



## Smartphone analysers for on-site testing of food quality and safety

Issue 8 – December 2020



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### Welcome to the 8<sup>th</sup> FoodSmartphone e-Newsletter!

Dear reader and FoodSmartphone follower,

For a collaborative initial training network such as FoodSmartphone, the on-going covid-19 pandemic caused the cancellation of many scheduled ESR secondments, postponement and eventual change into an online version of our final network event and open day, reduced dissemination opportunities due to worldwide cancellations of scientific events, lockdowns in several countries and, last but not least, a lot of stress for our researchers in their final project year. Despite all this, you can read in this newsletter several successful adaptation stories. For example, again a number of high impact research papers have been published by our ESRs, beneficiary CSIC turned the final network event into a highly successful online Workshop SmartTech for Food with more than 130 participants and a Virtual Video Open Day, Aris Tsagkaris successfully defended his PhD thesis online at UCT in Prague, and the ESR blogs became a top hit.

The FoodSmartphone project was granted a short 3 months extension in order to enable ESRs (1)7 and (1)9 to finalize their collaborative research on smartphone-based imaging surface plasmon resonance for multiplex biosensing of antibiotics. Several ESRs are finalizing their project now by drafting a PhD thesis (some of them continue to do experimental work beyond the 3 years of EC funding, thanks to local financial support). At the end of this e-Newsletter you will find their farewell messages. As a coordinator I am delighted and feel privileged with all the work done by the ESRs: thanks to you all, a paradigm shift in food quality and safety testing is no longer a dream but becoming more and more within reach. As expected, the novel prototype solutions from the project are typically at a technology readiness level 3-4, waiting for further development into truly exploitable products. But be aware that EC regulators have recognized and are supporting these developments, as became evident at the SmartTech for Food workshop.

The FoodSmartphone website will remain active, so don't forget to read the ESR latest open access research papers on the dissemination page of the website. Or simply stay tuned by following us on twitter (@FoodSmartphone) and tweet us using the hashtag #FoodSmartphone. Feel free to contact us with any suggestions for future collaboration and/or dissemination opportunities, or just for a friendly chat.

For now I wish you some well-deserved Christmas holidays and, most, importantly, stay safe! (the vaccines are the 2021 news:-)



Michel Nielen  
coordinator

## FoodSmartphone progress versus research objectives

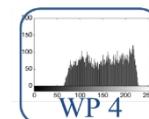
### Key facts:

**Grant Agreement:** 720325 – FoodSmartphone - H2020-MSCA-ITN

**Start date:** January 2017

**Duration:** 51 months

**Volume:** 2.8 M€



The major science and innovation gaps to be addressed by the FoodSmartphone project relate to high-speed and novel biorecognition of food contaminants, novel optical and electrochemical detection schemes in conjunction with smartphones, simplified



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**WP1 leader**

M.-Pilar Marco (CSIC)

**WP2 leader**

Gert Salentijn (WFSR)

**WP3 leader**

Jens Eriksson (LIU)

**WP4 leader**

Karen Rafferty (QUB)

**WP5 leader**

Jana Hajslova (UCT)

**WP6 leader**

Katrina Campbell (QUB)

**WP7 leader**

Jana Pulkrabova (UCT)

**WP8 leader**

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microfluidic sample handling solutions that enable non-expert operation, advanced software architecture and the development of application demonstrators for food quality and safety issues of concern, viz. for antibiotics, pesticides, allergens, mycotoxins, food spoilage and marine toxins. Despite the covid-19 situation hampering access to the lab and face-to-face collaborations a lot of progress has been made: the ESRs can be proud of their achievements!



Prototype assays with smartphone readout have been developed, initially validated and applied to real samples. The allergen assay was even simplified to such an extent that an untrained teenager was capable to perform the assay using a pictogram-like manual. The following recent papers are listed on our [website](http://www.foodsmartphone.eu):

