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From animal to plant ecosystems and vice versa

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From animal to plant ecosystems and vice versa ?

Isabelle Virlogeux-Payant

INRA, UMR1282 Infectiology and Public Health
« Signaling, Bacterial Carriage and Virulence » team

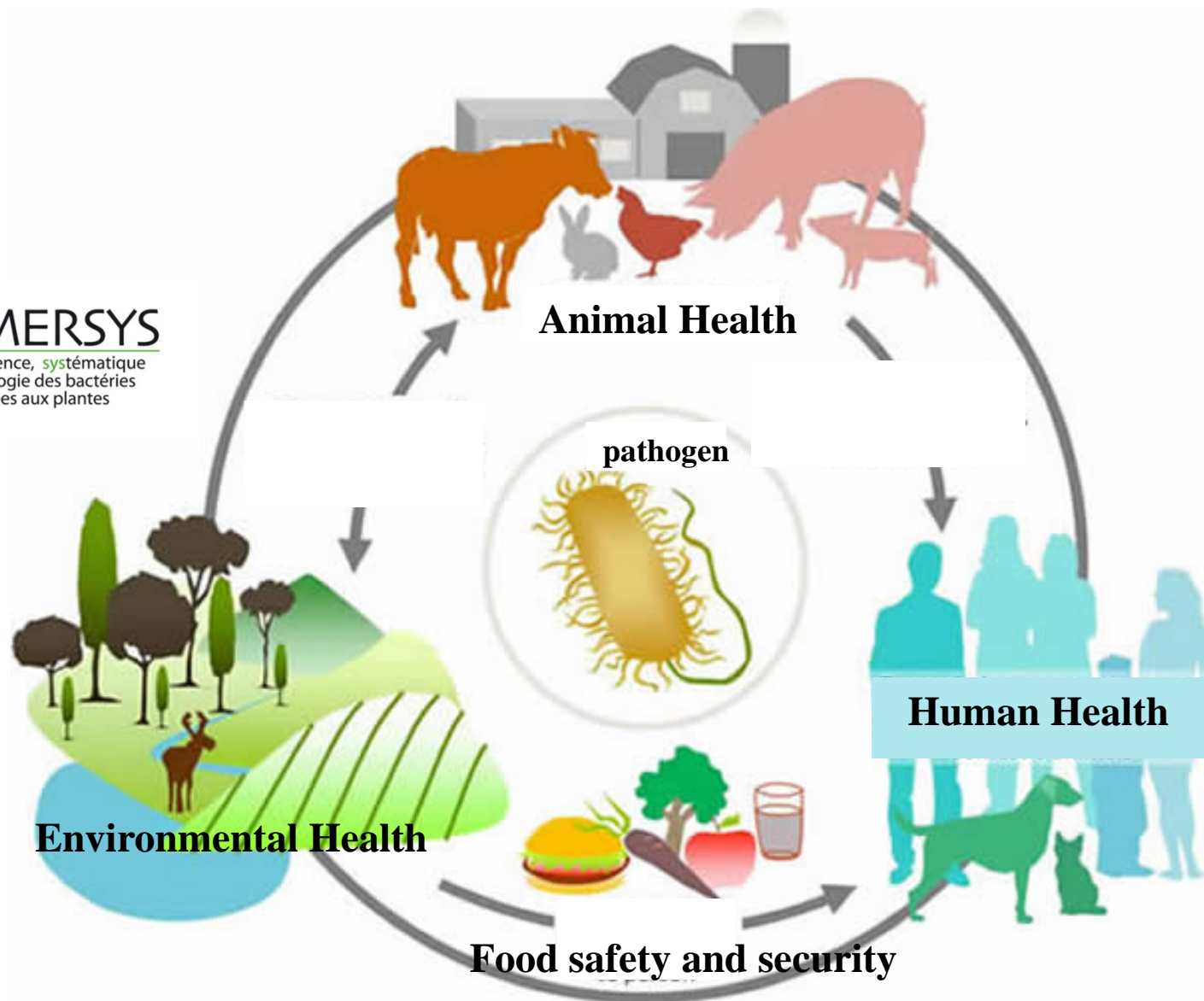
Matthieu Barret

IRHS, Research Institute of Horticulture and Seeds
Emergence, systematics and ecology of plant-associated bacteria

