

报告 21

大数据背景下的我国食品安全管理之路

Food Safety Management of China Based on Big Data

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报告摘要 Abstract

食品安全问题是一个开放的复杂系统问题。食品质量链是食品安全风险的宿主和载体，风险隐患常深藏于质量链上且在质量链时空上呈长鞭效应传播和多源时空扩散性而转化为食品安全事件。在检测、投诉举报、互联网媒体舆情等几类食品安全大数据驱动下，从食品质量链协同视角，分析了食品质量安全的主要治理方向及其协同控制策略。食品安全问题具有典型的外部性和信息不对称性，从食品安全广义质量链出发，构建质量链信息组织结构模型，建立以关键质量窗口期数据为载体的多源数据库系统。通过质谱、光谱和色谱采集多源质量信息动态特征参数，利用过程网络分析和质量损益函数分析等方法，系统解析和定义质量链上的关键节点和关键路径。在关键风险因素的基础上进一步挖掘网络拓扑结构，提出进化规划算法学习先验网络参数，构建实时在线的「风险监控预警、网络风险演化推理、风险溯源追踪、质量链风险社会共治」的理论模型，旨在创建大数据驱动的食品安全风险预警与实时控制理论方法体系及在线管理系统。基于人工智能、数据挖掘理论，运用机器学习技术，借助智能融合的信息化应用平台，实现对食品安全信息的自动收集、有效发布和挖掘，并进行智慧化决策。特别是需要对不同来源知识的协同式交互关系及关联性进行挖掘，从多层次、多角度、多环节提出相应的信息检索和过滤框架。最后基于食品安全系统的过程复杂性、主体行为多向性以及影响因素多样性特点，强调多组织、多要素、多线程为背景，将食品质量链上各方统一在协同框架下，考察质量链上各方功能和相互作用，从协同控制的视角寻求解决食品安全问题的管理控制策略，提出大数据驱动的食品安全管理策略与政策体系。

Food safety problem is an open complex system. Food quality chain is the host and carrier of food safety risk. Food safety incidents occurred from the hidden risk dangers which appear in forms of bullwhip effect and multi-source space-time diffusivity in the quality chain. Driven by big data of detection, complain inform and Internet media, main governance direction and coordinated control strategy of food quality safety are analyzed from the perspective of food quality chain synergy. Food safety problems have the futures of typical externality and information asymmetry. From the point of general quality chain food safety, quality chain information organization structure model is built, and multiple source database system which carries key quality window data is established. Key node and critical path of quality chain are defined and analyzed using the methods of process network analysis and quality profit and loss function analysis by quality multi-source information dynamic big data collected by spectrum, spectral and chromatographic. On the basis of key risk factors network topology structure is further mined, evolutionary programming algorithm is put forward to learn prior network parameters. The above two steps help to construct a real-time online theory model of "risk monitoring warning, network evolution reasoning, chain risk traceability tracking, quality risk social work" in order to create big data driven food safety risk warning and real-time online control theory method system and management system. Food safety information is automatically collected, effectively published and mined to make wise decision based on the theory of artificial intelligence, data mining and machine learning techniques with the help of intelligent integration of information application platform. Especially it is necessary to do data mining of different sources knowledge collaborative interaction relations and relevance. Information retrieval and filtering framework is corresponding made from multi-level and multi-angle point. Finally the process complexity of food safety system, the agent behavior diversity and factors diversity are considered in which multi-organization, multi-elements and multithreading as the background. Every agent of the food quality chain is unified under the collaborative framework to study the function and interaction. It is a new idea to explore management control strategies to solve food safety problems from the angle of coordinated control. Food safety management strategy and policy are proposed driven by big data.