



Sciences biologiques,  
Écologie et Environnement  
**CONFÉRENCES  
JACQUES-MONOD**



**BACTERIAL-FUNGAL INTERACTIONS: A FEDERATIVE  
FIELD FOR FUNDAMENTAL AND APPLIED MICROBIOLOGY**

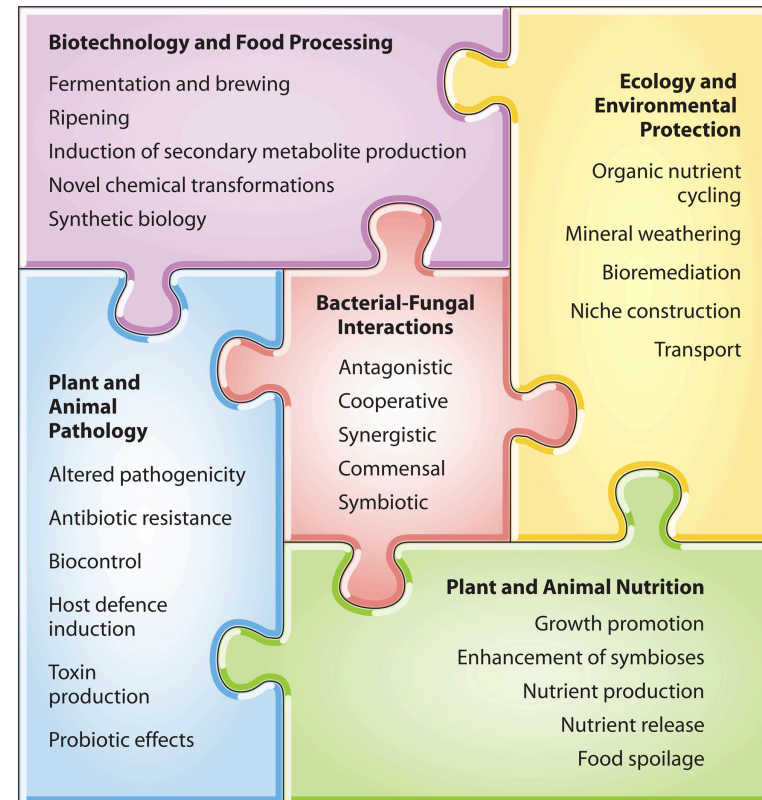
*INTERACTIONS BACTERIES-CHAMPIGNONS : UN DOMAINE DE  
RECHERCHE FEDERATEUR POUR LA MICROBIOLOGIE FONDAMENTALE  
ET APPLIQUEE*

*Roscoff (Brittany), France  
December 7-11, 2013 - 7-11 décembre 2013*



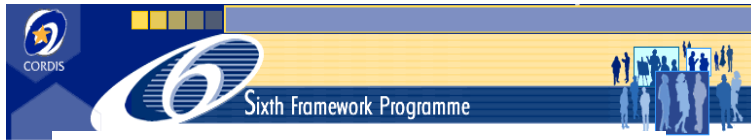
# Rationale

- Classical separation of microbiological researches between bacteriologists and mycologists
- In many environments bacteria and fungi co-exist and interact
- Multiple practical relevancies of these interactions



## An European initiative: 40 research groups

2002



### Invitation to Submit Expressions of Interest

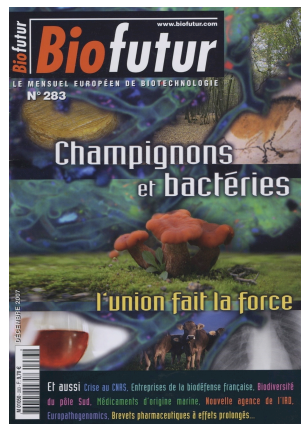
An opportunity for Europe's research community to help prepare for the first calls of FP6