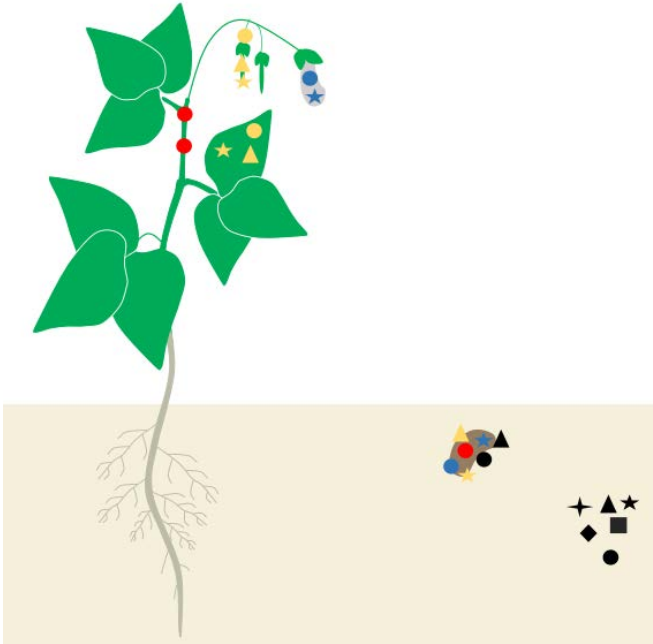
One Health concept



EMERSYS
Emergence, systématique
et écologie des bactéries
associées aux plantes



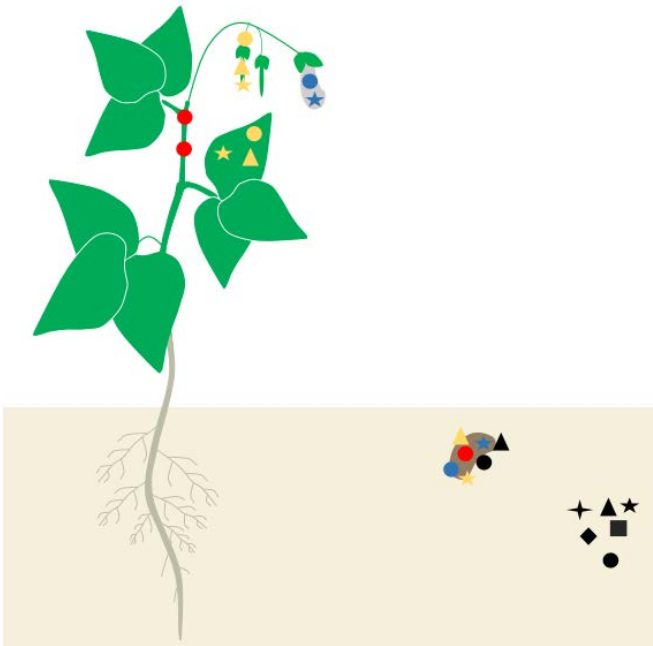
❖ Understand biological/ecological processes involved in seed transmission of microbes



- Pathogen-centric approach (*Xanthomonas*)
 - Seed transmission pathways (systemic, floral)
 - Bacterial determinants (T3SS, adhesins, ...) involved in transmission
- Seed-associated microbial communities (various plant sp.)
 - Ecological processes involved in assembly of seed microbiota
 - Dynamics of seed microbiota during germination and emergence of seedling

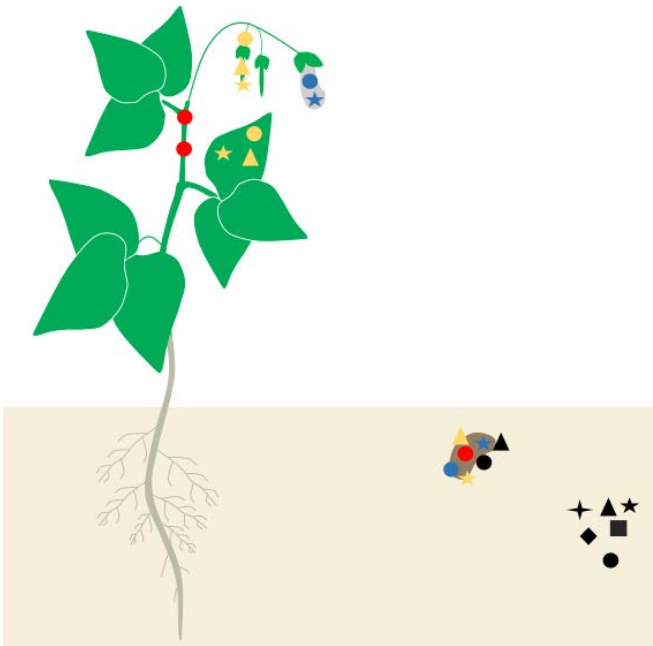
❖ Goal : understand Resistance/resilience of seed microbiota in order to control seed-transmitted pathogens

