EMbaRC

European Consortium of Microbial Resource Centres

Grant agreement number: **228310**

Seventh Framework Programme

Capacities

Research Infrastructures

Combination of Collaborative Project and Coordination and Support Actions

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Version of this document: V1.0

Dissemination level: PU

PU	**Public**	
PP	Restricted to **other programme participants** (including the Commission)	
RE	Restricted to a **group defined by the Consortium** (including the Commission)	

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Title	D.NA2.3.3: Report on the EMbaRC workshop for emerging collections (Eastern Europe)
Version number	V1.0
Authors	David Smith and Yohan Lecuona
Abstract	The outreach seminars and workshops are part of the key EMbaRC project objectives at the coordination level. The goal is to integrate orphan, endangered and emerging European collections into the EMbaRC community and share with them the project results via best practice workshops, targeted training programmes and outreach activities, specifically, as outputs of tasks NA2.1 and NA2.3 of work package NA2. This workshop was held at the Cantacuzino Institute, Bucharest and was attended by 48 participants from 15 institutions representing 9 countries.
Validation process	Document prepared by CABI in collaboration with INRA and submitted to the Executive Committee for agreement.

Revision table			
Date	***Version***	***Revised by***	***Main changes***

Contents

Abbreviation key

BCCM	Belgian Coordinated Collections of Microorganisms
BRC	Biological Resource Centre
CABI	CAB International
CBS	Centraalbureau voor Schimmelcultures
CRBIP	Centre de Ressources Biologiques de l'Institut Pasteur
DSMZ	German Collection of Microorganisms and cell Cultures
ECCO	European Culture Collections' Organisation
INCDMI	Institutul National De Cercetare – Dezvoltare Pentru Microbiologie si Imunologie
INRA	Institut national de la recherche agronomique
MUM	Micoteca da Universidade do Minho
RBCAR	Romanian Bioresource Centre and Advanced Research Association
WFCC	World Federation for Culture Collections

1 Background and Objectives

European Microbial collections: a high added value for science!

Background The outreach seminars and workshops are part of the key EMbaRC project objectives at the coordination level. The goal is to integrate orphan, endangered and emerging European collections into the EMbaRC community and share with them the project results via best practice workshops, targeted training programmes and outreach activities, specifically, as outputs of tasks NA2.1 and NA2.3 of work package NA2. The deliverable **D.NA2.3.3** reports on the EMbaRC workshop for emerging collections (Eastern Europe): Month of delivery 18.

Location Cantacuzino Institute, Bucharest – Contact : Ms. Felicia Mardale, Secretary-General feliciam@cantacuzino.ro

Organisers
The scientific programme was drafted by the EMbaRC Executive committee and input from the local organisers. The logistics of the meeting were arranged between the EMbaRC project manager, Yohan Lecuona and the local organising committee led by Felicia Mardale.

Aims of the workshop The aim of this workshop was to meet and exchange with microbial collections, to advertise the FP7 infrastructure program EMbaRC and its call for transnational access, and to put foundations for involving collections of Eastern countries in next EU project.

2 Programme

Programme Monday 8 March, 2010

14.45 **Welcome**
15.05 **Opening Lecture** [Radu Iordăchel, INCDMI Cantacuzino, Romania]
15.15 **The EMbaRC project and integration of microbial collections in the European Research Area (ERA)** [Sylvie Lortal, INRA, France]
15.45 **How to develop Quality Assurance and become a BRC** [Chantal Bizet, CRBIP, France]
16.15 **Collection associated tools: taxonomy, research, information management** [Erko Stackebrandt, DSMZ, Germany]
16.45 **Coffee break**
17.15 **Selected Success stories of collection exploitation** [Nelson Lima. MUM, Portugal]
17.45 **Networking Collections: WFCC and GBRCN perspectives** [David Smith, CABI, UK]
18.15 **Round Table: interactive discussion about *the 'value' of a strain collection:*** Strengths: rarity of species, interest for local/national availability, etc…

Programme Tuesday 9 March, 2010

08.30 **Biosecurity and microbial collections** [Joost Stalpers, CBS, The Netherlands]
09.00 **Microbial Culture Collection of Cantacuzino Institute: Perspectives in the Development of medical Research** [Olguta Dracea, INCDMI Cantacuzino, Romania]
09.30 **Scientific and Technical Exchange – A potential impact in Biosecurity** [Marian Negut, INCDMI Cantacuzino, Romania]
10.00 **Coffee break**
10.30 **Call for trans-national access in EMbaRC** [Philippe Desmeth, BCCM, Belgium]
11.00 **Round Table**: Interactive Discussion about the next step of collection integration across Europe

3 Participants

There were 48 participants from 15 institutions representing 9 countries. A 71% of participants were female.

Table I. List of participants

Country	Attendant	Gender	Organization	Department
Albania	Dr. Lila SHUNDI	F	Institute of Public Health	Dept. of Infectious Deseases Control
Germany	Prof. Dr. Erko STACKEBRANDT	M	DSMZ German Collection of Microorganisms and cell Cultures	Microbiology
France	Dr. Chantal BIZET	F	IP	
France	Dr. Evelyne BEGAUD	F	IP	
Germany	Dr. David SMITH	M	CABI	
Belgium	Philippe DESMETH	M	Belgian Science Policy	Belgian Coordinated Collections of Microorganisms
France	Dr. Sylvie LORTAL	F	INRA	CIRM
France	Yohan LECUONA	M	INRA	CIRM
Netherlands	Dr. Joost A. STALPERS	M	CBS, Utrecht	Collection
Poland	Dr.Agnieska KORZENIOWSKA-KOWAL	F	Institute of Immunology and Experimental Therapy	Medical Microbiology
Portugal	Prof. Dr. Nelson LIMA	M	Micoteca da Universidade do Minho	Centro de Engenharia Biológica, Universidade do Minho
Portugal	Dr. Cledir SANTOS	M	Micoteca da Universidade do Minho	Centro de Engenharia Biológica, Universidade do Minho
Serbia	Ivana CIRKOVIC	F	Institute for Microbiology and Immunology, Medical Faculty Belgrade	Bacteriology
Serbia	Prof. Natasa OPAVSKI	F	Institute for Microbiology and Immunology, Medical Faculty Belgrade	Bacteriology
Romania	Dr. Sergiu FENDRIHAN	M	Romanian Bioresource Centre and Advanced Research Association	
Romania	Dr. Ion SANDU	M	The Institute for Diagnosis and Animal Health	Bacteriology
Romania	Dr. Mihail Claudiu DIACONU	M	The Institute for Diagnosis and Animal Health	Major Epidemics
Romania	Dr. Radu IORDACHEL	M	Cantacuzino Institute	
Romania	Dr. Monica STRAUT	F	Cantacuzino Institute	Mollecular Microbiology Laboratory
Romania	Prof. Marian NEGUT	M	Cantacuzino Institute/"Carol Davila" University of Medicine Bucharest	Microbial Culture Collection Unit
Romania	Biol. Olguta DRACEA	F	Cantacuzino Institute	Microbial Culture Collection Unit
Romania	Felicia MARDALE	F	Cantacuzino Institute	
Romania	Dr. Gabriel IONESCU	M	Cantacuzino Institute	Public Health Microbiology Department
Romania	Biol Rodica OANCEA	F	Cantacuzino Institute	Microbial Culture Collection Unit
Romania	Biol. Camelia BABES	F	Cantacuzino Institute	Microbial Culture Collection Unit
Romania	Gabriela OPRISAN	F	Cantacuzino Institute	Mollecular Microbiology Laboratory/"Jacques Monod" Training Center
Romania	Dr. Irina CODITA	F	Cantacuzino Institute	Nosocomial Infections Laboratory
Romania	Dr. Emilia LUPULESCU	F	Cantacuzino Institute	Viral Infections of Respiratory Tract Laboratory

Romania	Marina PANA	F	Cantacuzino Institute	Bacterial Infections of Respiratory Tract Laboratory
Romania	Dr. Anda BAICUS	F	Cantacuzino Institute	Viral Enteroccocal Infection Laboratory
Romania	Mariana ORASANU	F	Cantacuzino Institute	Internal Quality Control Laboratory
Romania	Dr. Daniela BADESCU	F	Cantacuzino Institute	Vector Transmitted Infections Laboratory
Romania	Dr. Dorina TATU	F	Cantacuzino Institute	Bacterial Enteroccocal Infection Laboratory
Romania	Radu TANASA	F	Cantacuzino Institute	The Advanced Studies Center - The Biotechnology Laboratory
Netherlands	Dr. Joost A. STALPERS	M	CBS, Utrecht	Collection
Romania	Dr. Gabriela BANCESCU	F	"Carol Davila" University of Medicine Bucharest	
Romania	Dr. Maria OPREA	F	Romanian Bioresource Centre and Advanced Research Association	
Romania	Dr. Vasilica UNGUREANU	F	Cantacuzino Institute	Bacterial Infections of Respiratory Tract Laboratory
Romania	Dr. Biol. Mioara DAMIAN	F	Cantacuzino Institute	Mollecular Epidemiology Laboratory
Romania	Daniela CRISTEA	F	Cantacuzino Institute	Enterobacterial Infections Laboratory
Romania	Dana-Elena IONESCU	F	Cantacuzino Institute	a resident to the Nosocomial Infections Laboratory
Romania	Brandusa LIXANDRU	F	Cantacuzino Institute	a resident to the Nosocomial Infections Laboratory
Romania	Cristiana Cerasela DRAGOMIRESCU	F	Cantacuzino Institute	a resident to the Viral Infections of Respiratory Tract Laboratory
Romania	Dana-Stefania TUDORICA	F	Cantacuzino Institute	a resident to the Micology Infections Laboratory
Romania	Ioana PETRI-GHEOLD	F	Cantacuzino Institute	a resident to the Micology Infections Laboratory
Romania	Catalina PANDURU	F	Cantacuzino Institute	a resident to the Micology Infections Laboratory
Romania	Dana IONESCU	F	Cantacuzino Institute	a resident to the Micology Infections Laboratory
Romania	Camelia FLOREA	F	Cantacuzino Institute	a resident to the Micology Infections Laboratory

4 Summary of discussions

The participants from Eastern Europe collections and institutions were very keen to be involved in European collaborative projects and initiatives. Many questions concerned the mechanisms for getting involved. Suggestions included they participate more in the European Culture Collections' Organisation (ECCO) which in the past had served as an incubator for several European Framework Programme projects. Networking and linkages between the participants was also suggested and a key opportunity was the Transnational Access opportunities at the EMbaRC partner institutions. A number of participants expressed interest in the latter and were reminded of how to apply.

