## THE SAFFI PARTNER CENTERS

Coordinated by the French National Research Institute for Agriculture, Food and Environment (INRAE), SAFFI bring together 14 partners from seven countries across Europe and 6 partners from two Chinese provinces gathering the required expertise in food safety control, infant food production, analytical and data sciences to achieve the project goal. This multi-actor and Sino-European consortium led by INRAE, the Europe's top agricultural research institute and the world's number two centre for the agricultural sciences, involves as full partners five international infant food companies (Friesland Campina, HiPP, YIOTIS, Beingmate, YFFC), two food safety authority institutions (ZAIQ and ANSES who published in 2016 the first total diet study worldwide dedicated to infant), three dynamic European technological SMEs (CremeGlobal, Computomics and BDS who are specialists in data science for industry decision making, omics data analysis and bio-based technologies, respectively), specialists in infant health and nutrition (EPA-UNEPSA, an international association of paediatrics) and leading European and Chinese academia (WU, UNITO, IRTA, IVV; ZJU, ZAAS, JAAS).

## ABOUT SAFFI

SAFFI targets food for EU's 15 million and China's 45 million children under the age of three. It aims at developing an integrated approach to enhance the identification, assessment, detection and mitigation of safety risks raised by microbial and chemical hazards all along EU and China infant food chains.
SAFFI will benchmark the main safety risks through an extensive hazard identification system based on multiple data sources and a risk ranking procedure. It will also develop procedures to enhance top-down and bottom-up hazard control by combining management options with a panel of technologies for the detection and mitigation of priority hazards.

SAFFI will discover unexpected contaminants by predictive toxicology and improve risk-based food safety management of biohazards by omics and predictive microbiology. SAFFI will co-develop with and deliver to stakeholders a decision-support system (DSS) to enhance safety control all along the food chain. This DSS will integrate the databases, procedures and methods described above and will be a framework for a generic DSS dedicated to other food.

This overall methodology will be implemented in two complementary European and Chinese mirror projects and exemplified for each, with four case studies that were selected to cover priority hazards, main ingredients, processes and control steps of the infant food chain.

Resulting databases, tools and procedures will be shared, cross-validated, concatenated, benchmarked and finally harmonized for further use in the EU and China. SAFFI will also set up training and knowledge transfer activities to foster EU-China harmonization of good practices, regulations, standards and technologies, and will cluster with other projects under the EU-China FAB Flagship initiative for continuous upgrade of food safety control.

This EU-China multi-actor consortium of 20 partners involves academia, food safety authorities, infant food companies, paediatrics and technological and data-science SMEs.

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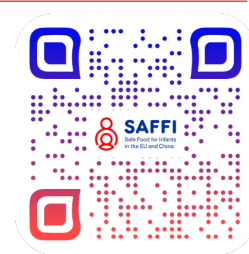
## SAFFI: SAFE FOOD FOR INFANTS IN CHINA AND THE EU [H2020 PROJECT]

The SAFFI project is one of the 3 projects selected within the framework of the European Horizon 2020 call for projects SFS-37-2019 "Integrated approaches for food safety along the food chain" concerning research and innovation actions. This project, coordinated by the Inra QuaPA Quality Research Unit for Animal Products, aims to develop an integrated approach to improve the identification, assessment, detection and mitigation of risks linked to microbiological and chemical hazards throughout the food chain in Europe and China.

SAFFI project focuses on infant food which needs to be carefully and strongly monitored and regulated given the vulnerability of its target population: infants.

SAFFI will develop and / or improve the multi-stakeholder surveillance system in the infant food sector by integrating the tools and methods for detecting and managing risks from primary production to the consumer, and to develop a system decision support to guide stakeholders in risk management.

**Beginning of the project: April 2020**
**Duration of the project: 4 years**

SAFFI is articulated in 8 collaborative Work Packages (WPs), which include all the 20 international partners contributing to the project. The WPs are engaged in a joint effort to achieve the goal of providing solutions to develop and/or improve a most efficient multi-stakeholder surveillance system in the infant food sector, serving the object to integrate the tools and methods for detecting and managing infant food chain risks from primary production to the consumer.

## WP1: HAZARD IDENTIFICATION AND RISK RANKING

WP1 develops DSS prototypes to carry out hazard identification (HI DSS) and risk ranking (RR DSS) within the infant food chain. In order to identify the top priority hazards to be managed (either chemical or microbiological hazards), also including unsuspected ones discovered in WP3 and WP4 (Step I), first a hazard identification with a very broad scope is needed. This requires the creation of underlying databases by collecting, aggregating, validating and analyzing a wide range of available data. In a second step, the evaluation and ranking of the risks of the hazards as identified in Step I enable to filter the main ones according to their public health impact but also to their perception by society. For both steps, integrative procedures and databases are translated into a prototype DSS that will be tested on the four case studies (CS i-CS iv) and upgraded by refining databases and procedures based on a systematic benchmarking with the related outcomes of the SAFFI Chinese mirror project.