❖ Skills



- **Microbial Ecology**
 - **Barcoding (16S rRNA gene, ITS1, *gyrB*)**
 - **Metagenomics (taxonomic classif of reads, gene-centric, binning)**
- **Taxonomy**
 - **Strain collection (CIRM-CFBP : 7000 bacterial strains)**
 - **Phylogeny/Phylogenomics/Pop. genomics**
- **Phytopathology (plant-bacterial interactions)**
 - **Greenhouses and growth chamber (S2-S3)**
 - **Plant phenotyping facility (Phenotics) → impact of plant pathogen on various host plants**

❖ Interest in COST HuPlant control

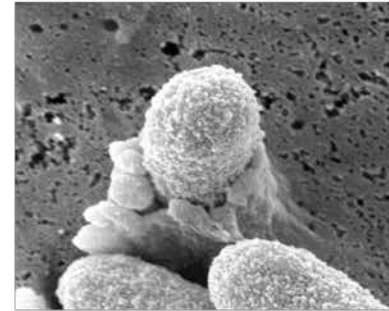
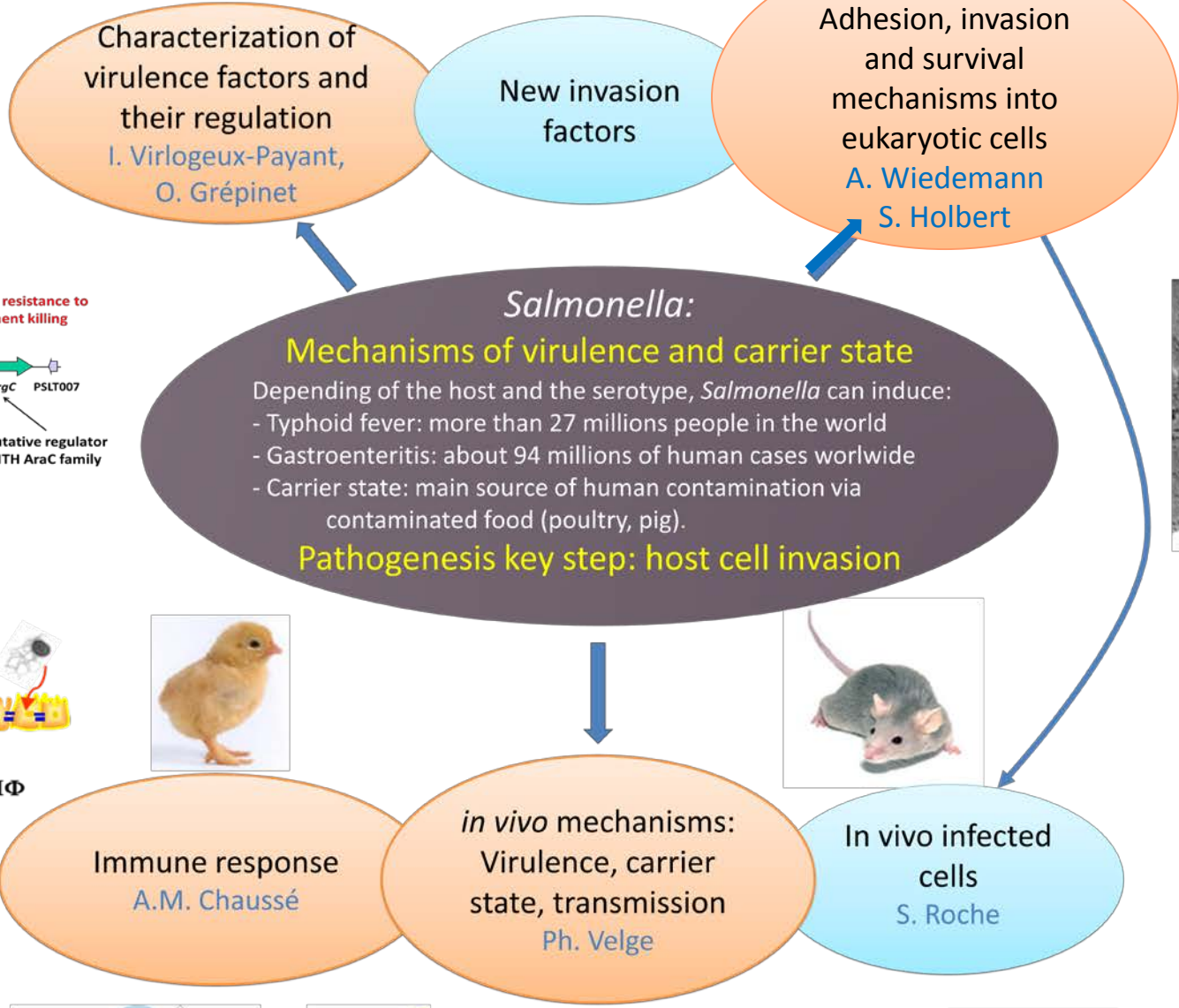
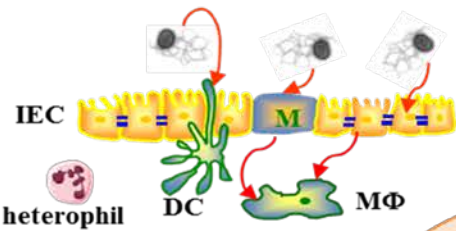
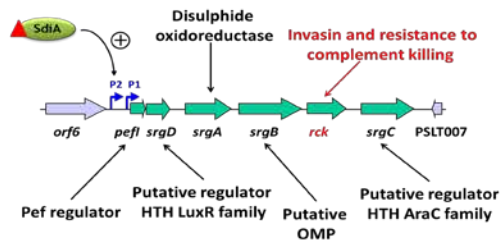