- ESR1, Gina Ross, wrote a research paper entitled "Interconnectable solid-liquid protein extraction unit and chip-based dilution for multiplexed consumer immunodiagnosics", which appeared in *Anal. Chim. Acta*, 1140 (2020) 190-198 (doi:10.1016/j.aca.2020.10.018).
- ESR(1)2, Ariadni Geballa, wrote a research paper entitled "Direct analysis of lateral flow immunoassays for deoxynivalenol using electrospray ionization mass spectrometry", which appeared in *Anal. Bioanal. Chem.*, 412 (2020) 7547-7558 (doi:10.1007/s00216-020-02890-4).
- ESR4, Javier Lou Franco, wrote a research paper entitled "Gold nanozymes: from concept to biomedical applications", which appeared in *Nano-Micro Lett.*, 13 (2021) 10 (doi.org/10.1007/s40820-020-00532-z).
- ESR6, Aris Tsagkaris, wrote a research paper entitled "A microfluidic paper-based analytical device (μPAD) with smartphone readout for chlorpyrifos-oxon screening in human serum", which appeared in *Talanta*, 222 (2021) 121535 (doi.org./10.1016/j.talanta.2020.121535).
- ESR1, Gina Ross, wrote a research paper entitled "Unraveling the Hook Effect: A Comprehensive Study of High Antigen Concentration Effects in Sandwich Lateral Flow Immunoassays", which appeared in *Anal. Chem.*, 92 (2020) 15587–15595 (dx.doi.org/10.1021/acs.analchem.0c03740).

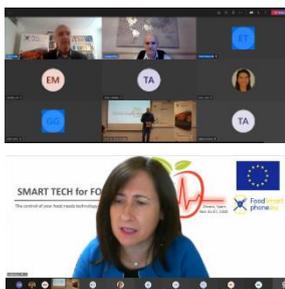
Several other research and review papers are in the approval and submission pipeline!

**Feature: online workshop SmartTech4Food organized by CSIC**



The final FoodSmartphone networking conference was to be organized in June 2020 in Girona, Spain. But due to the pandemic, even a second postponement did not solve the covid-19 restrictions and eventually a virtual two-day workshop was organized by CSIC in November 2020, "Workshop SmartTech for Food (ST4F)". The ESRs





were heavily involved in the programming of this workshop. The event was also marketed via RAFA as the 2<sup>nd</sup> European workshop on portable food analysis and citizen science.

The workshop was opened with a plenary lecture by Prof. Chris Elliott entitled “uncovering the cause of a major food safety incident by the application of analytical chemistry” in which he presented two case studies in Africa in which the availability of smartphone-based food analysis tools could have been of great value in order to map the spread of a huge food contamination and fraud case. The program of the workshop comprised a very nice mixture of lectures by experts in the field, regulators, diagnostic companies and FoodSmartphone ESRs. The session topics covered optical sensors, electrochemical sensors, spectrometric analysis, food surveillance and regulatory issues, natural toxins, food allergens, antibiotics and bacteria, and pesticides. Each session ended with a lively round table discussion. The workshop was very well attended by more than 130 participants from 18 countries. The award for the best oral presentation by a young scientist being a FoodSmartphone ESR, was won by Klaudia Kopper.



The workshop program also included a Virtual Open Day for the general public: all the ESRs produced a video about their work: these videos are individually available on our YouTube channel at

[youtube.com/channel/UCBfWt4Me3loLy7kJArJnGVg/videos](https://youtube.com/channel/UCBfWt4Me3loLy7kJArJnGVg/videos) and of course via the FoodSmartphone.eu website. Together, these videos were compiled by CSIC into an 80 minutes Virtual Open Day Video that was made open access available on YouTube at



[www.youtu.be/HsApkr1MQBg](https://www.youtu.be/HsApkr1MQBg). The award for the most creative and fancy video production by a FoodSmartphone ESR was won by Ariadni Geballa Koukoula. Thanks to the local propaganda made for the Virtual Open Day, the attention of a TV channel was triggered resulting in TV registration and broadcasting of a demonstration of the FoodSmartphone research performed at CSIC by ESRs (1)7 and 8.

A *Big Thank You* to the crew at CSIC and to our ESRs, you all did a fantastic job in organising this great event, muchas gracias!

## FoodSmartphone doctorate for Aris Tsagkaris at UCT Prague



Faculty of Food and Biochemical Technology  
Department of Food Analysis and Nutrition

Smartphone-based enzyme assays for cholinesterase inhibitors screening

### DISSERTATION

AUTHOR	Aristeidis Tsagkaris, M.Sc.
SUPERVISOR	prof. Ing. Jana Hajšlová, CSc.
SUPERVISOR SPECIALIST	prof. Ing. Jana Pulkrabová, Ph.D.
STUDY PROGRAMME	Food Chemistry and Technology
FIELD OF STUDY	Food Chemistry and Analysis
YEAR	2020

