



National Institute for Public Health
and the Environment
Ministry of Health, Welfare and Sport

Reducing the attractiveness of e-liquids to youth: *a proposal for a restrictive list of tobacco-related flavouring ingredients*

This publication contains
an addendum dated June
2023 on page 6



Electronic cigarettes are addictive and harmful, and their flavours make them attractive to use. As both adults and youth like sweet and fruity flavours in particular, e-cigarette use can be discouraged by banning such flavours. In order to discourage e-cigarette use among young people and non-smokers, the Dutch Government announced in 2020 to only allow tobacco flavours in e-liquids. This factsheet describes a proposal for a restrictive list of allowed flavouring ingredients that will only enable the production of e-liquids with a tobacco flavour.

Over the last several years, e-cigarettes have become increasingly popular among young people (1, 2). In recent years, ever use of e-cigarettes among high school students in the Netherlands has increased to more than 25% (3). One aspect that makes e-cigarettes attractive to young people, as well as adults, is the diversity of flavours available (1, 4, 5). Flavours reduce harm perception and increase willingness to try (6). Both smokers and non-smokers like sweet and mint flavours much more than tobacco flavours (2, 7). Thus, it is concerning that the majority of e-liquids have a sweet flavour (1, 8).

The Dutch National Prevention Agreement aims to achieve a smoke-free generation by 2040. Youth e-cigarette use does not contribute to this goal (9). Thus, in order to further reduce the attractiveness of e-cigarettes and to protect young people, a ban on all e-liquid flavours other than tobacco will be implemented by the Dutch Government (10). They decided to ban flavours based on the flavouring ingredients in the e-liquid that impart the perceived flavour and announced that a restrictive list of such ingredients would be established (10).

The e-liquid market in the Netherlands

The Dutch government determined that the restrictive list will be based on data provided by manufacturers via the European Common Entry Gate (EU-CEG) system (10). This is a notification database in which manufacturers and importers are legally obliged to provide information about the composition and other properties of the tobacco and related products they market in each European Member State. On June 20, 2020, just before the decision to ban e-cigarette flavours was announced (11), 28,556 e-liquids were registered for the Dutch market. These products and their EU-CEG product data were used for further analysis (12). All liquids were categorized into 16 flavour categories, based on the previously published e-liquid flavour wheel (13). Out of all e-liquids, only 3,366 (11.8%) were reported having a primary tobacco flavour. In these liquids, a total of 503 different flavouring ingredients were used.

Which compounds were included and why

In order to ensure that only flavouring ingredients remain in use that taste like tobacco or are found in tobacco (smoke), and are not harmful to health, RIVM has established five criteria (14, 15):

1. The flavouring must be present in at least 0.5% of all liquids with a tobacco flavour. Flavours rarely used in tobacco flavoured e-liquids are not expected to be essential for creating a tobacco flavour, even if they are needed to create the specific tobacco flavour in which they are used.
2. The flavouring must be present more frequently in liquids with a tobacco flavour than in other liquids. Such compounds are likely specific for tobacco flavour, and not for other flavours. This criterion makes it more difficult to make non-tobacco flavoured e-liquids.
3. The flavouring may not be an extract of plant-based raw materials. The composition of such extracts is not constant and is therefore difficult to ascertain. This hinders checking the compliance of manufacturers to regulations regarding the use of these ingredients.
4. The flavour of the substance must resemble the flavour of tobacco or the substance must be found in tobacco (smoke). In this step, sweet, non-tobacco flavourings were excluded, in order to minimize attractiveness for youth. We used flavour descriptions as found in the Leffingwell database (16), data from the EU Independent Advisory Panel (IAP) on characterizing flavours in tobacco products (17), and a comprehensive analysis of tobacco industry documents (18) to evaluate the flavour descriptions and ingredient sources.
5. The substance should not be harmful to health. We used data from publicly available databases to evaluate the toxicity of the final ingredients.

