



NOTHING LOST IN IT – RESEARCH PROJECT "PAH IN RUBBER MATS"

Chemically, polycyclic aromatic hydrocarbons (PAHs) are organic compounds that consist of at least two connected aromatic ring systems that are in-plane. Only with this definition, a nonchemist usually cannot do much. However, if you mention the simplest of naphthalene (Figure 1), everyone immediately has the typical smell of mothballs in their noses. Decisive is the ringshaped molecular structure with alternating single and double bonds, which however smear over the entire system and are no longer distinguishable from each other. The name comes from the aromatic smell of the first discovered compounds of this class. While naphthalene is used less in mothballs today than as a raw material for dyes and insecticides, some PAHs are mainly used as plasticisers in plastics. Man-made incomplete combustion processes of organic matter are considered to be the major source of detectable PAH compounds throughout the world. Since they can also be produced during the production of soot, they can be found in black-colored soft plastics and rubber products such as car tires or floor coverings for animal husbandry.

Harmful to health and the environment

Since the 1980s, the PAHs have increasingly fallen into disrepute. Of the several hundred compounds, PAHs, which have been shown to be carcinogenic, are of particular concern. Individuals also alter the genome or endanger the reproduction. In direct contact, PAHs degrease the skin, leading to skin inflammation. It is particularly treacherous that PAHs - in addition to absorption via the mouth or lungs - can be absorbed into the body via the skin during normal use of the products.

Danger by PAH in stable mats?

Due to increasing reports on the possible health effects of PAH exposure, the DLG Test Center also considered potential endangering of livestock such as cattle, pigs and horses by PAH in stable rubber mats and at the Fraunhofer Institute for Process Engineering and Packaging (Fraunhofer IVV), Freising, commissioned a comprehensive study on this topic. It should be clarified whether



- 1. stable mats have an increased PAH load
- 2. the use of stable mats may lead to an unwanted transfer (migration) of PAH into the farm animal, as has been proven in humans, for example with bicycle or suitcase handles
- 3. there may also be an undesirable transfer of PAHs into milk as food or into the blood of farmed animals.

In order to determine the potential of a migration of the chemical compounds in stable mats, first the PAH content of the stable mats was analyzed. Thereafter, migration experiments were carried out. For this purpose, an adsorbent was applied to a defined area of the mat patterns derived from the udder contact area while lying down (Figure 2). After a contact time of 24 hours or ten days at a constant temperature of 40 degrees Celsius, the adsorbent was removed and the contents of 17 different PAHs determined. The same analysis was carried out on various blood and milk samples from animals that had lain for some time on rubber mats installed in the stable. A transition from PAH to milk or blood was not observed.



Figure 1: Naphthalene in the 3D model, carbon atoms black, hydrogen atoms shown in white. Source: Wikipedia



Method and benchmarks developed, market study in progress

The study results show that the developed method is suitable for determining the migration of PAH from stable mats. Since the compounds do not pass over the skin into the milk or the blood, the welfare of the animals and the protection of the consumer take center stage. Therefore, at the end of the project, a migration benchmark for the two most important groups of PAH compounds in stable mats was developed, which will later become the basis for a DLG audit with an audit of the manufacturing process to obtain a DLG quality seal:

These include 15 PAHs plus benzo (c) fluorene, which the Scientific Committee on Food of the European Commission (SCF) has come to believe are likely to be mutagenic and carcinogenic (15 + 1 EU SCFPAKs). In addition, there is a second group of eight PAH compounds, the maximum levels of which in EU products are already regulated by an annex to the REACH Regulation (8 EU REACH-PACs). In a current market study with stable mats from different countries of origin and different price segments, the PAH migration of products currently available on the market is to be determined.



Figure 2: Angled: How to calculate the udder contact surface of a dairy cow. Photo: DLG