2005

## 1st International Conference on Bacterial-Fungal Interactions

2013

2008



2007



2005

## A French network: 10 research groups

## A reference paper from the USA

2002

### *Pseudomonas-Candida* Interactions: An Ecological Role for Virulence Factors

Deborah A. Hogan and Roberto Kolter\*

Mycorrhiza Helper Bacteria a new dimension to the mycorrhizal symbiosis

Bacterial-fungal interactions have great environmental, medical, and economic importance, yet few have been well characterized at the molecular level. Here, we describe a pathogenic interaction between *Pseudomonas aeruginosa* and *Candida albicans*, two opportunistic pathogens. *P. aeruginosa* forms a dense biofilm on *C. albicans* filaments and kills the fungus. In contrast, *P. aeruginosa* neither binds to nor kills yeast-form *C. albicans*. Several *P. aeruginosa* virulence factors that are important in disease are involved in the killing of *C. albicans* filaments. We propose that many virulence factors studied in the context of human infection may also have a role in bacterial-fungal interactions.

Interactions between prokaryotes and eukaryotes are ubiquitous. Although the pathogenic and symbiotic relationships bacteria have with plants and animals have garnered the most attention the prokaryote-eukaryote interactions among microbes are many. Many of the virulence genes important for bacterial virulence in mammals have an ecological role in natural communities.

Bacteria and unicellular eukaryotes, such as yeasts and filamentous fungi, are found together in a myriad of environments and exhibit both synergistic and antagonistic interactions (1, 2). Here, we describe a pathogenic relationship between a fungus, *Candida albicans*, and a bacterium, *Pseudomonas aeruginosa*, that involves genes important for bacterial virulence in mammals. *P. aeruginosa* is prevalent in soils and is often found on the skin and mucosa of healthy individuals (3). In compromised hosts, however, *P. aeruginosa* uses an arsenal of virulence factors to cause serious infections associated with burns, catheters, and implants. *C. albicans* is also a benign member of the skin and mucosal flora. When host defenses falter, however, *C.*

#### References and Notes

1. J. Garbaye, *New Phytol.* **128**, 197 (1994).
2. I. Chet, J. Inbar, *Appl. Biochem. Biotechnol.* **48**, 37 (1994).
3. N. Palleroni, in *The Prokaryotes*, M. Dworkin, Ed. (Springer-Verlag, New York, ed. 1, published online, 2000). Available at <http://link.springer-ny.com/link/service/books/10125/>.
4. F. C. Odds, *Candida and Candidosis* (Baillière Tindall, London, ed. 2, 1988).
5. H. Lo et al., *Cell* **90**, 939 (1997).

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2011

MICROBIOLOGY AND MOLECULAR BIOLOGY REVIEWS, Dec. 2011, p. 583-609  
1092-2172/11/\$12.00 doi:10.1128/MMBR.00020-11  
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### Bacterial-Fungal Interactions: Hyphens between Agricultural, Clinical, Environmental, and Food Microbiologists

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## A review promoting inter-field interactions

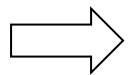
## Main challenge of the conference

### *Two observations:*

- In each field to which Bacterial-Fungal Interactions (BFIs) are important, researches progress differently
- Many commonalities exist between BFIs in these different fields but need to be better appreciated

| Characteristic                         | Parallel                                 |   |
|--|--|---|
| Tolerance to antibiotic treatment      | Human polymicrobial infections (141)     | Cave painting biofilms (22)                       |
| Removal of inhibitors/toxins           | Probiotics in the digestive tract (56)   | Degradation of wood preservatives (371)           |
| Suppression of fungal pathogen         | Disinfection of ant fungus gardens (136) | Biocontrol of crop diseases (374)                 |
| Enhanced release of nutrients          | Ruminal digestion (223)                  | Mycorrhizal helper effect (357)                   |
| Mobilization of bacteria to new niches | Invasion of human tissues (283)          | Transport of PAH degrading bacteria in soil (188) |
| Metabolic cooperation                  | Cyanolichen symbiosis (183)              | Food production (39)                              |