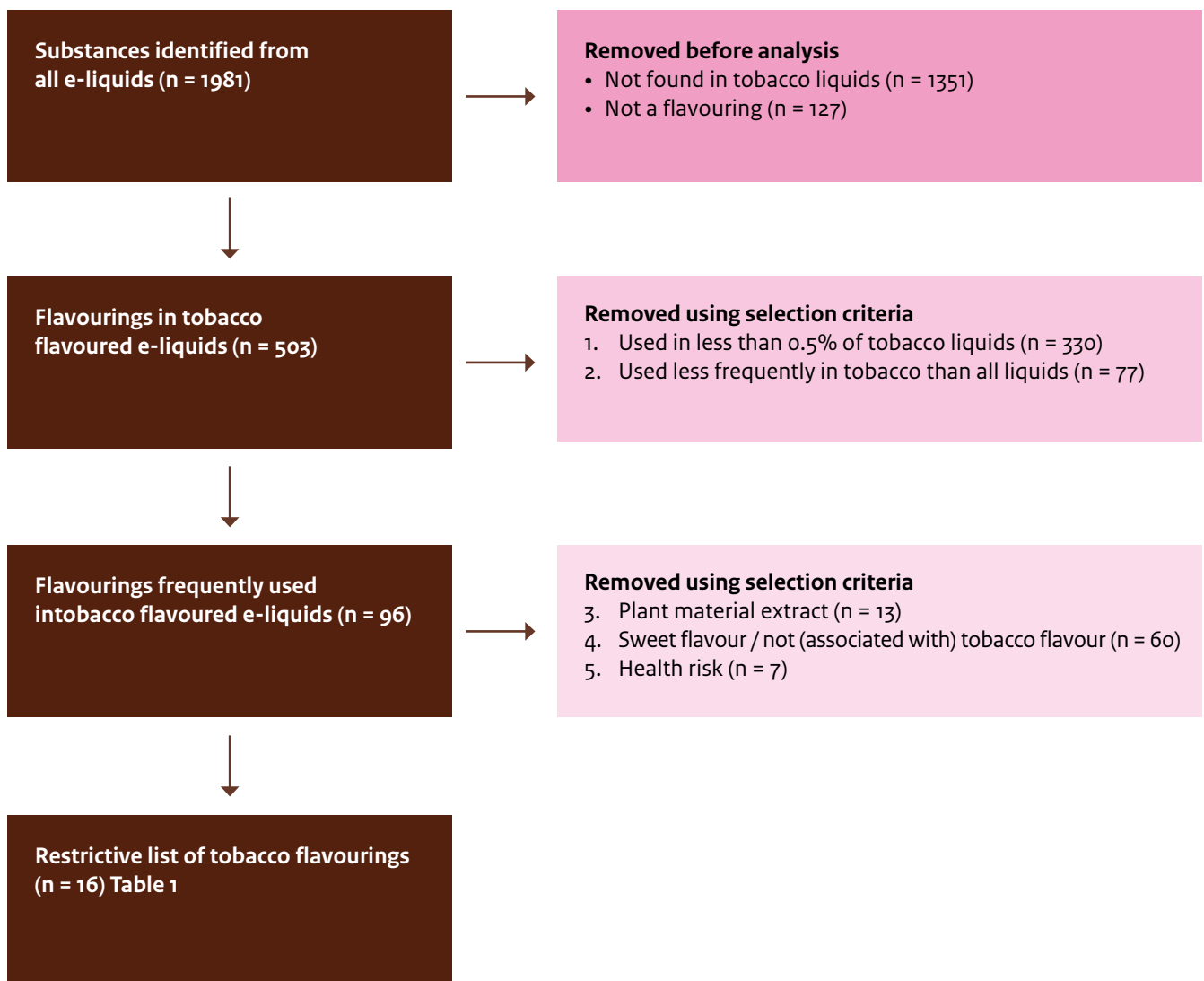


Figure 1: Flow chart for the stepwise application of selection criteria to obtain a proposed list of allowed flavourings.

List of allowed flavourings

Table 1 lists the 16 remaining flavourings that meet the abovementioned criteria. Note that the health effects of these 16 substances are unknown, as no data were available

to assess them. These substances could be prohibited from a precautionary principle. After considering the options, the Dutch Government decided to allow use of these substances in e-liquids to keep the product available for smokers to help them quit smoking.

Table 1. Proposal for a list of allowed flavourings in e-cigarette e-liquids.

CAS number	Flavoring name	Flavor description	Association with tobacco
35044-68-9	beta-Damascone	Complex odor of blackcurrant, plum, rose, honey and tobacco	Tobacco-like flavor
23726-91-2	(E)-beta-Damascone	Complex odor of blackcurrant, plum, rose, honey and tobacco	Tobacco-like flavor
23726-92-3	(Z)-beta-Damascone	Complex odor of blackcurrant, plum, rose, honey and tobacco	Tobacco-like flavor
23696-85-7	Damascenone	Fruity-floral with apple-plum-raisin-prune, tea, rose, tobacco notes	Tobacco-like flavor
23726-93-4	(E)-beta-Damascenone	Fruity-floral with apple-plum-raisin-prune, tea, rose, tobacco notes	Tobacco-like flavor
1125-21-9	Keto-isophorone	Tobacco like , hay-straw, tea notes, honey	Tobacco-like flavor
4883-60-7	2-Hydroxy-3,5,5-trimethyl-2-cyclohexenone	Sweet, musty tea, caramellic odor; musty, tea, nutty, tobacco taste	Tobacco-like flavor
536-78-7	3-Ethylpyridine	Strong tobacco, roasted, nutty, smoky notes odor; tobacco-like flavor	Tobacco-like flavor
350-03-8	3-Acetylpyridine	Strong, burnt roasted, nutty, cigar tobacco like	Tobacco-like flavor
91-10-1	2,6-Dimethoxyphenol	Phenolic- woody -medicinal, smoky odor; a tarry, spicy, smoky (bacon) taste	Attribute of tobacco aroma
67-47-0	5-(Hydroxymethyl)-2-furfural	Herbaceous winey hay-like odor, sweet herbaceous hay & tobacco-like taste	Tobacco-like flavor
591-12-8	alpha-Angelica lactone	Sweet, bread, molasses, coumarin, tobacco odor ; nut-like taste	Tobacco-like flavor
503-74-2	Isovaleric acid	Very sour, 'sweaty', cheesy , odor; fruity on dilution	Attribute of tobacco aroma
1139-30-6	(-)-Caryophyllene oxide	Dry, woody, faint cedar, tobacco like notes	Tobacco-like flavor
3738-00-9	Ambroxide	Intense velvety ambergris notes	Present in tobacco smoke
564-20-5	(3aR)-(+)-Sclareolide	Cedary; impact compound of certain tobaccos ; fish & berry flavor improver	Tobacco-like flavor