- Response of the seed microbiota to invasion by HPMO

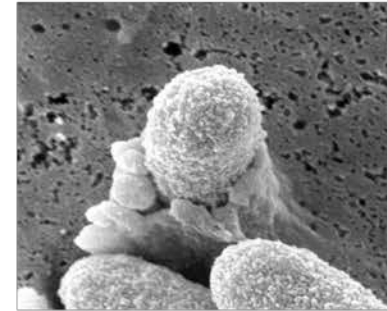
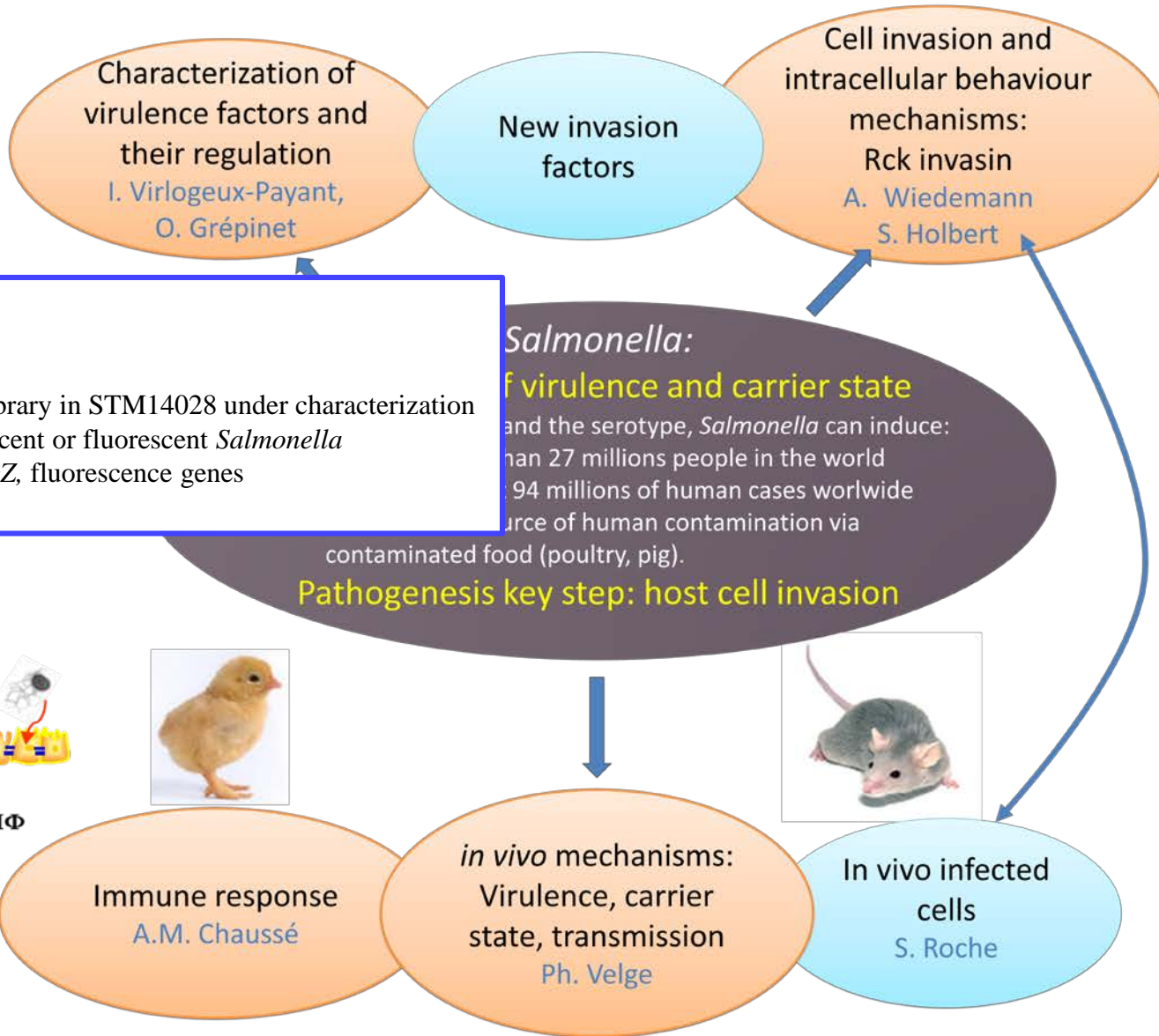
(WG1)