Goals for the expansion of EMbaRC, its development of the European component of the Global Biological Resource Centre Network and the joint initiative to place a Microbial Resources Research Infrastructure on the European Strategy Forum Road map were discussed as ways

forward for the Eastern European collections to network more effectively across Europe. The World Federation for Culture Collections was also mentioned in this context and the need for each collection to register with the World data centre for Microorganisms.

One of the participants, Sergiu Fendrihan, was one of the founder members of the Romanian Bioresource Centre and Advanced Research Association (RBCAR www.rbcar.ro) and he reported on the first National Conference of Culture Collections of Microorganisms and Cells Lines from Romania that had brought together 20 participants from various parts of Romania and included researchers and managers of collections from the University of Craiova, Sibiu, Cluj University, the Botanical Garden, a medical institution in Iasi and the Cantacuzino Institute. Fendrihan had contacted both the WFCC and EMbaRC in the past and was making progress in establishing a Romanian BRC, presenting plans of the building after the discussions. He agreed to keep EMbaRC informed on progress and would send some of the prospective staff to take advantage of the EMbaRC Transnational Access.

Post workshop meeting

A meeting was held with the Director of the Cantacuzio National Institute of Research-Development for Microbiology and Immunology, Dr. Radu Iordăchel, with David Smith, Philippe Desmeth, Chantal Bizet, Joost Stalpers and Yohan Lecuona. The Director expressed his pleasure in having the workshop at his institute and stressed that he would like to see Romania participating more in the international activities and that the Institute would do all it could to coordinate Romanian collection participation. He emphasised that the institute already had good relations with the Institute Pasteur.

Conclusion

The workshop forged links with collections and their scientific staff that had not previously been involved in joint European activities and provided opportunity for future collaboration. It highlighted the need for local investment in the Eastern European collections if they are to be able to implement best practice.

References

The presentations are available publicly on the project website, at the following URL: www.embarc.eu (section Events). They are enclosed in Annex of the present deliverable.

Significance of this deliverable

This workshop was organized for promoting Biological Resource Centres in the Eastern countries of Europe. It could be the first step of synergies between EMbaRC partners and the Eastern countries for developing strategies concerning the preservation of biodiversity under Quality System and without duplication into the European Biological Resource Centres.

Annexes

Poster of the event

Presentations from the speakers

The EMbaRC project and integration of microbial collections in the European Research Area (ERA)
Sylvie Lortal, INRA, France

How to develop Quality Assurance and become a BRC
Chantal Bizet, CRBIP, France

Collection associated tools: taxonomy, research, information management
Erko Stackebrandt, DSMZ, Germany

Selected Success stories of collection exploitation
Nelson Lima. MUM, Portugal

Networking Collections: WFCC and GBRCN perspectives
David Smith, CABI, UK

Biosecurity and microbial collections
Joost Stalpers, CBS, The Netherlands

Microbial Culture Collection of Cantacuzino Institute: Perspectives in the Development of medical Research
Olguta Dracea, INCDMI Cantacuzino, Romania

Scientific and Technical Exchange – A potential impact in Biosecurity
Marian Negut, INCDMI Cantacuzino, Romania

Call for trans-national access in EMbaRC
Philippe Desmeth, BCCM, Belgium

EMbaRC EU FP7 Workshop

www.embarc.eu

European Microbial collections:
a high added value for science!

Bucharest, 8-9 March 2010

Cantacuzino Institute

"Jacques Monod" Training Center

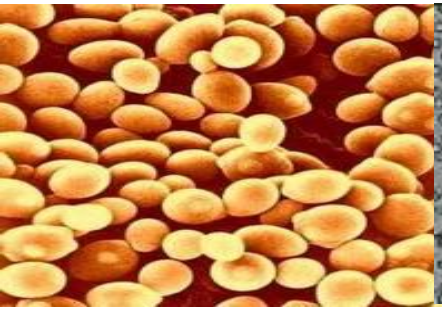
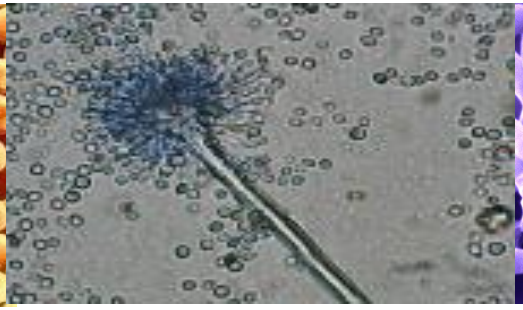
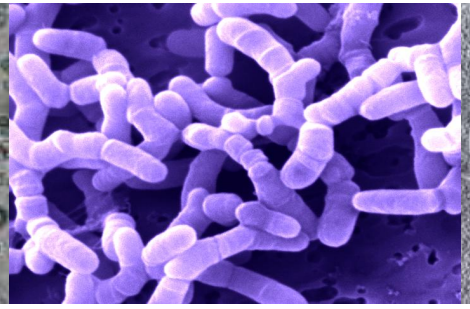
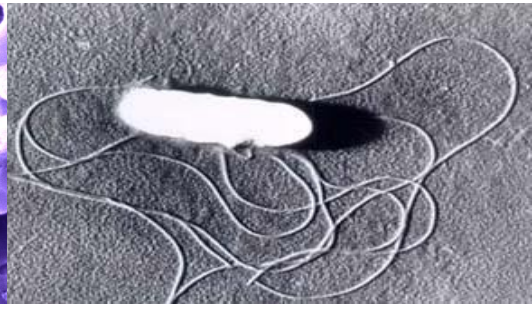
EMbaRC

SEVENTH FRAMEWORK PROGRAMME

European Consortium

of

Microbial Resources Centers

Cantacuzino Institute, Romania, March 2010

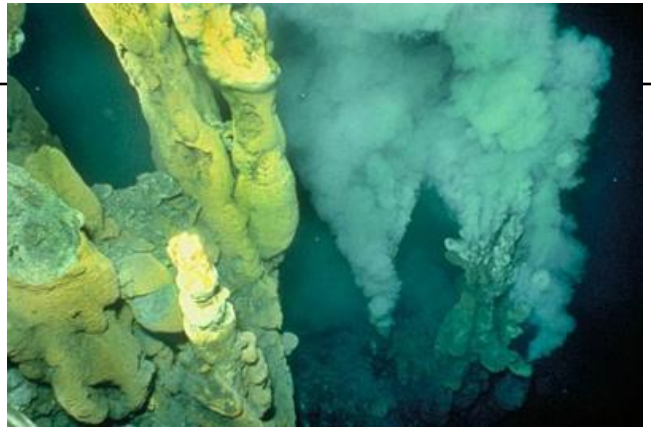
Thank you !

1. Microbial **biodiversity**
2. Collections, state of the art in Europe
3. EMbaRC project, partners and main expected achievements
4. Conclusions and our meeting today !

In soil ….

Key role in recyclying
(C,P,N,S..)

In water



Extreme biotopes …..

In human ..

In the air …..

Microbial biodiversity is an extraordinary source for innovation

… carbon, nitrogen cycles**,** depolluting, essential in agriculture and food ; produce components like hormones, vitamins, antibiotics…essential for digestion…

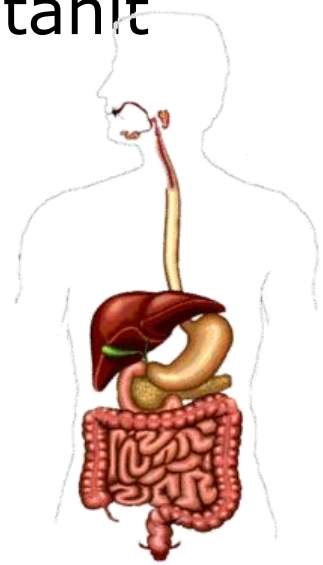
All metabolisms represented

= richness to keep and explore
large potential of added value

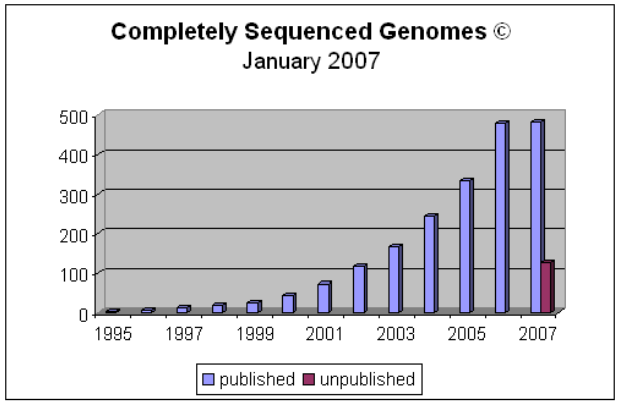
Microbes = first source of genes in the planet !
underexplored until recently

Metagenomic programs by international research consortiums
Soon a more complete view of the microbial diversity = revolution

