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Digital Tracing

Special software known as FoodChain-Lab is now used if there is an increase in foodborne diseases due to a particular pathogen. It helps to recognise the source of the infections or impurities, with the goal of identifying the "culprit" of a food crisis.

The investigation of the hepatitis A outbreak took several months. Several hundreds of people all over Europe became infected with hepatitis A viruses in May 2013. These viruses cause acute inflammation of the liver and are transmitted from person to person or via contaminated food.

Tracing back the culprit more quickly

"The investigation of the hepatitis A outbreak was the breakthrough for FoodChain-Lab," reminisces Dr. Armin Weiser, mathematician at the BfR. Food-Chain-Lab is software with which data on the sale and distribution of food is recorded. The BfR developed it in the course of the EHEC crisis in 2011 and it can be used to investigate dangerous foodborne outbreaks. The special feature of this software is that it process-es the huge amount of data collected in the search for clues and visualises the results immediately. Doing this same job manually used to take up a lot of time.

On-site tracing

The search for clues begins with an Excel table into which the authorities enter the most important information on-site. Who ate which foods where and when? Where and when were the foods purchased? The authorities make inquiries in private households, in restaurants and along the entire supply chain with dealers, distributors, manufacturers and primary agricultural producers, all of whom have to present the delivery documents. In this way, a total of 6,227 stations were identified within the investigated goods flows in the course of the trans-European hepatitis A outbreak.

Together with a team of nine, mathematician Dr. Armin Weiser develops and guides software solutions with which foodborne outbreaks can be investigated.

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With this data the scientists used FoodChain-Lab to visualise a map of Europe on which many circles appear. These represent the places on which the data were collected. If a circle is red, an infection occurred there. In this way, it is estimated for every food and every station how great the probability of a connection to the outbreak is. The software also recognises geographical connections. One commonality found during the hepatitis A outbreak was that the people who took ill at all infection sites had eaten deep-frozen blackberries from Bulgaria and redcurrants from Poland.

Networking becoming more and more important

The hepatitis A outbreak shows that the investigation of foodborne outbreaks is becoming more difficult as goods flows become more complex and global, especially in Europe with its single market and free movement of goods. FoodChain-Lab has become an important tool here to simplify collaboration among the different countries so that the source of an outbreak can be identified more quickly. That is why the European Food Safety Authority (EFSA) and the BfR have had an official cooperation agreement in this area since 2017. One of the goals is to further develop the software and make it available to other EU member states for the investigation of future outbreaks. In addition to this, Armin Weiser and his team are holding workshops at European partner authorities to teach personnel how to handle the software. "We would also like to make the software available to official food control authorities," says Professor Karsten Nöckler, head of the Biological Safety department at the BfR. "By doing so, it would be possible to retrace the flows of goods more quickly both regionally and supraregionally in the event of foodborne outbreaks in Europe, because we would have a uniform data standard." The success of the training can be seen by the fact that the software is already being used specifically by authorities in the UK and Austria.

Another advantage is that FoodChain-Lab is freely available as open-source software. The BfR has continuously further developed it in recent years and developed new modules. Accordingly, there is a desktop version, and a web-based application is to follow this year. There are also other programs, such as software that helps to find out where bacteria can propagate easily during the food production process.

Demand for tools to support the investigation and analysis of foodborne disease outbreaks will increase. Armin Weiser is sure of this and hopefully states: "We need more colleagues in every institution and local authorities too with a high degree of affinity to software and digital data. That would be a great help towards deploying tools like FoodChain-Lab to great effect." ◘

More information:
https://foodrisklabs.bfr.bund.de/foodrisk-labs