* Terms associated with tobacco or tobacco smoke are indicated in **bold**

Expected impact on e-liquid market and e-cigarette consumption

We found that 23% of tobacco-flavoured e-liquids can stay on the market unchanged, after implementation of the ban. The other 77% contain one or more ingredients that are not on the list, such as caramel or vanilla, and thus their recipe should be changed. Moreover, manufacturers have the option to create new e-liquid recipes with the allowed flavourings. Overall, e-cigarettes will probably become less attractive when all flavours except tobacco are prohibited. This will support the intended goal of the Dutch National Prevention Agreement, i.e. discouraging e-cigarette use among young people and non-smokers.

Further considerations: side effects and compliance

As sweet flavours are not only attractive to youth, but to adults as well, the use of e-cigarettes may also become less attractive for smokers who want to quit smoking (19). Although in general only weak to moderate evidence exists for the effectiveness of e-cigarettes as a cessation aid (20), it seems that adult smokers who use e-cigarette flavours other than tobacco, such as sweet and fruit, are more likely to quit smoking (21-23). Another potential consequence of the ban is that users will add flavourings to e-liquids themselves. With the proposed list, manufacturers can still produce unflavoured 'base e-liquids'. Numerous aromas are for sale to add to such e-liquids, as well as accessories that can deliver additional flavour to e-cigarettes. For example, in Finland, vape-related web shops started selling aroma's 'intended for seasoning food and drinks' after implementation of an e-liquid flavour ban (24, 25). Moreover, mouthpieces are available containing a flavour capsule that the user can crush for more flavour. Such products will still enable consumers to use a desired flavour after implementation of the proposed list (26).

When the proposed list comes into effect, compliance can be checked in two ways. First, data of product composition in EU-CEG can be analysed to identify any non-allowed flavourings. In addition, chemical analysis can be used to detect the presence of (non-allowed) flavourings in selected e-liquids.

Conclusions

This factsheet presents the restrictive list of 16 flavourings to be allowed as e-liquid ingredients. We expect that with these flavourings only e-liquids with a tobacco flavour can be produced. The ban on e-liquid flavours other than tobacco, implementing this list, will come into effect on January 1st 2023. Implementing this proposed list in legislation will likely discourage e-cigarette use among youth, but it may also make e-cigarettes less attractive as smoking cessation aid. Regulators should consider that users may add flavourings not marketed for use in e-liquids as alternative.

Addendum

Reducing the attractiveness of e-liquids to youth: a proposal for a restrictive list of tobacco-related flavouring ingredients

Bilthoven: June 2023

Subject: Addendum to publication Reducing the attractiveness of e-liquids to youth: a proposal for a restrictive list of tobacco-related flavouring ingredients

Page 5 of the factsheet states: “We found that 23% of tobacco-flavoured e-liquids can stay on the market unchanged, after implementation of the ban.”

This addendum further explains the percentage of 23%. Only 0.2% of this 22.7% (rounded to 23% in the factsheet) contains one or more of the 16 flavourings on the proposed restrictive list and no other flavourings (according to the manufacturer’s notification). For the other 22.5% of the liquids, the manufacturer has provided insufficient or unclear information via the EU-CEG database and we cannot say with certainty whether the liquids comply with the proposal for an exhaustive list. For further details, please refer to the addendum in report (20).

This addendum does not affect the main conclusion. The approach we used produces a list of flavourings with a tobacco(like) taste or smell and substances that occur in tobacco smoke. There are no substances listed that have a sweet or fruity taste, nor substances that pose a risk to health.

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Published by:

**National Institute for Public Health
and the Environment, RIVM**

P.O. Box 1 | 3720 BA Bilthoven
The Netherlands
www.rivm.nl/en

June 2023

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