Metahit

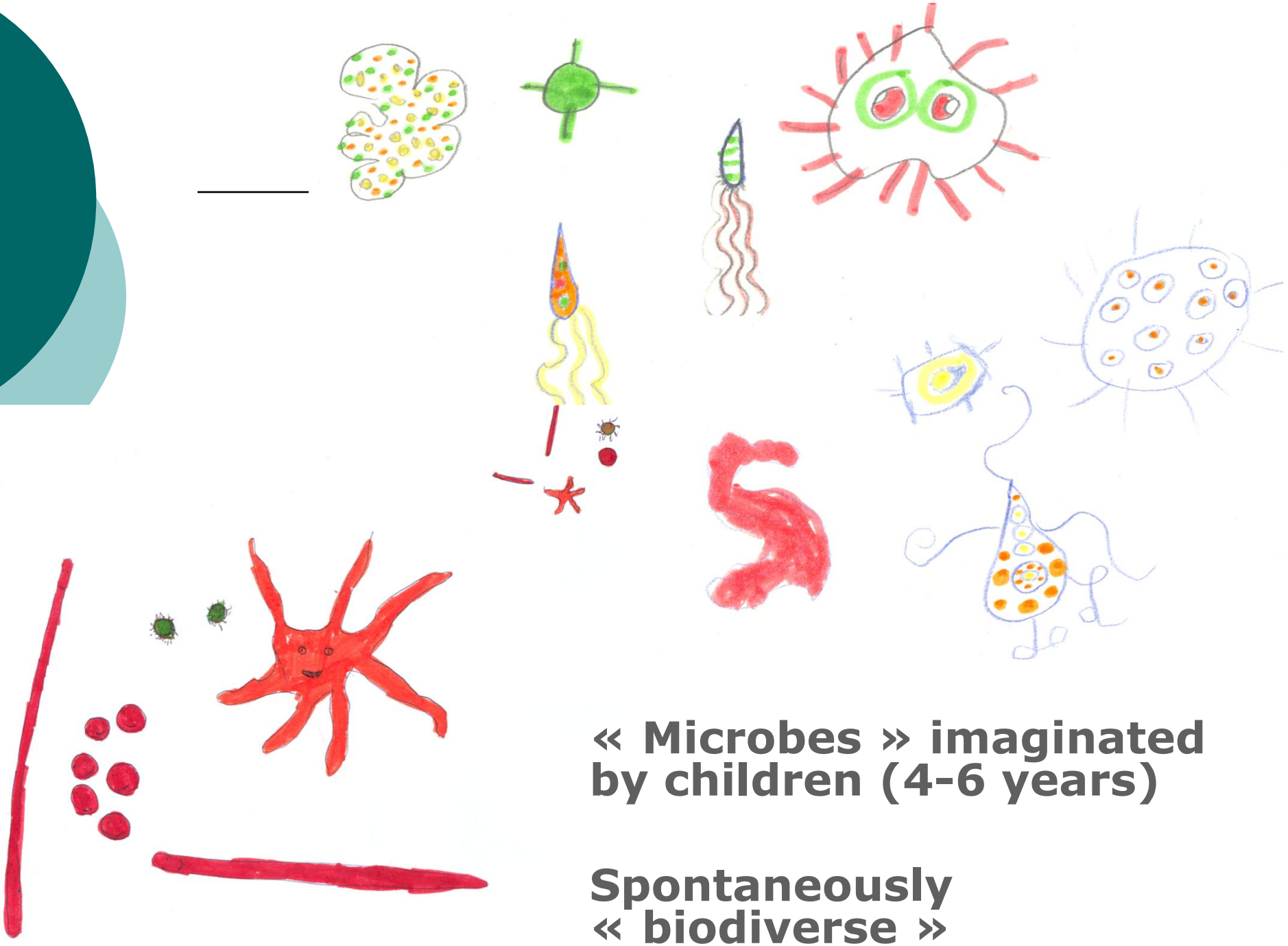


Interaction with diet, links with obesity



Terragenome

70 % of antibiotics are coming from soil bacteria, from a very small fraction <0.1%



« Microbes » imaginated by children (4-6 years)

Spontaneously « biodiverse »

FAO / Commission on genetic resources for food and agriculture

Rome, session oct. 2009, twelfth regular session

« Agricultural production (plants and animal growth) depends **heavily** on µorg biodiversity; they provide also a broad range of beneficial services in food processing + emerging use in forestry and fishery sectors; some non beneficial »

Trends for the conservation and exchange and uses …

FAO, background study paper n°46

It is the historical mission of culture collections to organize the collection, the authentication, maintenance, distribution of strains of microorganisms.

The use of certified materials from culture collections **diminishes the costs from mistakes in cumulative research** (Furman and stern, 2006) and **decreases the search costs for finding appropriate materials** (Visser et al., 2000)

The situation of culture collections is characterized by a high level of interdependancy. The largest collection (25000 strains) hold less than 2% of the total nb strain holdings

Biological resources of high quality are essential for high quality research

- Concept of Biological Resource Center (Tokyo, 1999)
- True also for microorganisms, in particular of course for reference strains

State of the art in EC ?

EC has many collections, more or less « official » in the field of agriculture, health, biotechnology, fermented foods, **covering a large biodiversity**

EC has only one structure at the European level « ECCO » European Culture collections organisation (350 000 strains, existing since 1981)

promote collaboration and exchange of ideas, informations about culture collection activity (meetings)

This patrimony is not well structured and interrelated; moreover it doesn't cover 100% of the described species (about 70% for bacteria, 40% for fungi)

State of the art in EC ?

Previous projects between European collections :

- MINE
- CABRI
- EBRCN

Producing electronic catalogs to increase visibility of these resources and providing guidelines (some protocols for conservation)

EMbaRC, a project to make accessible, authenticated, and «complete», most of the European microbial resources, **to reinforce European research and stimulate innovations**

EC Collections intrinsic quality & expertise

transnational connections, overall organisation

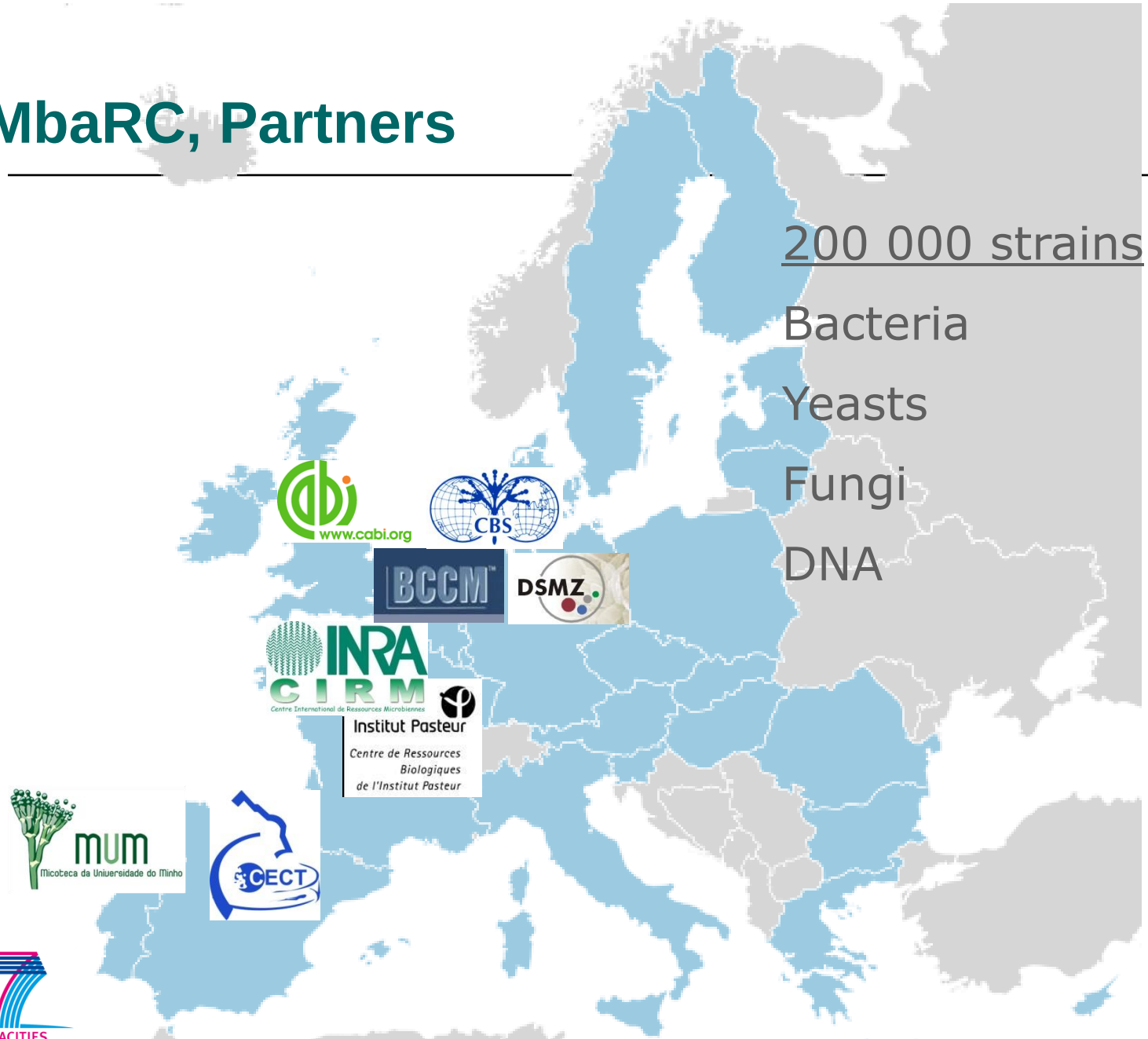
connection with Bioeconomy

EMbaRC, Partners & Project objectives

- Consortium of 10 partners
- From 7 EU countries
- EU-funded Infrastructure project
- 3 years: 2009-2012
- EU contribution: 4,2 M€

