JECFA
IOFI
Food & Drug Administration
FEMA
EFFA
European Parliament
SAAFFI
National Dept of Health
others

Codex Alimentarius Commission

Founded in 1963 by FAO & WHO to develop: Food Standards & Guidelines

The Reasons:

- Protect Health of Consumers
- Ensure Fair Trade
- Coordinate food standards on an international level

JECFA

JOINT FAO/WHO
EXPERT COMMITTEE
ON FOOD ADDITIVES

The Joint FAO/WHO Expert Committee on Food Additives

Started meeting in 1956

Provides independent scientific advice

Has evaluated >1500 food additives

The Global Standard for the Safety Evaluation of Flavouring Substances

International Organization of the Flavor Industry (IOFI)

Mission:
IOFI represents the interests of the global flavour industry and its partners by providing leadership in safety, scientific and regulatory matters.

IOFI Database

Split into three parts:
Chemically Defined Substances (CDS)
Natural Complex substances (NCS)
An extensive User Manual

Search by:
Industry name, CAS, JECFA, FEMA, FL-No

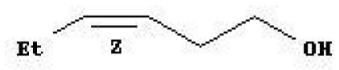
Information:
Substance Identification
Test Paramenters
Descriptive Parameters
Regulatory Information
Supportive Information

International Organization of the Flavor Industry

IOFI Regulatory Database

Chemically Defined Substances

Report on Substance Identification

Industry Name	cis-3-Hexen-1-ol
CAS	928-96-1
JECFA	0315
Structural Formula	
FL-No	02.056
FEMA	2563
EINECS	213-192-8
EILINCS	
CoE	750
INS	
Identification Status	identified in nature
Date of Decision	For any clarification please contact the IOFI secretariat
Supporting Reference	
Updated	2019-04-15

With Thanks to IOFI

IOFI International Organization of the Flavor Industry

IOFI Regulatory Database

Chemically Defined Substances

Report on Regulatory Information

Industry Name	cis-3-Hexen-1-ol
CAS	928-96-1
JECFA	0315
Structural Formula	
JECFA Status	Evaluated - No safety concern
Year of the JECFA Evaluation	1998 (Session 51)
EFSA Status	No need for evaluation
EFSA Opinion	SCF/CoE-A/JECFA
FEMA Status	GRAS List 3
IOFI Labeling Manual	Listed
Updated	2019-04-15

IOFI International Organization of the Flavor Industry

IOFI Regulatory Database

Chemically Defined Substances

Report on Regulatory Information

	Approval	Ref. No	Other Ref. No	
IOFI	Yes	IOFI GRL		Approval by Reference
CODEX	Yes	JECFA 0315		
China	Yes	I1027	S0027	
EU Register	Yes	02.056		Note
EU List	Yes	02.056		Approval by Reference
Indonesia	Yes	BPOM 22/2016		
Japan	Yes	JRL		
Korea	Yes	H065		
Mexico	Yes	Do-16.07.2012		
Russia	Yes	Ru02.056		Approval by Reference
Turkey	Yes	EK-1		
USA	Yes	FEMA 2563		Approval by Reference

With thanks to IOFI

How does this all work in practice?

Name:					**VANILLA SUPREME**		
Experimental Number:					**123/3**		
Commercial Number:							
Creator:					**Joe Bloggs**		
Date created:					**2005-07-22**		
Strength indication:					**1:1000**		
Reference Code	**Status**			**RM cost/Kg**	**INGREDIENT**	**Grams**	**Cost in formula**
011678-10	**G**	**UL**	**IOFI**	**R 34.76**	**Acetoin**	**5.00**	**R 0.17**
085730-25	**G**	**UL**	**IOFI**	**R 90.00**	**Heliotropin**	**20.00**	**R 1.80**
298469-00	**G**	**UL**	**IOFI**	**R 120.00**	**Vanillin crystals**	**30.00**	**R 3.60**
036789-00	**G**	**UL**	**IOFI**	**R 350.00**	**Ethyl Vanillin**	**50.00**	**R 17.50**
134569-00	**G**	**UL**	**IOFI**	**R 1 009.00**	**Maltol**	**2.50**	**R 2.52**
042944-00	**G**	**UL**	**IOFI**	**R 670.00**	**Di Hydro Coumarin**	**7.50**	**R 5.03**
043457-10	**G**	**UL**	**IOFI**	**R 45.00**	**Diacetyl**	**0.50**	**R 0.02**
034445-00	**G**	**UL**	**IOFI**	**R 56.00**	**Cinnamic alcohol**	**3.50**	**R 0.20**
209934-00				**R 3 056.00**	**Tonka bean extract**	**5.00**	**R 15.28**
019964-00	**G**	**UL**	**IOFI**	**R 50.50**	**Anisic Aldehyde**	**3.00**	**R 0.15**
235568-00	**G**	**UL**	**IOFI**	**R 0.05**	**Water**	**35.00**	**R 0.00**
160093-00	**G**	**UL**	**IOFI**	**R 40.23**	**Propylene Glycol**	**250.00**	**R 10.06**
013008-00	**G**	**UL**	**IOFI**	**R 10.50**	**Ethyl alcohol**	**588.00**	**R 6.17**
TOTALS						**1 000.00**	**R 62.50**

VANILLA FLAVOURING SUPREME

Flavouring Substance	JECFA Number	STATUS	IOFI	China	EU	Japan	Korea	Mexico	Russia	Turkey	USA
Acetoin	4050	Non-NAT	√	√	√	√	√	√	√	√	√
Heliotropin (Piperonal)	0896	Non-NAT	√	√	√	√	√	√	√	√	√
Vanillin	0889	Non-NAT	√	√	√	√	√	√	√	√	√
Ethyl Vanillin	0893	Non-NAT	√	√	√	√	√	√	√	√	√
Maltol	1480	Non-NAT	√	√	√	√	√	√	√	√	√
Dihydrocoumarin	1171	Non-NAT	√	√	√	√	√	√	√	√	√
Diacetyl	0408	Non-NAT	√	√	√	√	√	√	√	√	√
Cinnamyl alcohol	0647	Non-NAT	√	√	√	√	√	√	√	√	√
Tonka Bean Extract		NAT	X	X	X	X	X	X	X	X	X
Anisaldehyde	0878	Non-NAT	√	√	√	√	√	√	√	√	√

USA (FEMA GRAS) also accepted in Argentina, Australia, Brazil, Chile, New Zealand, Paraguay, Uruguay, Philippines

The Regulation of Flavourings in South Africa

Flavouring standard for the
South African flavour industry

Largely based on the EC Regulation 1334/2008 on Flavourings
(16 December 2008)

Flavouring standard for the South African flavour industry

- Is part of SAAFFI's Code of Practice
- Has been approved by IOFI
- Is on the SAAFFI website
- Deals with B2B labelling of flavourings
- Referred to on IOFI's Global Reference List

https://saaffi.co.za/about/flavouring-standard/

CONSIDERATIONS

- Quality
- Consistency of quality and supply
- Audits (traceability)
- Safety – toxicity, allergens (for new materials)
- Compliance with ABS regulations
- Long term commitment
- Biochemistry

Thank you

Any questions
?

www.saaffi.co.za