- Seed transmission pathways of HPMO

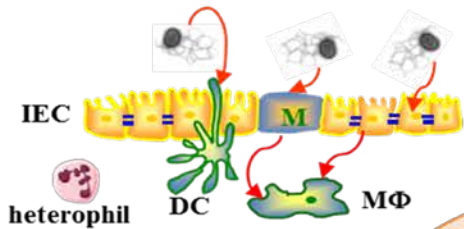
- Taxonomic classification of HPMO (WG2)

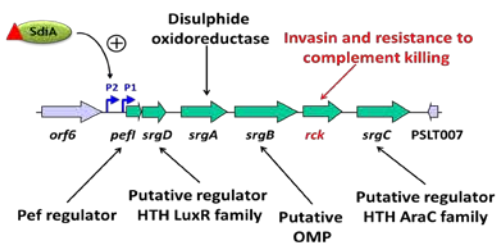
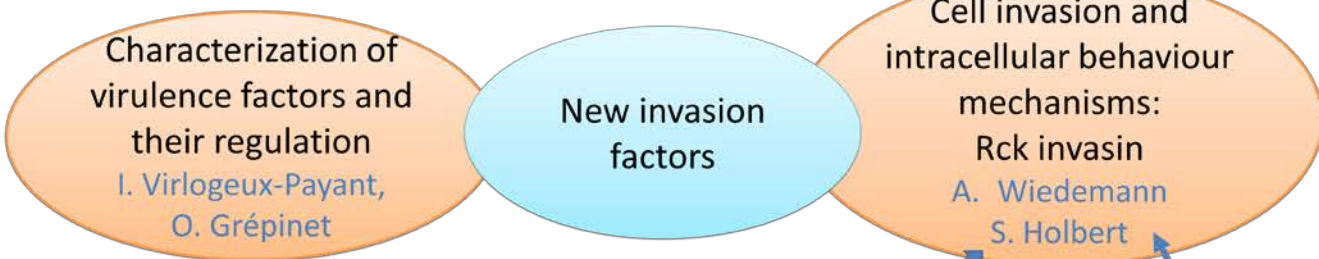


Bacterial genetics



- Mutants in SE, STM
- All genetic manipulations
- qRT-PCR
- Barcode-tagged mutant library in STM14028 under characterization
- Constitutively bioluminescent or fluorescent *Salmonella*
- Gene fusions with *lux*, *lacZ*, fluorescence genes