www.embarc.eu

EMbaRC, Partners



200 000 strains

Bacteria

Yeasts

Fungi

DNA

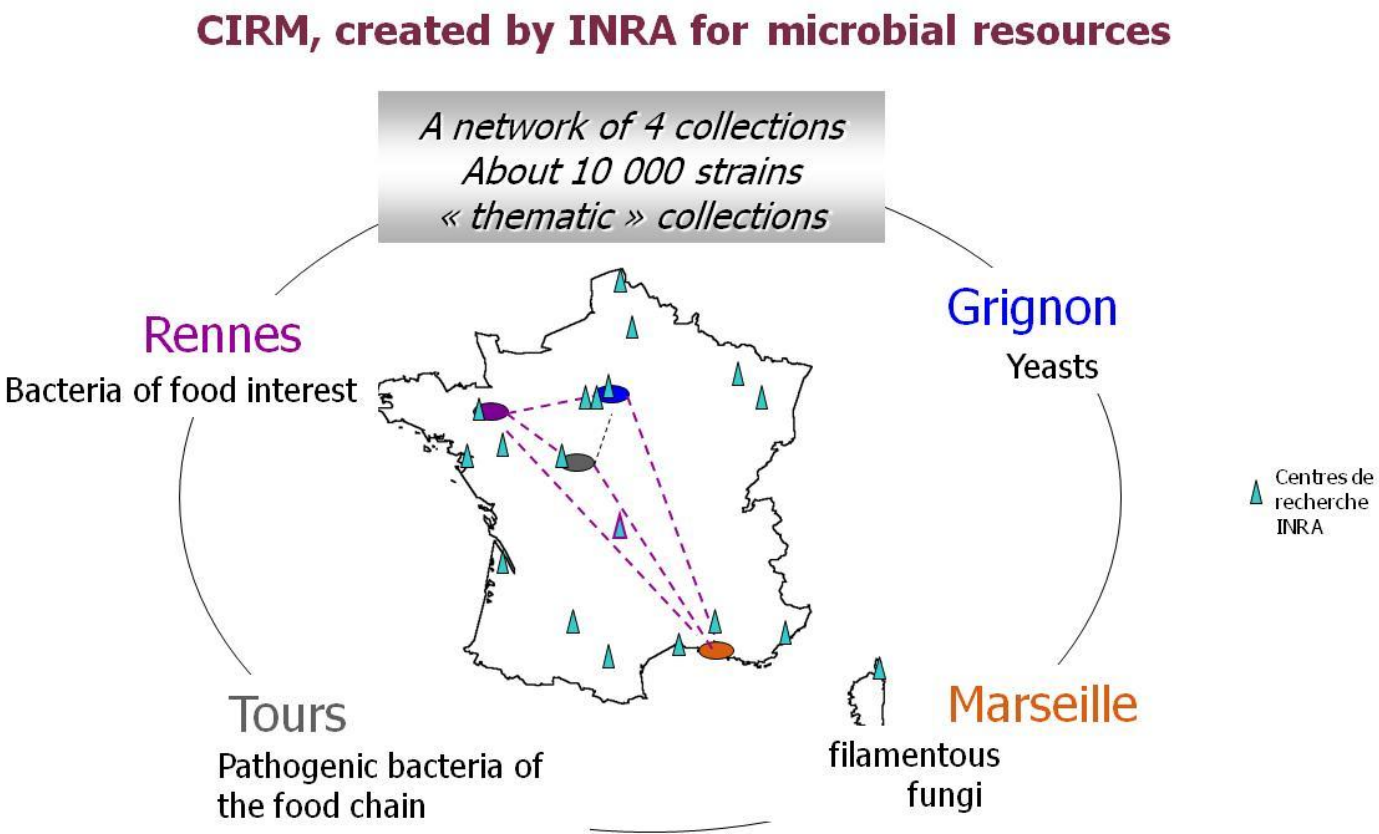
CAPACITIES

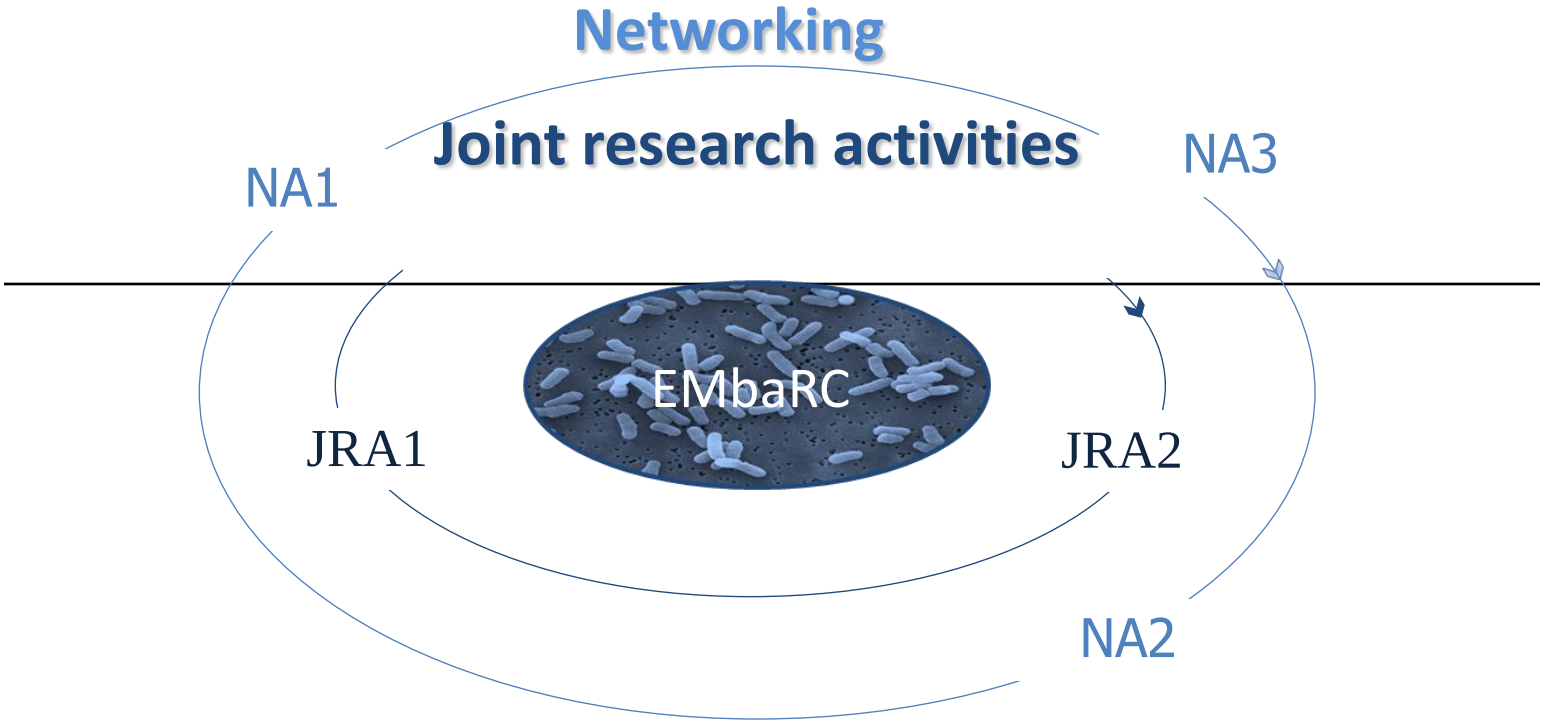
Specificity of some partners

- BCCM : not a collection but a consortium representative of four belgian collections

- INRA :

four sites





Contribution to standards

Biological material
Data & associated expertise

Call for transnational access
to the different sites

DISSEMINATION | OUTREACH | WEB PORTAL

Infrastructure users

Laboratories - Institutions - Private companies - Other collections

CAPACITIES

Few words about the coordination

Chantal Bizet, vice coordinator

Well known head of the CIP of Pasteur
Reference for collection management

Yohan Lecuona, project manager

Agronomic ingenior, trained in Bruxells and at INRA transfer for EC project management

Executive committee

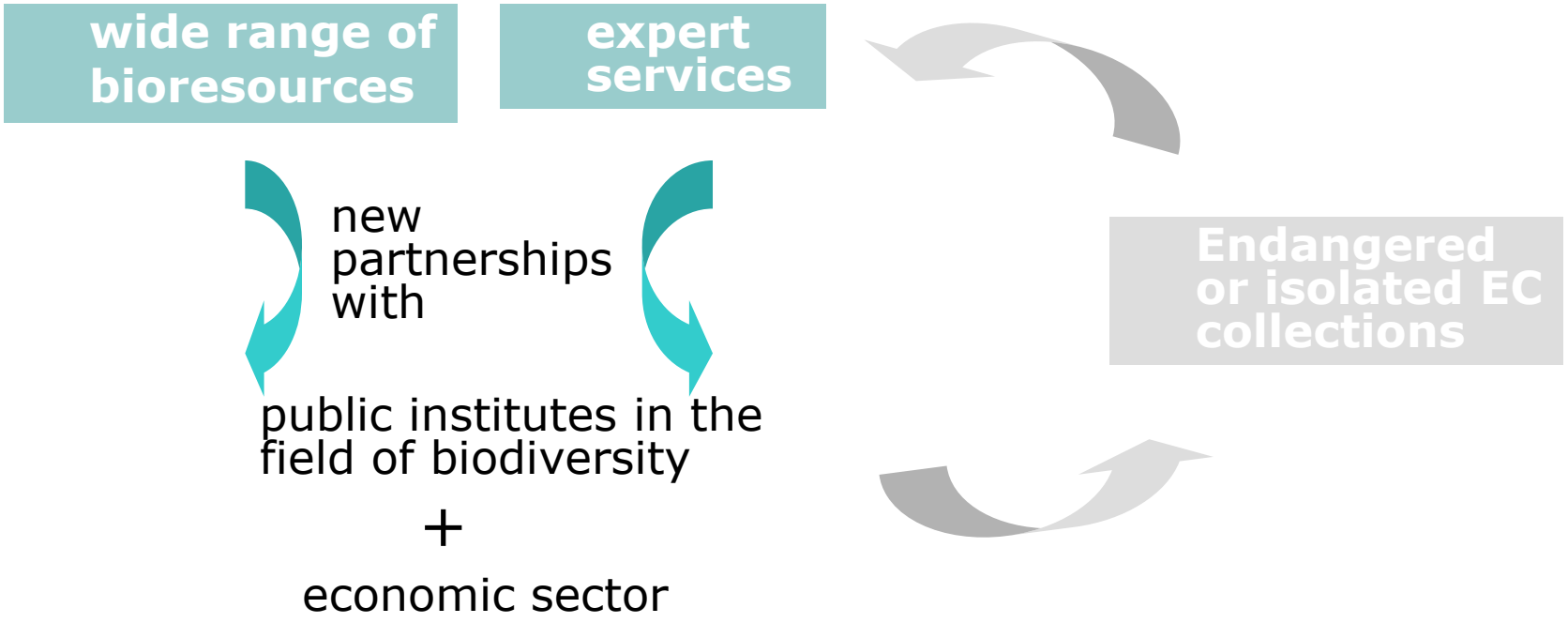
Sylvie Lortal, coordinator

Research director at INRA, head of the lab « Dairy and Egg Science and Technology », located in Rennes

