The Matrix – a DGK initiative to provide guidance to substantiating anti-pollution claims in cosmetics

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Abstract

Background: Due to the varied nature of pollutants and the effects they can have on skin, efficacy tests and cosmetic claims need to be relevant and correctly substantiated. However, to gather relevant knowledge is tedious. Therefore, the German Society for Scientific and Applied Cosmetics (DGK) working group [WG] "Anti-pollution", developed an interactive matrix in which information on air pollutants, some of their effects on skin, cosmetic applications and ingredients that may be beneficial in this context, and relevant methods to evaluate the efficacy, can be found.

Methods: A working group consisting of interdisciplinary experts was formed. Literature was screened to identify effects that take place in and on the skin after exposure to pollutants, and different cosmetic approaches how these effects could possibly be modulated considering the specific mechanism addressed were looked at. Methods that are accessible, and which address the potential damage being done to the skin, were identified.

Results: The results were integrated into an interactive matrix intended for public use which can be found on the DGK website. This website will be available in both German and English language on the URL: https://dgk-ev.de/antipollution-matrix/ .

Conclusion: This matrix serves as an information source and is intended to stimulate the user to gain a better understanding of factors involved and to explore further how to address their claim support challenges when developing cosmetic products with anti-pollution claims.

Keywords: pollution, skin, cosmetics, claim substantiation, interactive matrix.

Introduction. The concerns about the adverse effects air pollution can have on our health is on the rise worldwide. Pollutants are very varied in nature, can be of natural or anthropogenic origin with typical pollutants ranging from particulate matter (PM; originating e.g. from exhaust, smoke, pollen or ash) and gaseous compounds (e.g. nitrogen and sulfur oxides, volatile organic carbons or ozone) to light (e.g. UVR or blue light) and heavy metals [1]. Not only the lungs but also the skin is exposed to pollutants on a daily basis, and this exposure can lead to signs of premature skin aging, damage to the skin barrier, pigmentation disorders as well as cell damage. In addition, preexisting skin problems such as dry and irritated skin as well as skin impurities can be exacerbated [2-4].

Although a wide variety of cosmetic products with different "anti-pollution" claims are already on the market, care needs to be taken, which modes of action are being looked at. Due to the varied nature of the pollutants and the effects they can have, efficacy tests and claims need to be relevant and correctly substantiated. There is no single "one size fits all" type claim or test method to cover all aspects of "anti-pollution" efficacy and claims [5]. There are already various publications summarizing the effects of pollution on the skin [1, 3, 6-8]. However, with regards to cosmetics there is still no clear definition or summary of pollution effects on skin, left alone of anti-pollution claims and their proper standardization and substantiation. In addition, it can be tedious to gather relevant information available in this field.

The goal of this work was to compile knowledge and literature data in an easily accessible way. We chose to create an internet-based interactive matrix which can serve as a starting point and knowledge source for people interested in pollution and anti-pollution of the skin.

Materials and Methods. The German Society for Scientific and Applied Cosmetics (DGK) working group [WG] "Anti-pollution", an interdisciplinary WG consisting of experts from industry and academia, was specifically formed to tackle the task to create an interactive matrix on the society's website. After outlining four main fields to be addressed, further subfields were then assigned to them. The idea was to interlink the main and the subfields within this matrix, through which users can navigate to gather information including potentially relevant test methods. Current literature was screened, and "one-pagers" (1-2 pages) developed for each subfield. A standardized reporting outline was used to structure these. A limited number (1-5) relevant references were added as a starting point for delving into the respective topics. After thorough scientific and regulatory assessment, the pages were integrated in a website building tool. The sites were interlinked, tested and put online. The matrix was first created in German and then translated into English.

Results. The Matrix is accessible via the home page of the working group or directly via the URL https://dgk-ev.de/antipollution-matrix/ of the below QR-Code.

The Anti-Pollution Matrix consists of a landing page and four main categories/fields of interest. These were 'Categories of Active Ingredients and Product Classes', 'Pollutants', 'Damage', and 'Methods' (Figure 1).
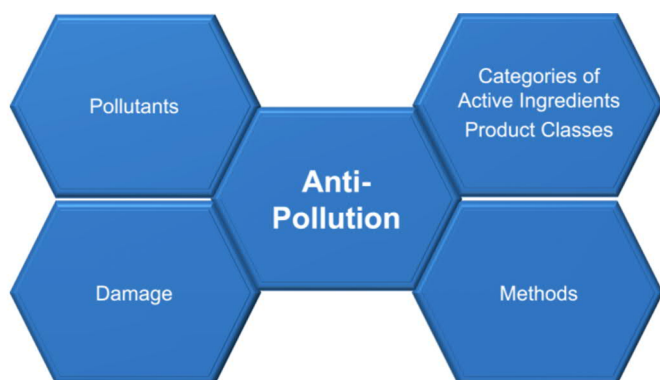
Anti-Pollution Matrix

Figure 1: Beehive like structure on the home page of the working group. Users can click on each category to access all the topics with more information.

