Digital tools for more safety in the food chain

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When feeds are contaminated with potentially health-damaging substances, such as per- and polyfluorinated alkyl substances (PFAS)/per- and polyfluorinated chemicals (PFC) from the environment, these substances can be transfered into foods such as meat, milk and eggs. Computer-based tools are currently being developed at the BfR with the aim of contributing to faster clarification of the health risks to humans potentially arising from such contaminants.

"With the help of our first two digital tools, it is possible to model what levels of certain perfluorinated alkyl substances are to be expected in the foods milk, eggs and pork in the event of feed contamination," explained Professor Dr. Dr. Andreas Hensel, President of the Federal Institute for Risk Assessment (BfR) during the presentation of the tools at the "2nd Expert Forum on Per- and Polyfluorinated Alkyl Substances/Per- and Polyfluorinated Chemicals" with German national and regional government authorities at the BfR. The new digital tools RITOPS and PERCOW are designed to help the monitoring authorities responsible for food and feed safety to respond quickly in the event of proven contamination of feeds with PFAS/PFC. They serve to facilitate the estimation of the health risks posed by foods produced from animals.

PERCOW (Perfluoralkyl Acids in Cow's Milk Calculator) is a modelling tool with which the toxicokinetic behaviour of substances such as perfluorooctanesulfonic acid (PFOS) in dairy cows can be simulated on a computer. The software is based on data acquired by the BfR in transfer experiments in which dairy cows were given feed containing PFAS under controlled conditions before measuring for how long the

substances remain in the animal organism and in what quantities they transfer to milk over a certain period of time. From the acquired data, algorithms were developed which enable the estimation of the enrichment and depletion behaviour of the PFAS ingested with the feed in the cow and their transfer to the milk. The aim is to make it possible to estimate the concentrations of undesirable substances such as PFOS in the milk in the event that contaminated feed is fed and depending on factors such as such as the milk yield, lactation duration and exposure of the animals. These parameters can be set accordingly via a graphical user interface.

Using the RITOPS tool (Risk Tool for Estimation of PFAA Concentration in Swine), the toxicokinetic behaviour of seven PFAS in the organism of rearing pigs can be modelled on a computer. The algorithms, which allow the prediction of the enrichment and depletion behaviour of the undesirable substances ingested with the feed in the animals, are also based on data from experiments conducted at the BfR on the transfer of the substances from the feed to the tissue of porkers. Depending on parameters such as fattening duration and slaughter weight, as well as details of the exposure of the animals to these substances, RITOPS can be used to estimate the concentrations of undesirable substances in the various edible tissues, such as liver, fat and muscle meat.

RITOPS and PERCOW have been specially developed for use in the German Federal State monitoring of foods and feeds and are easy to use. No special knowledge of mathematical modelling is required to use them. RITOPS and PERCOW are now to be tested in practical applications.

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