Collection of Food related bacteria

EMbaRC, Project objectives

Establish a community of EC microbial resources centers – develop sustainability



Foundations of the future GBRCN

Global Resources Biological Center Network

EMbaRC, concrete expected achievements from networking activities

- **Harmonizing methods** for strain identification and validation of type/reference strains

- **Contribution to standards** : ensure consistent quality of all european collection resources, make national standards emerging to the international level (from OECD best practices to ISO specific for BRC)

- **Propose a Code of Conduct for Biosecurity** : help BRC to avoid any direct or indirect contributions to biological weapons

- **One-stop-shop to the EU collections via a web portal for users**

EMbaRC, concrete expected achievements from networking activities

- **Disseminate largely the call for access,** be a locomotive

- **Broaden the coverage ratio nb of species kept in BRC / nb species described /** strategy increase deposit, holding

- **Integrate orphans or endangered or emerging collections into the EMbaRC community, share project results via**
  - Best practices workshops
  - Targeted training programs
  - Outreach activities

- **New ways for Self-sustainability of EU BRCs,** business model

EMbaRC, concrete expected achievements from joint research activities

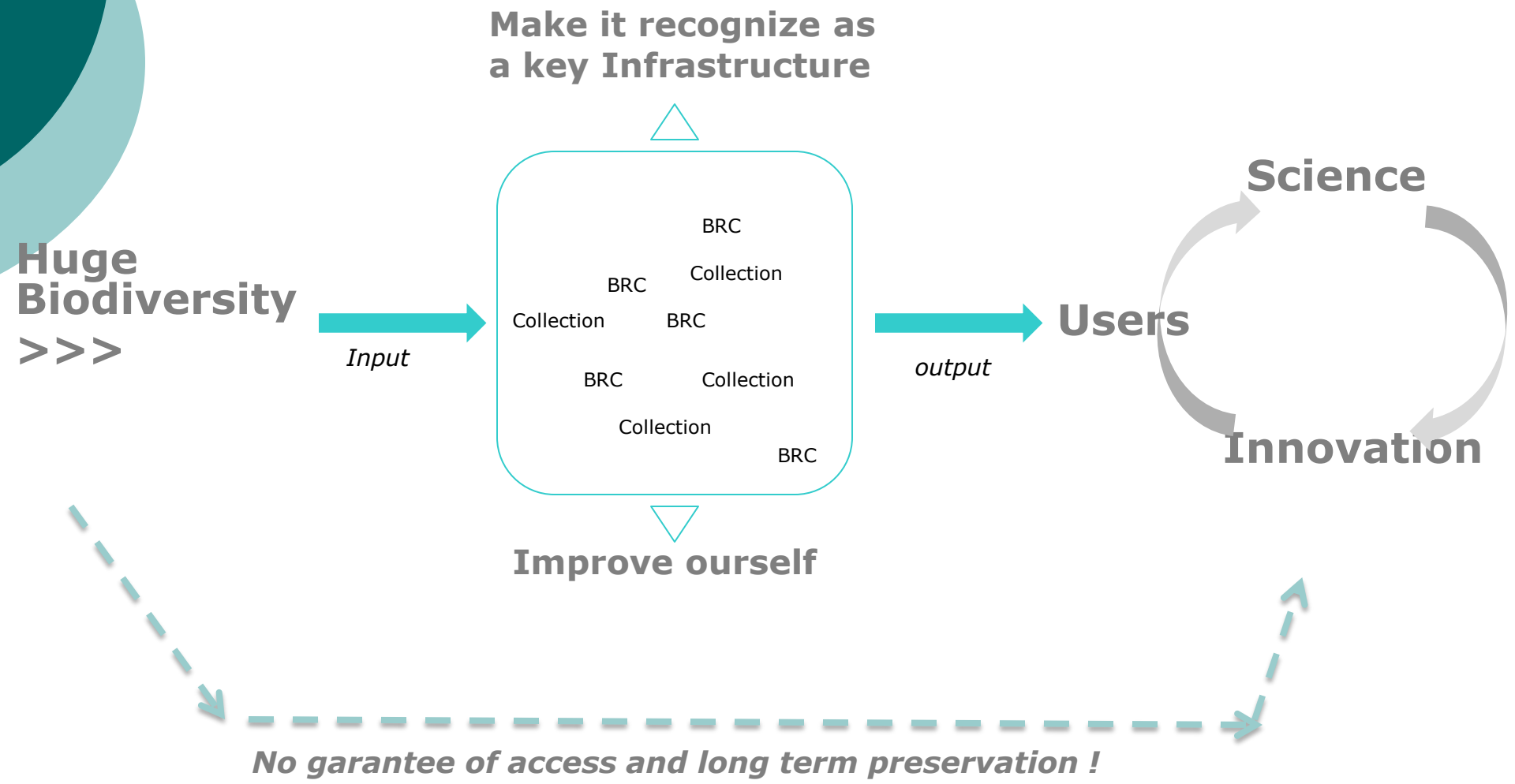
Strain & DNA preservation: longer shelf-life

European microbial DNA bank network

Exploring new methods for accurate species identification

Dissemination of the results,
via Publications

To summarize … ;-)



Many thanks for your attention

New giant Microbes « teddy bears »…

HOW TO DEVELOP QUALITY ASSURANCE AND BECOME A BRC

C. BIZET – CRBIP, France

Organisation for Economic Co-operation and Development

- 30 member countries and 70 associated countries
- 2008 : edition of guidelines related to good practices regarding Biological Resource Centres (health and and microbiology)

Organisation for Economic Co-operation and Development

- Targets: definition of high standards of quality concerning the preservation of bio-diversity and the distribution of biological resources

- Two parts:
  - Management relating to requirements (like the organization, the audits, the management review….)
  - Technical requirements (the validation of methods, the traceability…)

Organisation for Economic Co-operation and Development

- Definition of the bottomline for standards
  - The working conditions
  - The confidence of scientists
  - The confidence between all BRC
- Certification/accreditation of BRC

Goal of Quality Assurance

- To formalize the existing documents
- Improve the management and the internal organization
- Provide reliable products and services
- Ensure the conformity of the strains according to the established requirements

BRC processes

Piloting

To enforce the strategy

Manage Quality system and develop it

C L I E N T

Acquisition of biological material by BRC

Preservation of biological material

Distribution of biological material

C L I E N T

Implementation of Quality Assurance

- To be helped by a staff specialized in Quality
- Motivate all the staff
- Perform an initial diagnostic and an action plan
- Follow-up regular development

Keys to success (1)

- the training
- a strong involvement of the Head of the laboratory
- a clear definition of the responsibilities of all the staff
- everybody's participation to the writing of procedures

Keys to success (2)

- To give off time for the implementation of the system
- Begin on writing technical standard operating procedures
- Follow-up regularly
- Take in account each suggestions (if possible)
- Work step by step

Everyday follow-up

- To update standard procedures regularly
- Have regular internal audits
- Follow up complaints and laboratory incidents
- Follow up the corrective and preventive actions
- Perform an annual management review

Management review

Participants

- A representative of the Management Institution
- A representative of the Quality department
- BRC managers or all the BRC staff

Goals

- To define the quality policy
- To plan the objectives for the following year

Advantages of a Quality System

- All the staff works similarly -> team cohesion
- Improve the traceability
- Save time
- Economical: best monitoring of the reagents and the equipments

Evaluation

- Practice laboratory examination by the expert audit
  - One quality audit for organizational aspect
  - One or more technical audits for the validation of methods

Conclusion

- To have a Quality System is a good way for BRC to reply to proposals and to find funding for some specific aspects

Collection associated tools: taxonomy, research, information management

Erko Stackebrandt

DSMZ, Germany

Main reference:

Smith D, Ryan MR, Stackebrandt E. Doelle, H. W. and Da Silva, E. J. Encyclopedia of Life Support systems (EOLSS)[Biotechnology]. 2008. UNESCO, Eolss Publishers, Oxford, UK.

Why do we need Culture Collections?

To understand the role and potential of biodiversity, the ability to maintain and identify biological resources is crucial

Though biodiversity offers more than biotechnology, e.g., understanding the evolution of the tree of life and to educate biosystematists, biotechnology is **key to meet the needs of the 21st century**. The global taxonomic impediment has been recognised and initiatives are underway to help lead to its resolution.

The Convention on Biological Diversity has specifically included microorganisms and the importance of ex-situ collections, as well as benefit sharing.

(CBD, http://www.biodiv.org/convention/default.shtml)

Article 9 of the CBD: Ex-situ Conservation

Each Contracting Party shall, as far as possible and as appropriate, and predominantly for the purpose of complementing in-situ measures:

(a) Adopt measures for the ex-situ conservation of components of biological diversity, preferably in the country of origin of such components;

(b) Establish and maintain facilities for ex-situ conservation of and research on plants, animals and **microorganisms**, preferably in the country of origin of genetic resources;

(c) Adopt measures for the recovery and rehabilitation of threatened species and for their reintroduction into their natural habitats under appropriate conditions;

(d) Regulate and manage collection of biological resources from natural habitats for ex-situ conservation purposes so as not to threaten ecosystems and in-situ populations of species, except where special temporary ex-situ measures are required under subparagraph (c) above; and

(e) Cooperate in providing financial and other support for ex-situ conservation outlined in subparagraphs (a) to (d) above and in the establishment and maintenance of ex- situ conservation facilities in developing countries.