These categories are displayed in a beehive-like structure where users can enter the matrix. Upon entering the matrix, users find themselves on a landing page with an overview of each category and their subfields (Figure 2). These subfields were 'Protect', 'Remove', and 'Repair' for the Active Ingredients and Product Classes category. 'Damage' was subdivided into 'Molecular' and 'Clinical', while the two categories 'Pollutants' and 'Methods' contained a single list (Figure 2).

Anti-Pollution Matrix

1. Categories of Active Ingredients + Product Classes

Protect	+
Remove	+
Repair	+

2. Pollutants

Pollutant list	+

3. Damage

molecular	+
clinical	+

4. Methods

Methods list	+

Figure 2: A different view of the four categories with the various subcategories. These fields are clickable and lead to the lists of the individual pages.

These subfields are again clickable and reveal a list of the final pages. As an example, the category 'Pollutants' (German: Schadstoffe) shows a list with pages for seven pollutants namely particulate matter (Feinstaub), gases/exhaust (Gase/Abgase), solar light (Sonnenlicht), smoke (Rauch), heavy metals (Schwermetalle), pollen (Pollen), and chemical and volatile pollutants (chemische und flüchtige Schadstoffe) (Figure 3). The other categories and subfields were created in an analogous way depending on the pollutant category.
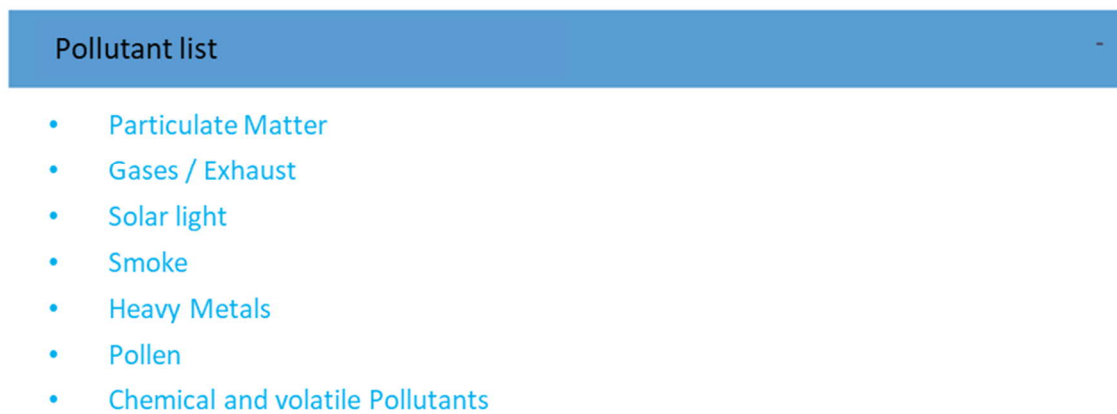
2. Pollutants

Pollutant list -

- Particulate Matter
- Gases / Exhaust
- Solar light
- Smoke
- Heavy Metals
- Pollen
- Chemical and volatile Pollutants

Figure 3: Example of a category (Pollutants) and its topics. These unfold by clicking on the link Pollutant list.

Discussion.

Because pollution, and more specifically air pollution, is a worldwide phenomenon with enough presence in the media, it is tangible and easily understood by consumers. This makes it particularly interesting also for the cosmetics industry. As such, pollution and the effects on skin have been a topic of interest for a number of years now. Over the past few years, the number of publications has increased and quite some literature accumulated on this topic (see e.g. [1-3, 6, 9, 10]. In addition, the cosmetics industry started to launch various products with anti-pollution claims. Nevertheless, a systematic and easily accessible knowledge base for pollution, anti-pollution, the skin, and claims thereof was lacking. The German Society for Scientific and Applied Cosmetics (DGK) therefore decided to close this gap. The working group [WG] "Anti-pollution" was created with the aim to develop a web-based tool that lists knowledge on anti-pollution and the skin regarding cosmetics. The here presented first version of the so called "Anti-pollution Matrix" is accessible through the DGK website and aims at providing information for people interested and/or working in the field such as scientists, technicians, formulators, but also technical marketing and business development folks to name a few. The matrix summarizes current literature knowledge and interlinks related topics. It is a dynamic and interactive tool that can be updated on a regular basis. With this, it also differentiates itself from printed articles which are neither interactive nor easily

updated. The Matrix is not intended to be complete, but it is comprehensive enough to stimulate the user to gain a better understanding of factors involved and to explore further how to address their claim support challenges when developing cosmetic products. In its full completion, the matrix will be available in German and English language.

Beyond the topic of pollution, this matrix could serve as a template for additional interactive knowledge bases with other topics relevant to the cosmetics industry.

Conclusion.

We present here a novel, dynamic and interactive tool serving as a knowledge base for pollution and anti-pollution in the cosmetics industry.

Conflict of Interest Statement. The authors have no conflict of interest.

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