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Listeria monocytogenes
National Reference Laboratory

Focus on NRL for *Listeria monocytogenes* and research activities

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What is a National Reference Laboratory?

Established by EU legislation, it is a national reference centre appointed by each Community Reference Laboratory in specific areas of food safety that shall:

- **collaborate** with the Community reference laboratory in their area of competence;
- **coordinate**, for their area of competence, the activities of official laboratories responsible for the analysis of samples;
- where appropriate, **organise comparative tests** between the official national laboratories and ensure an appropriate follow-up of such comparative testing;
- ensure the **dissemination** to the competent authority and official national laboratories of information that the Community reference laboratory supplies;
- **provide scientific and technical assistance** to the competent authority for the implementation of coordinated control plans.

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What NRL Lm has to do or demonstrate:

Competence : Demonstration of competence and evaluation of competence (participates to and organises PT trials)

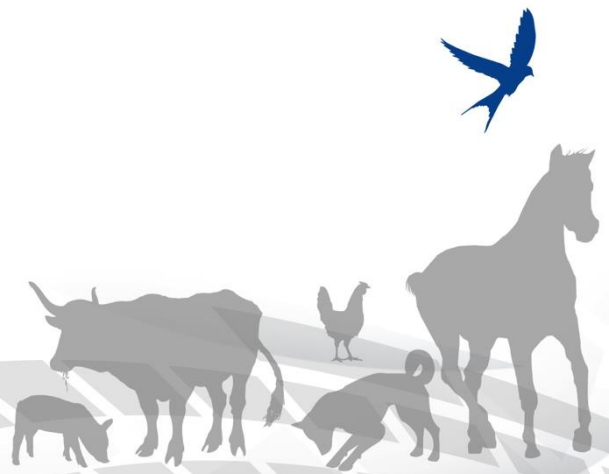
Leadership: Coordinate and training personnel from other official laboratories

Researches:

- National and international research projects
- Scientific papers
- International WG members (EURL Lm and European Commission)
- EFSA collaboration
- ECDC collaboration
- Collaboration with the Ministry of Health

Development:

- Validation of methods
- New methods of analysis



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Information systems

- **SEAP** (Information System for Foodborne Pathogens Epidemiological Surveillance) for the collection of epidemiological information and molecular profiles (PFGE) of *Listeria monocytogenes* related to strains from food, feed, animals and environment.

- **SINVSA** (National Information System for Food Safety) for the collection of epidemiological and lab data from food and feed samples, including info on export to USA and other Third Countries.

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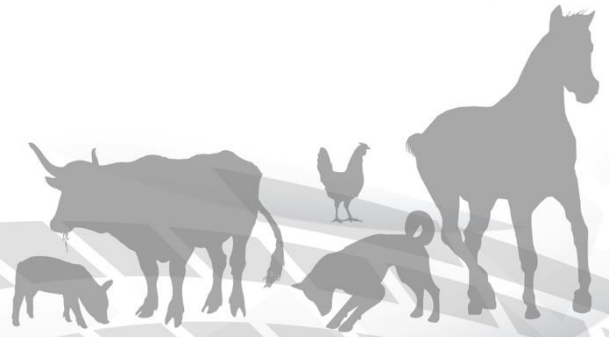
Collaboration activities with Ministry of Health as concerns the export of foodstuffs to USA and other third countries

- Guidance document for official controls in establishments that export RTE meat products to USA according to USDA-FSIS (DGISAN document of 17.03.2017)
- Guidance document for *Listeria monocytogenes* and *Salmonella* own-check and official sampling in establishments that export RTE meat products to USA according to FSIS (DGISAN document of 16.09.2015)



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LISTERIA MONOCYTOGENES IN EUROPEAN UNION: FOOD SAFETY CRITERIA IN READY TO EAT PRODUCTS

- In EU there is no zero tolerance for *Listeria monocytogenes* in RTE foods

Microbiological criteria applying a risk based approach have been set.

In fact, there are different microbiological criteria according to:

- The type of consumer (ready-to-eat foods for particularly vulnerable consumers: babies, unhealthy people)

- Food characteristics (ready-to-eat foods able or not able to support the growth of *Listeria monocytogenes*)

LISTERIA MONOCYTOGENES:FOOD SAFETY CRITERIA

Listeria monocytogenes

Food	Micro-organism	Sampling plan		Limits		Stage where the criterion applies
		n	c	m	M	
Ready-to-eat foods able to support the growth of L. m.	***Listeria m.***	**5**	**0**	100 cfu/g		Products placed on the market during their shelf-life
				Absence in 25 g		

The 100 cfu/g criteria applies only if the manufacturer can demonstrate to the competent authority that the product will not exceed the limit of 100cfu/g throughout the shelf-life.