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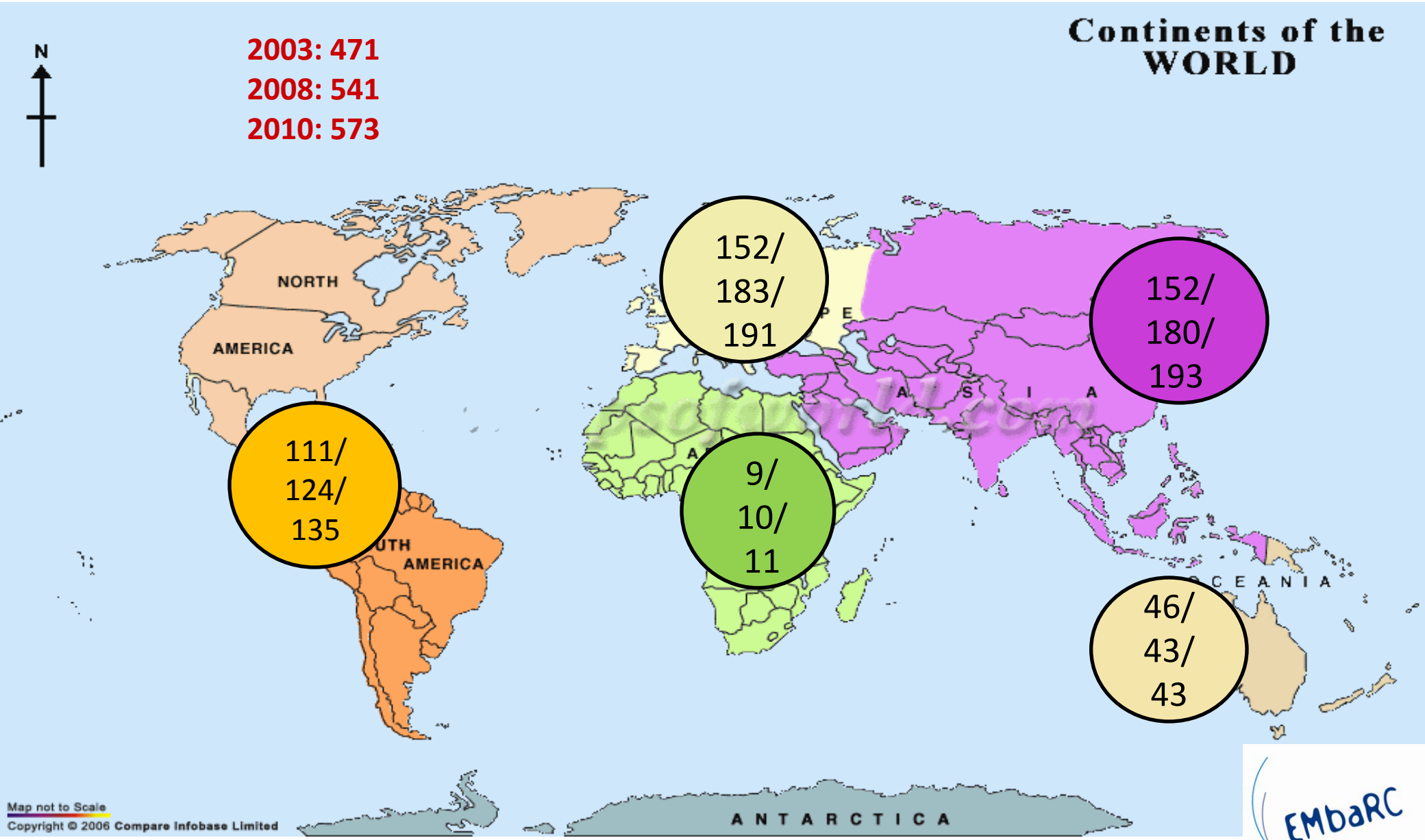
Numbers of collections and percentage of holdings



Source: World Data Centre for Microorganisms (WDCM)

Of the 573 culture collections in 68 countries*

227 of them are supported by government.

54 of them are semi-governmental.

211 of them are supported by university.

14 of them are supported by industry.

21 of them are private.

Of these

245 provide storage services.

265 provide distribution services.

284 provide identification services.

237 provide training services.

247 provide consultation services

*, http://wdcm.nig.ac.jp/statistics.html; date: Feb 24, 2010

573 culture collections*

In Europe	191	633,444
Armenia	1	7,575
Belarus	1	1,175
Bulgaria	3	13,234
Czech	1	38,497
Estonia	3	6,300
Hungary	6	8,717
Kazakhstan	2	199
Latvia	1	692
Poland	9	8,464
Romania	2	760
Russian Federation	14	40,874
Slovak	3	4,916
Slovenia	2	4,160
Ukraine	3	3,286
Uzbekistan	3	1,456
Yugoslavia (?)	2	897
East Europe	56 (29%)	141,203 (22.3%)

*, http://wdcm.nig.ac.jp/statistics.html; date: Feb 24, 2010

1. Taxonomy: for authentification (in, out, viability check), service, reputation

- Phenotype: morphology, physiology, cultural properties, key properties..
- Genotype: G+C content, MLSA sequences, DNA pattern, ribopattern..
- Chemotaxonomy: peptidoglycan, polar lipid, fatty acid, isoprenoid quinone protein pattern, MALDI-TOF..

2. Research: publications = reputation, capacity building, collaboration

- New descriptions
- Phylogeny: MLSA..
- New methods: genome sequences, ANI..
- Ecology, clone libraries, metagenomics, proteomics..
- Culture conditions..
- Long-term preservation..

3. Information management: outreach, visibility, improved efficiency

- Online catalogues: what, where, when, how, by whom, which methods, references..
- In-house network: linking access, dispatch and research with online catalogue
- National and international networks: linking online catalogues
- Added value entries: separate databases on basically anything
- Improved capacity building for bioinformation scientists

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ad 1. Identification and authenticity check

Automated identification systems, including the

- API system (Biomerieux, S.A. France) and
- Biolog plates (Biolog Inc, USA).
- MIDI FAME analysis

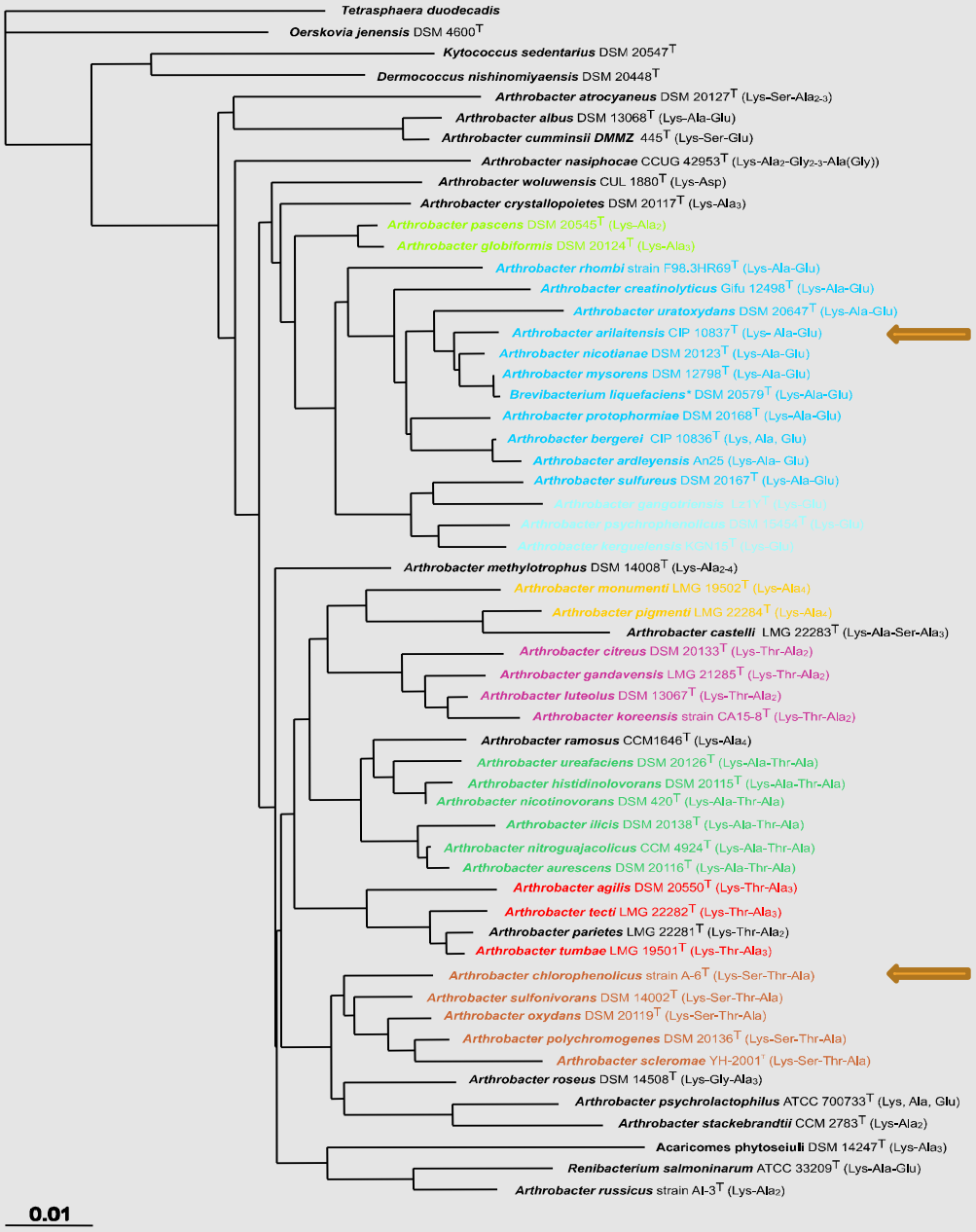
MALDI-TOF

Analysis and characterisation of nucleic acids.