**Objectives of WP 1:** the aim of WP1 is to develop a decision support system prototype to carry out hazard identification and a decision support system prototype for risk ranking. Specific objectives include i) the creation of databases for potential microbiological and chemical hazards and risk estimates; ii) the development of selection procedures for hazard identification and risk ranking; iii) the integration of these databases and procedures in decision support system (DSS) prototypes that are developed for both hazard identification and risk ranking.

## WP2: HAZARD CONTROL AND MITIGATION

WP2 develops a prototype of a decision support system for hazard control (HC DSS) and set preservation technologies/ mitigation strategies for enhancing the food safety management throughout the four infant food chains chosen as case studies from raw materials to consumer. This is done by i) quantifying the fate of key chemicals and the behavior of microbiological hazards along the four infant food chains chosen as case studies, ii) setting and assessing the ability of emerging processing and preservation technologies (HPP, PCD, RD) to control pathogens at least as efficiently as classical technologies while mitigating key heat-sensitive contaminants, iii) setting efficient monitoring and sampling strategies at operational (IFC) and governmental (FSA) level to enhance the effectiveness of food safety management options. The HC DSS prototype will be upgraded based on the relevant additional data, technologies and management solutions provided by the SAFFI Chinese mirror project.

**Objectives of WP 2:** the aim of WP2 is to set preservation technologies / mitigation strategies for enhancing the food safety management throughout the four infant food chains chosen as case studies from raw materials to consumer and to develop a prototype of a decision support system for hazard control (HC DSS). Specific objectives include: i) to quantify the fate of key chemicals (degradation, generation, migration) and the behaviour of microbiological hazards (growth, inhibition, inactivation) along the four infant food chains; ii) to set and validate emerging processing and preservation technologies to control key contaminants and pathogens as efficiently as classical technologies; iii) to set efficient monitoring and sampling strategies at operational (IFC) and governmental (FSA) level to enhance the effectiveness of food safety management options.

## WP3: CHEMICAL HAZARD DETECTION AND DISCOVERY

WP3 focuses on the development of novel methods based on analytical chemistry and bioassays for the detection, monitoring and discovery of chemical hazards. It includes i) high-throughput and cost effective targeted detection of the key contaminants in the four case studies for improving surveillance by FSA while promoting self-monitoring by IFC and ii) non targeted approaches for the discovery of unsuspected and unknown contaminants combining high throughput quantitative bioassays of infant food toxicity, directed HRMS profiling and bio-and chemo-informatics. WP3 outcomes (databases, procedures, tools) will be translated into a DSS module dedicated to Hazard Detection (HD) which will be upgraded based on concatenation, benchmarking and harmonization of the databases, tools and procedures with the SAFFI Chinese mirror project.

**Objectives of WP 3:** the aim of WP3 is to develop novel innovative approaches by combining the latest innovations in molecular biology and analytical chemistry for the detection, monitoring and discovery of chemical hazards and to establish all elements of a DSS module for chemical hazard detection. Specific objectives include: i) the development of high throughput, cost-effective and robust targeted approaches for the detection and monitoring of known priority contaminants to promote self-monitoring by the infant food companies and to improve the coverage of the safety surveillance by the European and Chinese food safety authorities; ii) the development and integration of non targeted analytical chemistry- and bioassay-based approaches for discovery of unknown or unsuspected contaminants and hazard characterization; iii) the integration of database, procedures and tools in the DSS module dedicated to hazard detection to be included in the WP5 DSS.

## WP4: MICROBIAL HAZARD DETECTION AND BEHAVIOUR

WP4 focuses on the implementation of novel omics method for microbiological hazard detection including the application of i) WGS as biotyping method to improve targeted microbial hazard detection, ii) metataxonomic, metagenomics and metabolomics for determining microbial dynamics and associations of the food microbiota with particular emphasis on tracing the microbial contamination source, iii) transcriptomics and volatolomics to identify biomarkers that describe and may predict microbial hazard behavior. Data and procedures of WP4 will also integrated into a DSS module dedicated to hazard detection and upgraded with the complementary data and tools provided by the SAFFI Chinese mirror project.

**Objectives of WP 4:** the aim of WP4 is the integrated and complementary application of state of the art nucleic acid sequencing methodologies for microbial hazard detection and characterization in order to establish all elements of a DSS module for microbial hazard detection (MHD DSS) and to provide predictive models of microbial behavior. Specific objectives include: i) Determination of the presence, distribution (in time and space) and prevalence of target foodborne pathogens throughout the 4 food chains; ii) Upgrade of predictive models by implementing omics data; iii) Integration of databases, procedures and tools for microbiological hazard detection at critical control points in the DSS module dedicated to hazard detection to be included in the WP5 DSS.