- *Demonstrate by historical evidence from testing the product on from tests from a similar product*
- *Evidence from the literature, **predictive modelling***
- ***Challenge tests** (according to specific EURL Lm guidance)*

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Food processing laboratory

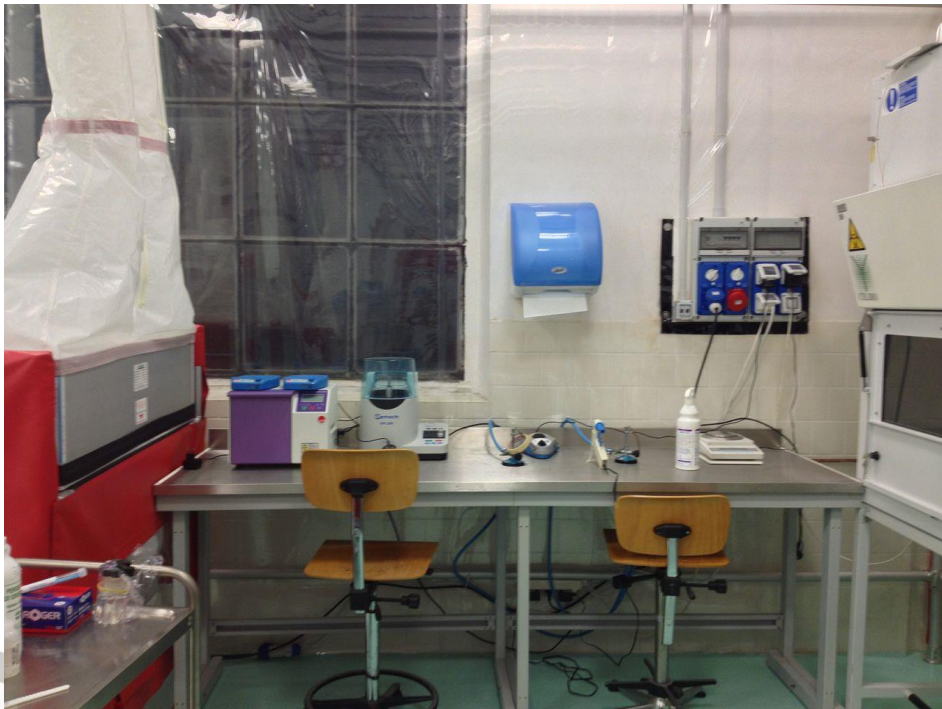
- It is **almost 400 square-meter facility** designed to meet research needs on food safety topics regarding the processing technology applied to meat and dairy production

- **Challenge test** for *Listeria monocytogenes* according to the Regulation (EC) 2073/2005, the IZSAM adopted the EURL Lm Technical guidance document On shelf-life studies for *Listeria monocytogenes* in ready-to-eat foods

- **The facility contains all major processing equipment scaled down** for laboratory-sized food formulations.

- **Cross contamination** studies

- Production of data to be used for **predictive modelling**



Experimental food processing laboratory

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Production of data used for predictive microbiology

What is PREDICTIVE MICROBIOLOGY?

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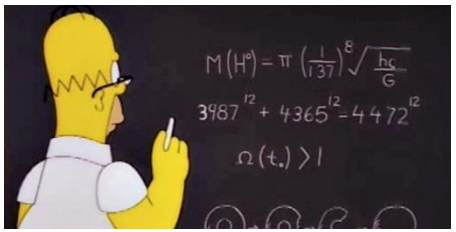
PREDICTIVE MICROBIOLOGY



Mathematical models

Software development

Predictive microbiology

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PREDICTIVE MICROBIOLOGY

temp **pH** **aw**

Microbial responses to environmental conditions

$$Change\ in\ log\ cell\ conc. = f(temp, pH, aw)$$

PREDICTIVE MICROBIOLOGY

- **Primary models**:

Describe changes of the microbial number (growth, survival, death) as a function of time

- **Secondary models**:

describe parameters of the primary models as a function of environmental conditions (pH, temp, a_w)

- **Tertiary models**:

Computational implementation (software tools) of primary and secondary models.