Sequencing of DNA genes, operons and spacers

Fingerprinting techniques

- Riboprinting
- RFLPs (Restriction Fragment Length Polymorphism),
- RAPDs (Random Amplified Polymorphic DNA),
- AFLP (Arbitrary Fragment Length Polymorphism),
- SSCP (Single Strand Conformation Polymorphism).
- Variable number tandem repeat (VNTR) PCR,
- Repetitive extragenic palindromic (REP) elements



16S rRNA gene phylogeny is generally consistent with peptidoglycan types

Lys-Ala-Glu

Lys-Thr-Ala

Lys-Ala-Thr-Ala

Lys-Ser-Thr-Ala

Peter Schumann, DSMZ

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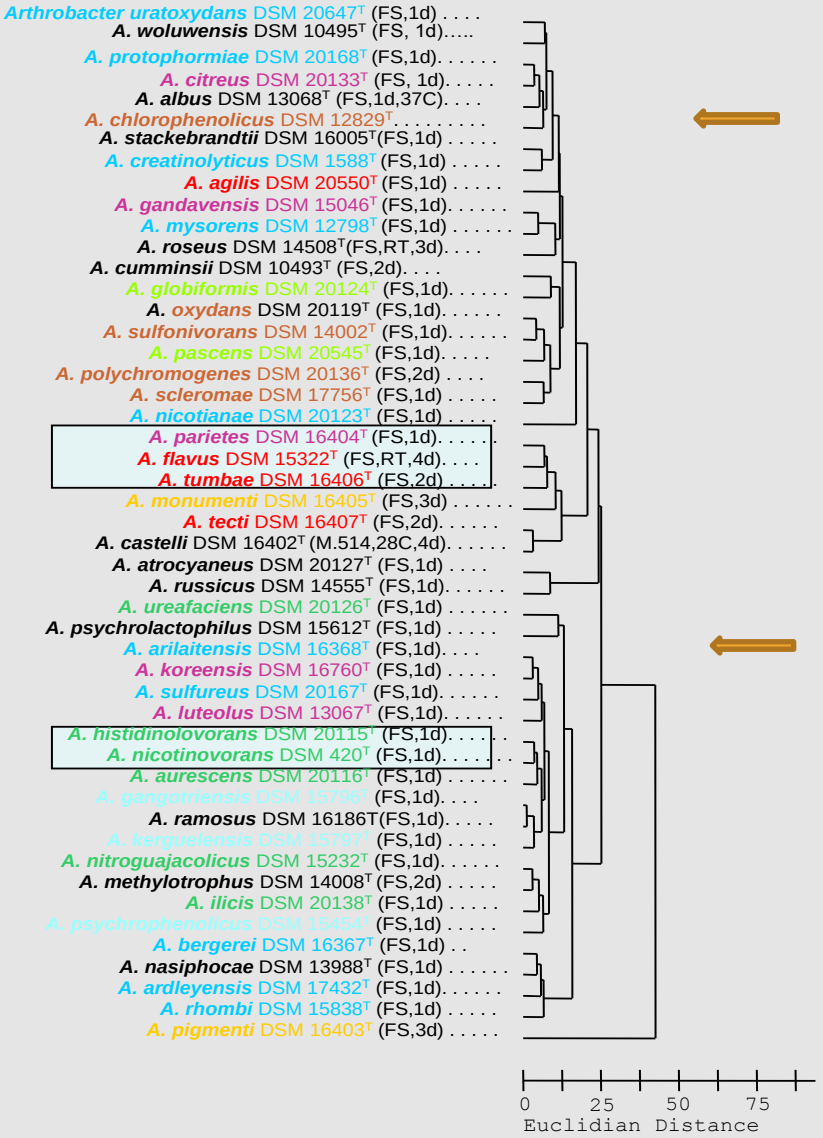
DSMZ
Deutsche Sammlung von Mikroorganismen und Zellkulturen GmbH



Frame indicates strains of high 16S rRNA sequence similarity

Fatty acid profiles of *Arthrobacter* type strains consist of 4-5 iso/ anteiso branched major components, **are highly similar and do not allow unambiguous differentiation**. Strain DSM 16403^T contains additionally $C_{20:0}$ and 2 unidentified late eluting components.

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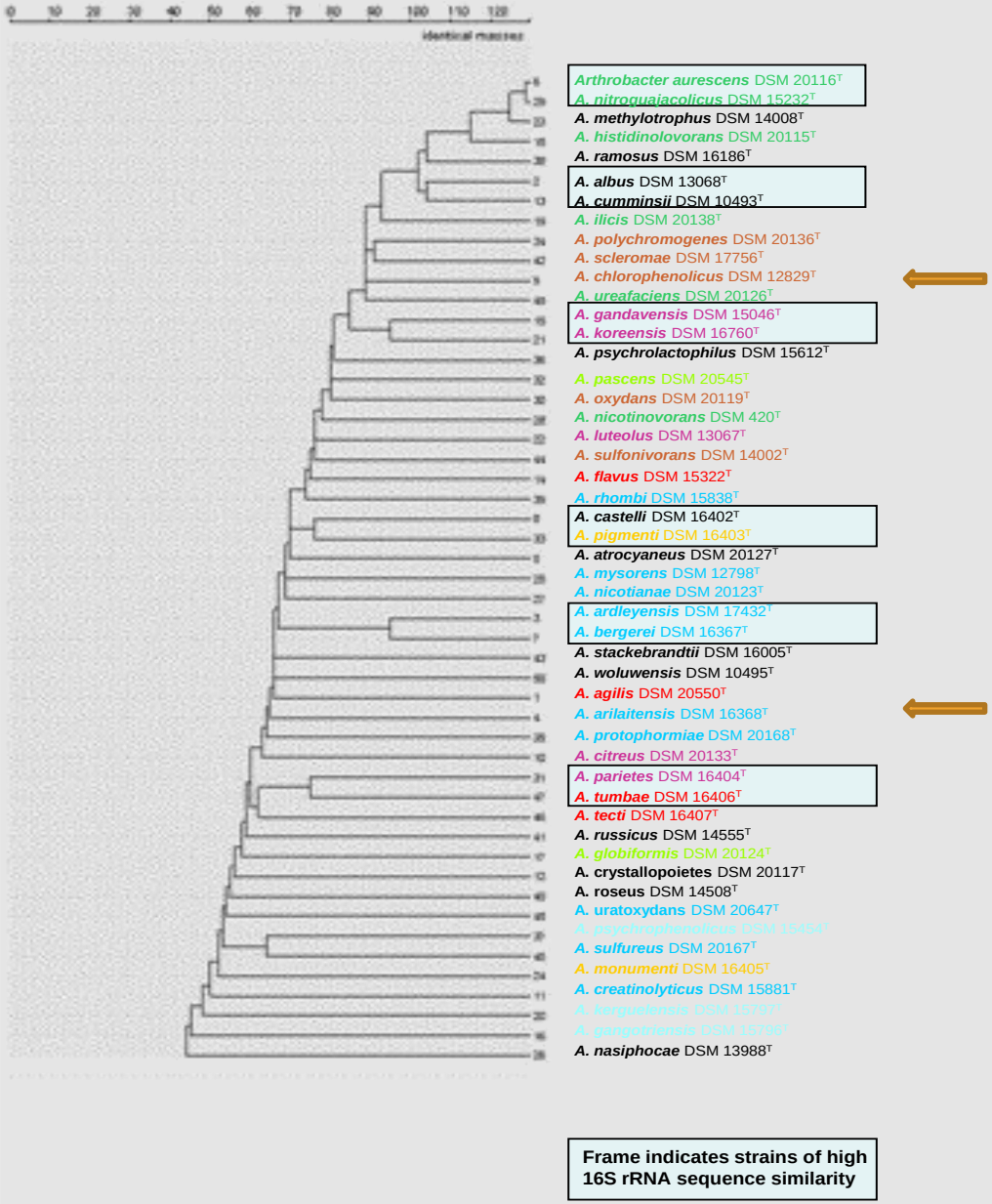

Frame indicates strains of high 16S rRNA sequence similarity

MALDI-TOF mass spectra differentiate *Arthrobacter* type strains (except of DSM 20116^T and DSM 15232^T) and **allow their identification**. Six pairs of type strains with similar 16S rRNA gene sequences show also similar mass spectra, demonstrating that MALDI-TOF reflects the phylogenetic relationship of highly related *Arthrobacter* species.

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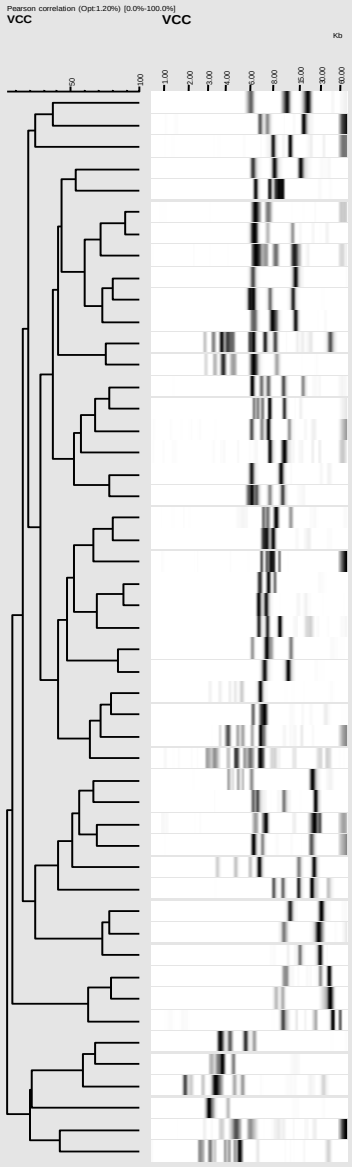