One of the key aims of an initial training network such as FoodSmartphone is to provide PhD training. On September 24<sup>th</sup> 2020, ESR6 Aris Tsagkaris successfully defended his PhD thesis entitled “Smartphone-based enzyme assays for cholinesterase inhibitors screening” at UCT Prague. Due to covid-19 restrictions the defence had to be organised online. In his thesis, following an introduction, the scope and objectives are discussed in chapter 2, followed by a critical review of the state-of-the-art in pesticide residue analysis in chapter 3. In chapter 4 and 5 experimental results of his PhD project are presented, while the corresponding peer-reviewed papers can be found in full in the appendices. Definitely, the development of 3D-printed paper hybrid unibody-lab-on-chip devices for smartphone-based pesticide screening is the highlight of his work. After just three years of research, the output of Aris has been impressive and of a very high level, so well done Dr Aris, our congrats! A pdf copy of the thesis can be found via the contacts mentioned on the PhD thesis tab at our website [http://foodsmartphone.eu/dissemination\\_materials.html](http://foodsmartphone.eu/dissemination_materials.html). Next in line: the PhD defence of ESR1 Gina Ross, is scheduled on March 12, 2021 at Wageningen University.



## Stats from the ESR blogs

During their EC contract period our ESRs produced in rotation a weekly blog on [www.foodsmartphone.blog](https://www.foodsmartphone.blog). Initially, the topics mainly covered their cultural background and mobility challenges while gradually over time the scientific content increased, as did their personal opinions about societal developments. In terms of reaching out to

Stats for All Time



stakeholders, including the general public, the weekly blogs became an absolute top hit: over the years 146 blogs were posted having 28,577 views by 12,822 unique visitors from 147 different countries! Thus, an almost global attention to the project was achieved. The blog with the highest number of views in 2020, entitled "Keep calm and wash your hands" was written by ESR Aris Tsagkaris

at the onset of the covid-19 pandemic [[www.foodsmartphone.blog/2020/03/18/keep-calm-and-wash-your-hands](http://www.foodsmartphone.blog/2020/03/18/keep-calm-and-wash-your-hands)]. Obviously, Aris is a gifted blog writer since in the first year his blog "Dream or Reality?" [[www.foodsmartphone.blog/2017/07/28/dream-or-reality](http://www.foodsmartphone.blog/2017/07/28/dream-or-reality)] also had the highest number of views!

## Farewell quotes from FoodSmartphone ESRs



**ESR1: Georgina Ross , WFSR, Wageningen University & Research, The Netherlands:**  
*FoodSmartphone has been an incredible journey; seeing my fellow ESR's final prototype devices and on-going research at the recent SmartTech4Food conference was the perfect closing to 3.5 years of hard work and impactful science.*



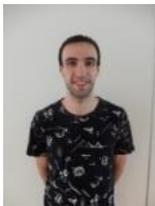
**ESR(1)2: Ariadni Geballa Koukoulou, WFSR, Wageningen University & Research, The Netherlands:**

*Innovation goes hand in hand with a challenge, and well-being goes hand in hand with safe food options. When we combine innovation for food options, no challenge is left for our well-being. The FoodSmartphone project's innovative techniques wish to minimize the food-related risks, reserve the well-being of billions of people worldwide by providing safer food and support the UN's SDGs "to improve the quality of life for everyone". (Adapted from: "The FoodSmartphone project fosters well-being through innovation")*



**ESR3: Jordi Nelis, Queens University, Belfast, United Kingdom:**

*I want to thank foodsmartphone for the incredible experience! Working with so many great scientists has broadened my horizon and made me love science even more. It was incredible!*



**ESR4: Javier Lou Franco, Queen's University, Belfast, United Kingdom:**

*It has been almost 4 years since the FoodSmartphone Project started and, as the end of 2020 approaches, it comes to an end in these very special circumstances. As an ESR, it has been an exceptional experience to start my research career. We have been given the opportunity to create an amazing network through collaborations with Universities all around Europe, but also with leading companies in the fields of biosensors and food safety. Now it is time for us to step up and move to the next adventure. I wish everyone involved in the FoodSmartphone consortium the very best and I hope we can find opportunities in the future to further collaborate to keep this network alive.*



**ESR5: Yunfeng Zhao, Queens University, Belfast, United Kingdom:**

*The diversity and inclusivity of the FoodSmartphone project has provided me with more interesting conversations than I can remember, multiple collaborations, and along the way many new friendships. The variety of research interests that I have experienced with during the project has allowed me to broaden my perspectives and contribute to exciting research in numeral fields.*