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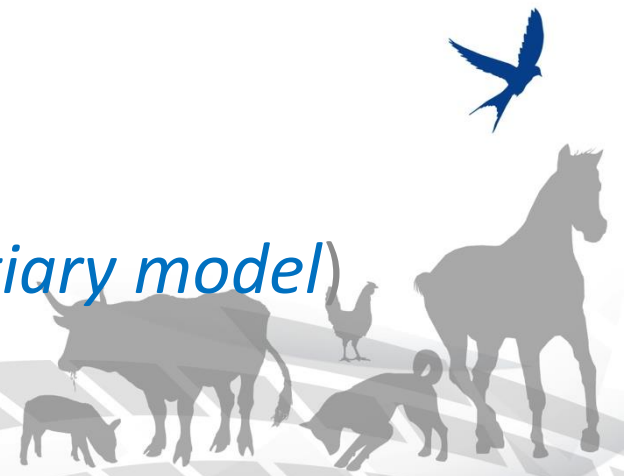
PREDICTIVE MICROBIOLOGY

MODEL DEVELOPMENT:

- Experimental design – data collection
- Estimation of the parameters of the *primary model*
- Effect of the environmental variables of the *secondary model*
- Model validation
- Integration in a software tool (*tertiary model*)



PREDICTING KINETICS OF LISTERIA MONOCYTOGENES AND YERSINIA IN SAUSAGE

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- "Dynamic" predictive model developed in collaboration with dr. József Baranyi of IFR (Institute of Food Research), Norwich, UK
- First model able to predict microbic cinetics in dynamic conditions, from «growth supporting» to «death inducing»

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Predictive microbiology

- 2017 publication from this collaboration:

International Journal of Food Microbiology 240 (2017) 108–114

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International Journal of Food Microbiology

journal homepage: www.elsevier.com/locate/ijfoodmicro

Predicting the kinetics of *Listeria monocytogenes* and *Yersinia enterocolitica* under dynamic growth/death-inducing conditions, in Italian style fresh sausage

Luigi Iannetti [a,*], Romolo Salini [a], Anna Franca Sperandii [a], Gino Angelo Santarelli [a], Diana Neri [a], Violeta Di Marzio [a], Romina Romantini [a], Giacomo Migliorati [a], József Baranyi [b]

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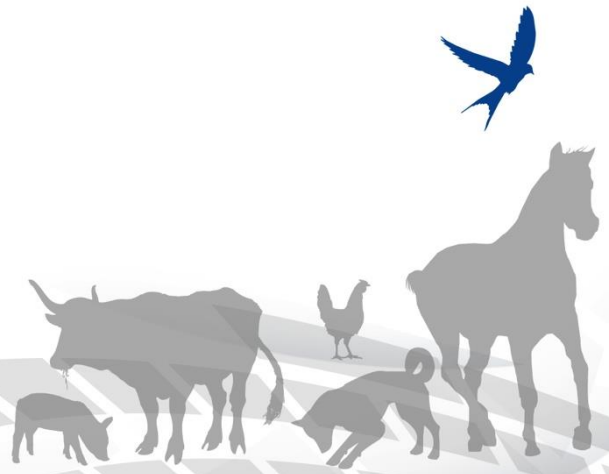
IZSAM Food Hygiene Research projects

Not only *Listeria monocytogenes*...



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MED VET EJP (Cofund European Joint Program)

"NOVA" project: Novel approaches for design and evaluation of cost-effective surveillance across the food chain.

AIM

Develop and demonstrate ways to better utilise novel and existing data sources useful for zoonoses surveillance, by developing methodological tools that will give improved decision support for authorities and industries.