Frey-Klett et al, MMBR 2011



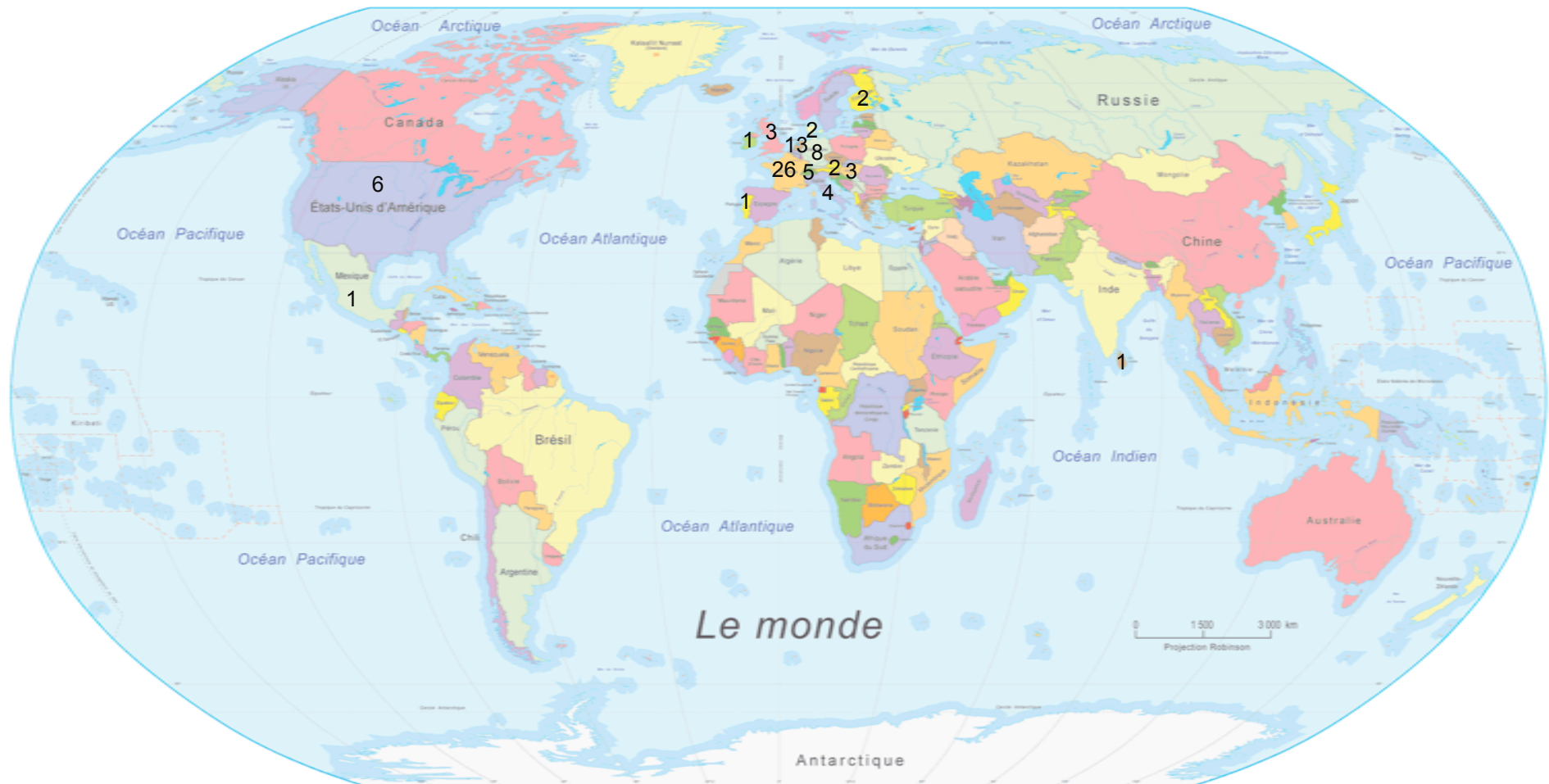
Bridge the gap between the different communities of microbiologists and create a meeting opportunity to force exchanges of knowledge, competencies and expertises, and stimulate inter-field collaborations

## Conference participants: geographical origins

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77 participants, including 17 PhD students

15 nationalities : 26 participants from France, 43 participants from other European countries, 8 non-European participants



# Conference participants: field repartition

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## Inter-field discussions