**ESR6: Aristeidis Tsagkaris, University of Chemistry and Technology, Prague, CZ:**

*Participating in the FoodSmartphone project has highly benefited me in many terms. I got my Ph.D., acquired useful knowledge that will be definitely helpful in my future research, created an international business network and, last but not least, met nice and wise people that will be always happy to communicate with. If you are looking for a Ph.D. opportunity then I highly recommend you Marie Curie actions opportunities. No matter the research success, you will definitely grow as a scientist as well as an individual.*



**ESR(1)7: Julian Guercetti, CSIC, Barcelona, Spain:**

*Even though I was one of the latest incorporations to the FoodSmartphone project, during this two challenging years I got the chance to know wonderful scientists and professionals, but the best part was to find they were amazing people! It was a life changing experience and I will keep many friends and colleagues expecting to continue sharing good moments in the future. I would like to especially thank my supervisors Prof. Pilar Marco and J-Pablo Salvador for giving me the opportunity to be part of this group, and to my colleagues in the project and in the laboratory. Best wishes from ESR 17!*



**ESR8: Klaudia Kopper, CSIC, Barcelona, Spain:**

*I feel really grateful for having had the opportunity to participate in the FoodSmartphone project. It has not only allowed me to evolve professionally as a scientist but also personally through the enhancement of my soft skills. Furthermore, I had the pleasure*

of getting to know and become a part of an incredible group of young scientists who continuously kept inspiring me and I sincerely hope that the friendships that we have made will last forever. Last but not least, I would like to thank our wonderful coordinator Michel and the entire consortium for their invaluable work and support throughout the entire lifetime of the project.

ESR(1)9: Chi Xiao, Linköping University (LIU), Sweden:

It is a tough year, but it is still important to remember that we are doing the best as we can and do not waste time.

ESR11: Safiye Jafari, CSEM, Switzerland:

It was a great adventure, being part of FoodSmartphone project. During these 3 years, I have learned a lot and grew up so much as a researcher. I wish all the best for our team.



## Forthcoming events / meetings



### [Rapid Methods Europe 2021](#)

1-3 February 2021, online event, Amsterdam, The Netherlands

### [EuroResidue IX](#)

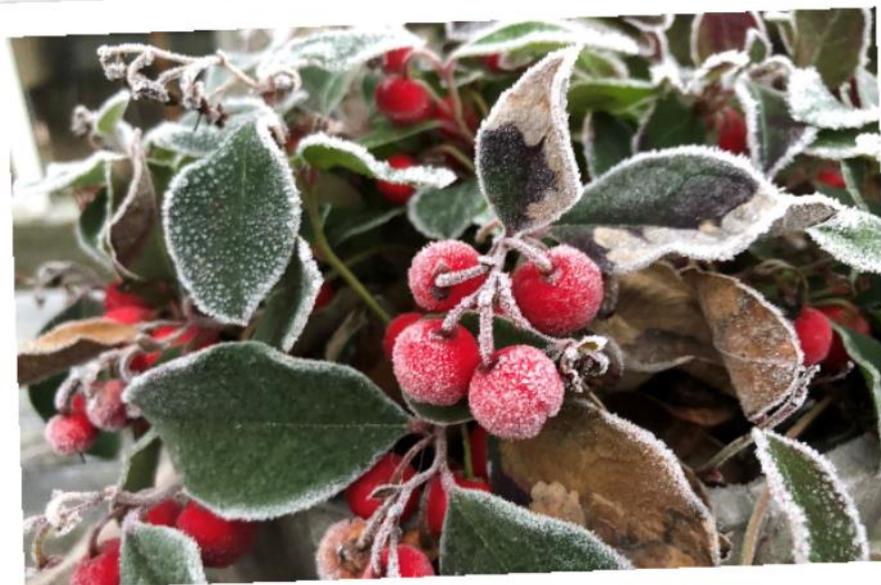
10-12 May 2021, Egmond, The Netherlands

### [EuroAnalysis 2021](#)

22-27 August 2021, hybrid event, Nijmegen, The Netherlands

### [Recent Advances in Food Analysis \(RAFA2021\)](#)

2-5 November 2021, live event, Prague, Czech Republic



Very best Christmas wishes and a lot of happiness, good health and spirit for the coming year.  
Michel Nielen, Ingeborg van Leeuwen-Bol

## Contact us

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