Environmental risk assessment for food additives using the artificial sweetener Acesulfame K as a model substance

Abstract

Food additives are subject to a safety evaluation by the European Food Safety Authority (EFSA) for inclusion in the positive list of food additives. The current data requirements for food additives risk assessment are defined in relation to the state of the art of risk assessment, science and technology. However, the food additives regulation only assesses effects on human health. Data requirements concerning effects on the environment have not been defined. Since food additives end up in the environment after uptake and fecal and/or urinary excretion, a possible impact on the environment must not be neglected.

The aim of this thesis was the development of an environmental risk assessment model for food additives. Several models which are already in use for other regulations were considered as a starting point. They were evaluated with respect to their suitability for food additives, and the most suitable building blocks were chosen or adapted for the environmental risk assessment. The artificial sweetener Acesulfame K was chosen for the validation of the model, because concern has been raised in the past years regarding its persistency in the environment and a resulting potential environmental hazard. Furthermore, a comprehensive data set on ecotoxicology and environmental fate is available for this substance. The environmental exposure values derived with the model were compared with the environmental concentrations of Acesulfame K measured in Europe and reported in the literature. In addition, the modelled values were compared with the commonly used model EUSES.

The results indicate that even for a highly persistent substance such as Acesulfame K, a low risk to the environment could be shown. All calculated risk characterization values did not reach the respective trigger values. The developed risk assessment model seems to be suitable to reflect the worst case of the exposure of a substance to the environment. Furthermore, compared with measured values, the modelled values are within the range of the concentrations detected in the environment. This means that the developed model indicates a “real case” for persistent substances regarding the exposure to the environment. In contrast, the common standard model EUSES results in exposure values clearly below the ones measured in the environment. If compared with the results from this model, EUSES also underestimates the environmental concentrations.