PARTNERS

19 Institutions from Human and Veterinary medicine in 10 different EU Countries.

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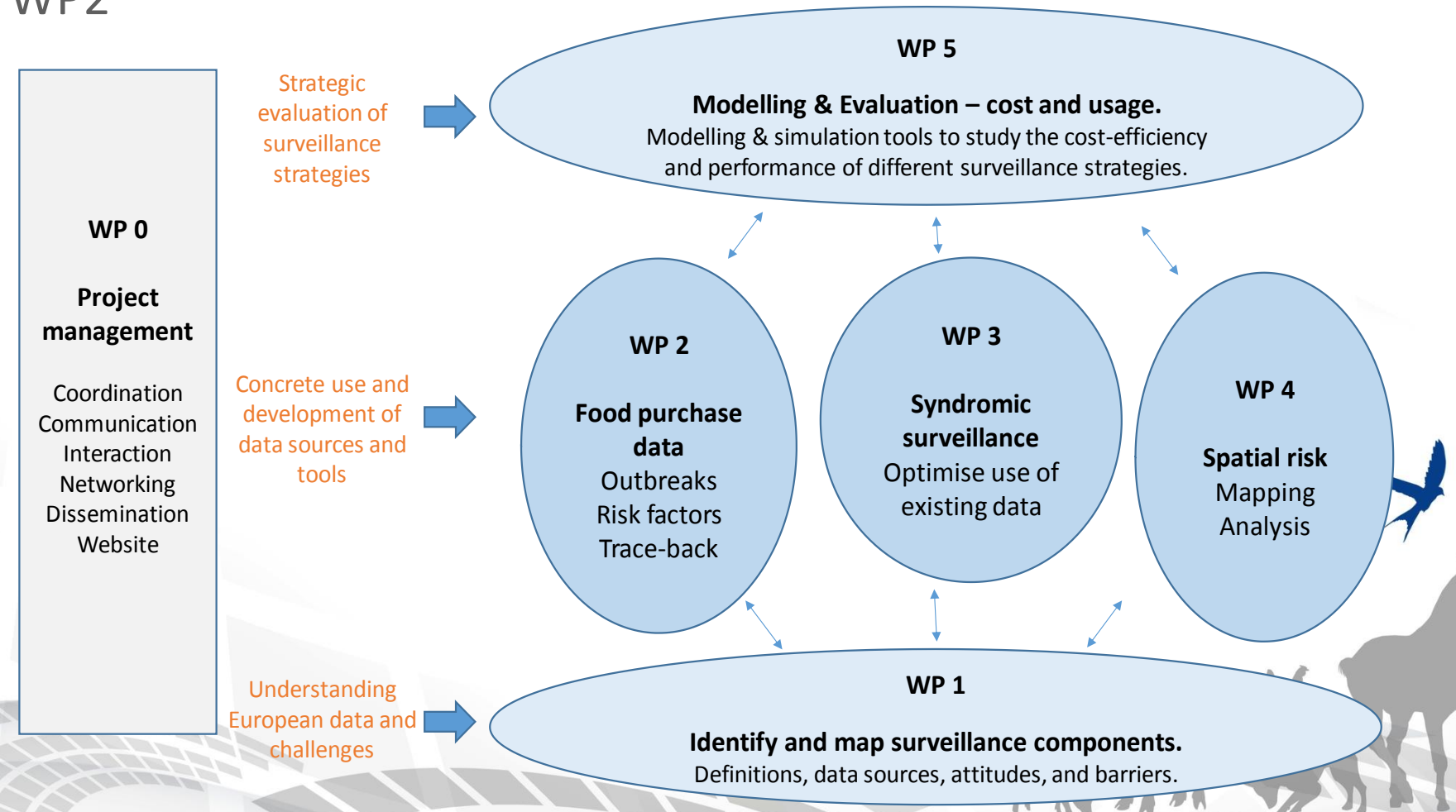
PROJECT PLAN

6 WP, IZSAM is involved in WP1 and, as deputy task leader, in WP2



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IZSAM ACTIVITIES IN NOVA

WP1: Food surveillance mapping. Providing a common language for discussion, and by mapping surveillance opportunities and hurdles for surveillance (data currently not used for surveillance)

WP2: Analysis of Food Purchase Data. Elucidate whether the surveillance potential of food consumption, as reflected by consumer purchasing patterns, may serve as a new digital tool to aid our understanding of both outbreaks and general risk factors of foodborne zoonoses (e.g. supermarket fidelity cards, data on hospital patients' meals)

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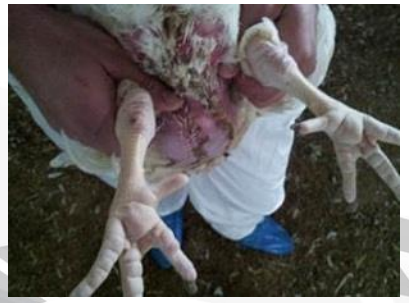
Effect of on-farm and pre-slaughtering stress factors on microbiological contamination of poultry meat

Can **improved animal welfare** impact on microbiological safety of poultry meat?

Aim: Evaluate if the level of animal welfare can influence shedding of foodborne pathogens and therefore poultry meat contamination**,** with particular reference to ***Campylobacter*****,** ***Salmonella*** **and** ***Listeria monocytogenes***

3-year project financed by the Italian Ministry of Health (end December 2018)



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Welfare Quality® protocol


Good feeding


Good housing


Good health


Appropriate behaviour

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Evaluation at slaughterhouse

Pre-slaughter

- WQ (Death at arrival-DOA, panting, pre-stun shock, etc..)
- Faecal sampling (pre-transportation)
- Faecal sampling (post-transportation)
- Blood sampling (eterophils / lymphocytes ratio)

Post-slaughter (carcasses)

- WQ (lesions, bruises, broken wings, ascites)
- Sampling of caeca: 40 samples per batch
- Sampling of skin: 40 samples per batch

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Animal welfare and food safety: Some preliminary results

- ***Campylobacter*** in cloacal swabs **increased after long transports**, with statistically significant difference compared to shorter transports
- **Widespread *Salmonella* contamination, both in faeces and in carcasses,** was **only** found in **"Low Welfare"** flocks
- The only **organic farm** examined so far showed a **reduction of 1log CFU/g of *Campylobacter*** contamination on carcass skin after conversion to organic production (significant difference)
- It was also **significantly less contaminated** than other "High Welfare", but not organic, flocks
- **Interaction** between ***Salmonella*** and ***Campylobacter*** in "Low Welfare" flocks?


Thank you!