Salmonella

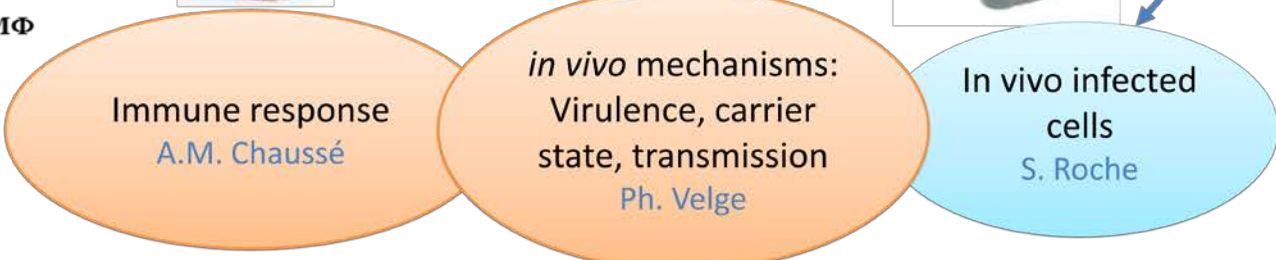
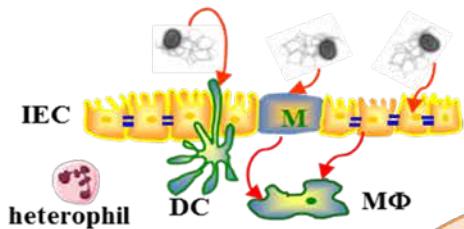
Mechanisms of virulence

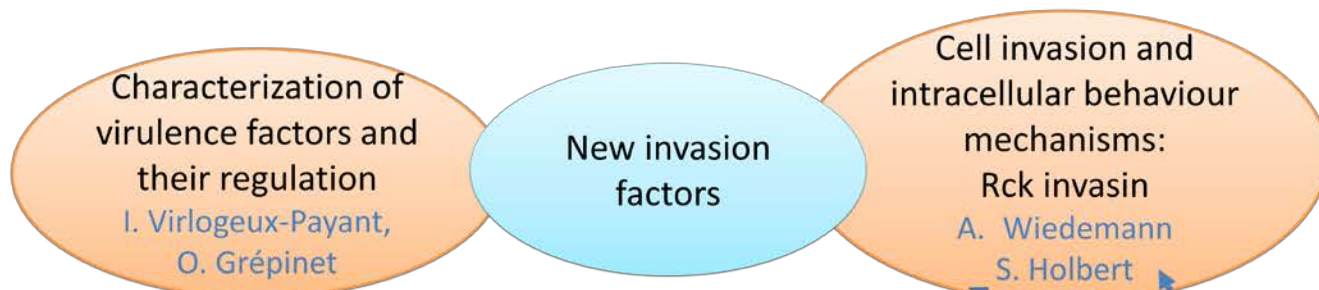
Depending of the host and the serotype

- Typhoid fever: more than 27 million cases worldwide
- Gastroenteritis: about 94 millions of human cases worldwide
- Carrier state: main source of human contamination via contaminated food (poultry, pig).

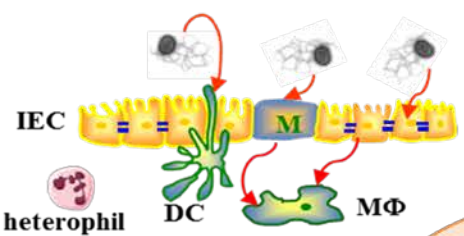
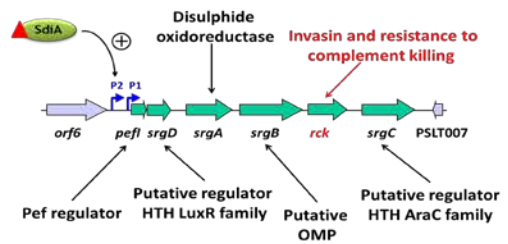
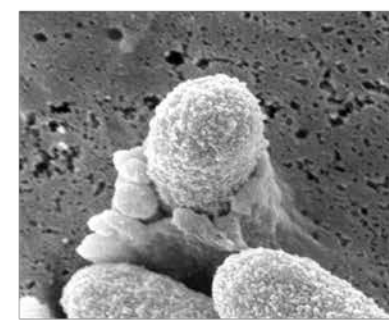
Pathogenesis key step: host cell invasion