## WP5: INTEGRATION OF DECISION SUPPORT SYSTEMS AND COST-BENEFIT ANALYSIS

WP5 integrates the DSS prototypes (H1,RR and HC DSS) designed in WP1 and 2 and the DSS module dedicated to hazard detection designed in WP3 and 4 (HD DSS) into a beta version of a generic DSS for safety control throughout the infant food chain. This beta version will be tested by European and Chinese end-users in order to make it suitable for further commercialization in both markets. WP5 also propose plausible scenarios of infant food hazard control systems, predict their cost / benefit ratio for the stakeholders in the EU and China and provide them with guidelines integrating food safety, regulatory and socio-economic inputs.

**Objectives of WP 5:** the aim of WP5 is to provide a generic DSS for hazard identification, risk ranking, hazard control and hazard detection in the infant food chain. Specific objectives include i) To integrate the DSS prototypes (HI, RR and HC DSSs) designed in WP1 and 2 and the DSS module dedicated to hazard detection designed in WPs 3 and 4 (HD DSS) into a single and upgradeable DSS; ii) To predict the global risk and benefit of scenarios of infant food hazard control systems shared in the EU and China based on multi-criteria analysis of the hazard focus and the technologies of control and detection explored in SAFFI integrating food safety, regulatory and socio-economic inputs; iii) To provide through the DSS recommendations and guidelines for stakeholders (supply chain actors, food safety authorities, consumers) based on their inputs/food safety specifications/requirements.

## WP6: COMMUNICATION, DISSEMINATION AND EXPLOITATION STRATEGIES TO FACILITATE THE IMPACT PATHWAY

WP6 ensures a proper communication on the project and the dissemination of its results to various key players and stakeholders involved at various levels in monitoring and supervising the infant food chain safety processes and the health of children, namely food authorities, food companies, healthcare professional, academics, other companies, consumers. This WP6 will also contribute to set EU-China common schemes for regulatory standards and harmonize control practices.

**Objectives of WP 6:** the aim of WP6 is to ensure a proper communication on the project and the dissemination of its results to various key players and stakeholders involved at various levels in monitoring and supervising the infant food chain safety processes and the health of children, namely food authorities, food companies, healthcare professionals, academics, other companies, consumers. Specific objectives include: i) Engaging all stakeholders in a two-way approach about the growing importance of infant food-chain and its current issues identified in the project; ii) Raising further awareness of decision and policy-makers (government, legislators) and end-users (consumers and healthcare professionals involved in child care and nutrition) on the impact of the food chain risks on food safety, and in general on health protection of children; iii) Communicating at large on project findings and solutions proposed; iv) Informing by media tools and editorial initiatives civil society, including advocacy groups and NGOs, and by meetings and educational activities involving them in the dissemination and exploitation process; v) Contributing to set EU-China common schemes for regulatory standards and harmonize control practices; vi) Establishing a preliminary plan for the immediate dissemination and exploitation of the project's results that will serve as a guideline for all project partners and guidance for their implementation.

## WP7: CONSORTIUM COORDINATION AND PROJECT MANAGEMENT

WP7 will coordinate the SAFFI project in an effective and efficient manner thanks to the project coordinator, together with the experience of the coordination assistance team and the WP leaders, highly experienced in the management of H2020 projects. This WP will also i) performs clustering with other projects financed under topics SFS-37-2019 and SF-45-2016, and ii) deals with the knowledge and research data management.

**Objectives of WP 7:** WP7 coordinates the SAFFI project in an effective and efficient manner. Specific objectives include : i) At the strategic level: to steer the project to address all unexpected situations, be these scientific, technological, environmental or societal; as well as perform clustering with other projects financed under topics SFS-37-2019 and SFS-45-2016; ii) At the operational level: to ensure that the project progresses in conformity with the work plan with regard to overall progress, milestones, deliverables, and planned resources; ensure the connections between the governing bodies of the project (GA, ExCom, Stakeholders Board, IMG, DMC); as well as ensure synergies with the SAFFI Chinese mirror project; iii) At the organisational level: to optimise the infrastructural setup to support the project, with special attention to finances, logistics, information, coordination issues, and conformity to EC rules and procedures; iv) At the valorisation level: to ensure that Intellectual Property Rights of the results produced by the project are preserved and that data are managed under FAIR conditions.

## WP8: ETHICS REQUIREMENTS

WP8 will ensure and demonstrate that the research carried out in the SAFFI project respects good practices and recommendations regarding ethical issues raised by the project activities.

**Objectives of WP 8:** WP8 sets out the Ethics requirements that the SAFFI project must comply with, in terms of procedures, legislation and good practices, regarding the use of biological samples, the protection of personal data, the involvement of third countries, the environmental protection and safety, and the participation of humans in SAFFI research activities.