- In vitro cell models for adhesion, invasion, immune response studies
- Confocal, electron, Correlative high resolution microscopy
- siRNA
- Cell signaling
- Development of organoid, PCTS models

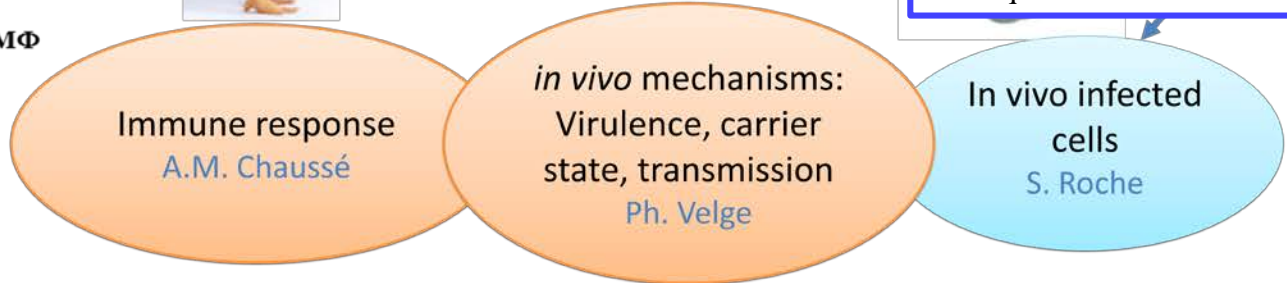


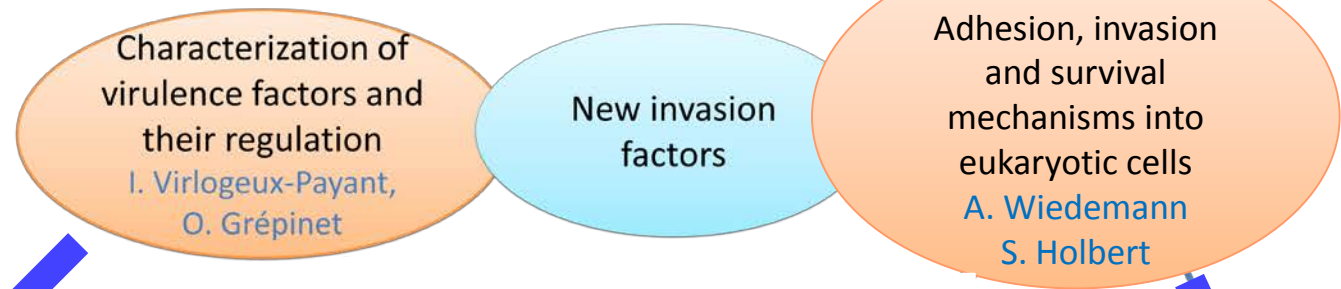


Salmonella:
Mechanisms of virulence and carrier state
 Depending of the host and the serotype, *Salmonella* can induce:
 - Typhoid fever: more than 27 millions people in the world
 - Gastroenteritis: about 94 millions of human cases worldwide
 - Carrier state: main source of human contamination via contaminated food (poultry, pig).
Pathogenesis key step: host cell invasion



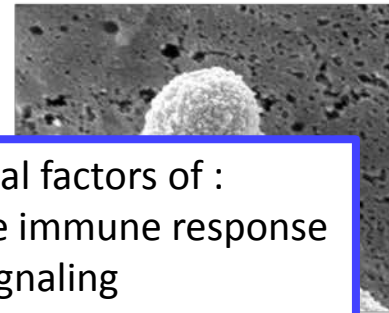
- Chicks and mice animal models including axenic chicks
- In vivo imaging (IVIS spectrum)
- Flow cytometry
- qRT-PCR on immune response (Biomark)





1- Influence of APS environment (quorum-sensing, Microbiota, metabolites) on virulence factors expression
 2- Bacterial genes involved in plant colonization or plant immune response

Salmonella:
 virulence and carrier state
 and the serotype, *Salmonella* can induce:
 an 27 millions people in the
 14 millions of human cases.
 ce of human contaminati
 d (poultry, pig).



Modulation by bacterial factors of :
 - the innate immune response
 - the cell signaling
 Plant/animal comparison