Arthrobacter	*albus*	DSM13068T
Arthrobacter	*polychromogenes*	DSM20136T
Arthrobacter	*russicus*	DSM14555T
Arthrobacter	*cumminsii*	DSM10493T
Arthrobacter	*creatinolyticus*	DSM15881T
Arthrobacter	*sulfonivorans*	DSM14002T
Arthrobacter	*nitroguajacolicus*	DSM15232T
Arthrobacter	*ureafaciens*	DSM20126T
Arthrobacter	*castelli*	DSM16402T
Arthrobacter	*aurescens*	DSM20116T
Arthrobacter	*ilicis*	DSM20138T
Arthrobacter	*bergerei*	DSM16367T
Arthrobacter	*ardleyensis*	DSM17432T
Arthrobacter	*histidinolovorans*	DSM20115T
Arthrobacter	*citreus*	DSM20133T
Arthrobacter	*chlorophenolicus*	DSM12829T
Arthrobacter	*rhombi*	DSM15838T
Arthrobacter	*pigmenti*	DSM16403T
Arthrobacter	*nicotinovorans*	DSM420T
Arthrobacter	*luteolus*	DSM13067T
Arthrobacter	*flavus*	DSM15322T
Arthrobacter	*gandavensis*	DSM15046T
Arthrobacter	*koreensis*	DSM16760T
Arthrobacter	*scleromae*	DSM17756T
Arthrobacter	*parietes*	DSM16404T
Arthrobacter	*stackebrandtii*	DSM16005T
Arthrobacter	*agilis*	DSM20550T
Arthrobacter	*kerguelensis*	DSM15797T
Arthrobacter	*oxydans*	DSM20119T
Arthrobacter	*gangotriensis*	DSM15796T
Arthrobacter	*sulfureus*	DSM20167T
Arthrobacter	*nasiphocae*	DSM13988T
Arthrobacter	*globiformis*	DSM20124T
Arthrobacter	*ramosus*	DSM16186T
Arthrobacter	*pascens*	DSM20545T
Arthrobacter	*crystallopoietes*	DSM20117T
Arthrobacter	*atrocyaneus*	DSM20127T
Arthrobacter	*monumenti*	DSM16405T
Arthrobacter	*tecti*	DSM16407T
Arthrobacter	*tumbae*	DSM16406T
Arthrobacter	*methylotrophus*	DSM14008T
Arthrobacter	*psychrolactophilus*	DSM15612T
Arthrobacter	*mysorens*	DSM12798T
Arthrobacter	*psychrophenolicus*	DSM15754T
Arthrobacter	*protophormiae*	DSM20168T
Arthrobacter	*arilaitensis*	DSM16368T
Arthrobacter	*nicotianae*	DSM20123T
Arthrobacter	*woluwensis*	DSM10495T
Arthrobacter	*uratoxydans*	DSM20647T

Frame indicates strains of high 16S rRNA sequence similarity

Riboprints:

*Pvu*II-RiboPrint patterns are useful for differentiation of *Arthrobacter* type strains but do not correlate with their phylogenetic relationship

Peter Schumann, DSMZ

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ad 1. Despite recognized needs we see a reduction in numbers of taxonomists

Today, **traditional microbiology found its alliance in molecular biology** and modern non-culture tools are now available to recognize the vast diversity of microorganisms, a small fraction of which has been grown in culture. The huge numbers of microbial species yet to be discovered requires skilled taxonomists, innovative isolation strategies, automated identification and a high quality global network of bioinformation of properties of organisms already in culture.

Smith D, Ryan MR, Stackebrandt E. Doelle, H. W. and Da Silva, E. J. Encyclopedia of Life Support systems (EOLSS)[Biotechnology]. 2008. UNESCO, Eolss Publishers, Oxford, UK.

Conclusion ad 1. Improve taxonomy

Taxonomic expertise is absolutely essential to ensure microorganisms are correctly identified and culture collections need access to such skills to ensure that the identity can be monitored during storage, handling and distribution.

Maintain the available skills: do not fully replace trained taxonomists by molecular biologist

Expand the molecular skills: apply sequence analysis and rapid and reliable DNA pattern analysis

Be involved in genome sequencing projects

Smith D, Ryan MR, Stackebrandt E. Doelle, H. W. and Da Silva, E. J. Encyclopedia of Life Support systems (EOLSS)[Biotechnology]. 2008. UNESCO, Eolss Publishers, Oxford, UK.

ad 2. Storage and maintenance

The primary objective of preserving and storing an organism maintaining it in a viable state **without morphological, physiological, or genetic change** until it is required for future use.

Complete viability and stability should be achieved, especially for **important** research and industrial isolates.

Preservation techniques range from

- continuous growth methods
- to methods that reduce rates of metabolism
- to the ideal situation where metabolism is suspended.

No preservation technique has been successfully applied to all microorganisms, although storage in liquid nitrogen appears to approach the ideal.

Smith D, Ryan MR, Stackebrandt E. Doelle, H. W. and Da Silva, E. J. Encyclopedia of Life Support systems (EOLSS)[Biotechnology]. 2008. UNESCO, Eolss Publishers, Oxford, UK.

ad 3. Quality management

The global system for Biological Resource Centres needs a **common standard** that can be worked to by all its members **to ensure conformity** and therefore at the very least the system chosen must be based on a common general standard.

Several collections have already adopted ISO 9000 series certification, a system that ensures quality through critical management of processes.

The system requires that

procedures and practices are documented and that

auditing procedures are put in place

to ensure that what is said is done is actually carried out.

Smith D, Ryan MR, Stackebrandt E. Doelle, H. W. and Da Silva, E. J. Encyclopedia of Life Support systems (EOLSS)[Biotechnology]. 2008. UNESCO, Eolss Publishers, Oxford, UK.

ad 3. Information technology

There are enormous possibilities for generating information on microorganisms from descriptive text on

- morphology,
- information on isolation and geographic location,
- host and substrate etc.,
- to digital images,
- metabolic
- genomic data.

Scatterered information is available:
- World Data Centre for Microorganisms (http://wdcm.nig.ac.jp),
- Global Information Facility (http://www.gbif.org),
- EMBL and GENBANK

To ensure the data provided by culture collections is authentic, of high quality and relevance they must institute quality assurance measures for recording, management and exchange.

Smith D, Ryan MR, Stackebrandt E. Doelle, H. W. and Da Silva, E. J. Encyclopedia of Life Support systems (EOLSS)[Biotechnology]. 2008. UNESCO, Eolss Publishers, Oxford, UK.

ad 3.: No collection is working fully independently

Actions like handling, maintenance, storage, shipping etc must be carried out safely and compliant with the various legislation and regulations that control these matters. Not only does the legislation exist but also from time to time it is changed or added to (http://wdcm.nig.ac.jp/wfcc/wfccreports.pdf).

CCs/BRCs must comply with biosafety requirements.

These responsibilities are wide ranging and incorporate:

- Health and Safety requirements
- Classification of Micoorganisms on the Basis of Hazard
- Quarantine regulations
- Ownership of Intellectual Property Rights (IPR)
- Convention on Biological Diversity
- Safety information provided to the recipient of microorganisms
- Regulations governing shipping of cultures
- Control of Distribution of Dangerous Organisms

Smith D, Ryan MR, Stackebrandt E. Doelle, H. W. and Da Silva, E. J. Encyclopedia of Life Support systems (EOLSS)[Biotechnology]. 2008. UNESCO, Eolss Publishers, Oxford, UK.

Summary 1:
In order to cope with the anticipated massive expansion of biological resources, including living biological materials and data on genomics, CC/BRCs need to:

- Contribute to the **co-ordination** of efforts to **conserve biodiversity** and to **provide access** to natural and engineered biological resources.
- Assist in the development of a **co-ordinated** international system for decision making to guide appropriate acquisition, maintenance and distribution of biological resources so as to avoid unnecessary duplication of effort while preserving critical levels of biodiversity.
- **Modernise** to incorporate the latest developments in web-based electronic communication, bioinformational science and informatics technologies.
- **Co-ordinate** and unify catalogues and databases to meet the requirements of science in the developing post-genomics era.
- **Develop** new systems and technologies for the long-term maintenance and distribution of large numbers of diverse biological resources.
- **Co-ordinate** curation, as well as development and networking of informatics tools for data analysis, comparison and visualisation.
- Ensure that the scientific community has access to affordable products and services.

Summary 2.: Culture collection benefits

- Recognition that they operate to international scientifically based quality criteria
- An international mark of quality
- Raised profile
- Sharing of tasks
- Common policies and procedures
- Competitive edge
- Common access to data enabling links to be made to other international initiatives without duplication of effort
- Common approach to data access, sharing and interoperability
- Improved data usage
- Collaborative research and development

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Summary 3.: Potential Income Streams Anticipated for CCs/BRCs (examples)

- cDNA libraries, genomic libraries, filter sets, clones, plates, PCR products
- Microarrays and reagents
- Accreditation/standardization-added value products and services
- Data storage and retrieval
- Software development/collaborations - data mining tools
- Technology development/collaborations
- Sequence database annotation/phenotypic analysis
- Linking genomics databases to proteomics

Smith D, Ryan MR, Stackebrandt E. Doelle, H. W. and Da Silva, E. J. Encyclopedia of Life Support systems (EOLSS)[Biotechnology]. 2008. UNESCO, Eolss Publishers, Oxford, UK.

At the end: where are the Culture Collection benefits from increasing its performance?

- Recognition that they operate to international scientifically based quality criteria
- An international mark of quality
- Raised profile
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Cantacuzino Institute, Bucharest, Romania, 8-9 March 2010

Selected Success Stories of Collection Exploitation

Nelson Lima

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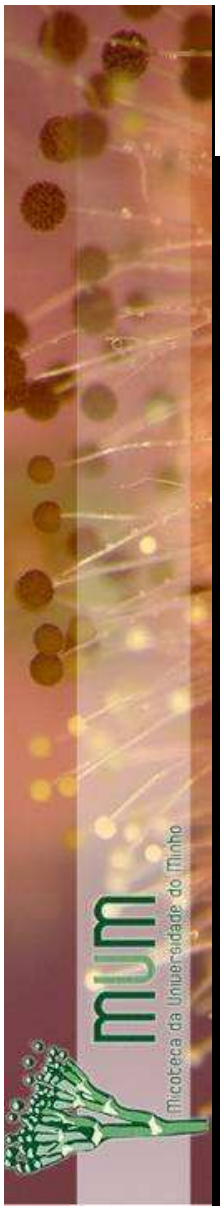
IBB-Institute of Biotechnology and Bioengineering
Biological Engineering Centre
Micoteca da Universidade do Minho
University of Minho
Braga - Portugal



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mum
Micoteca da Universidade do Minho

MUM – A Fungal Culture Collection

==========

MUM is a filamentous fungal culture collection which was established in 1996. The purpose is to maintain and provide strains for research in biotechnology and in teaching laboratories, and to act as a centre of expertise, information and training complying with international quality standards.

Port Wine
Table Wine

The value generated by Portuguese wine exports represents:

1.0% of GDP

3.2% of export market share

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Ochratoxin A (OTA) was first detected as a wine contaminant in 1996 and the role of *Aspergillus* section *Nigri* in OTA production discovered in Europe in 1999.

2 µg/kg ochratoxin A (OTA) is the maximum limit in wine according the UE regulation 2005.

The latitude of production is an important factor in determining risk from OTA wine contamination. Some geographic regions in Southern Europe, like Portugal, are more prone to contamination with OTA.

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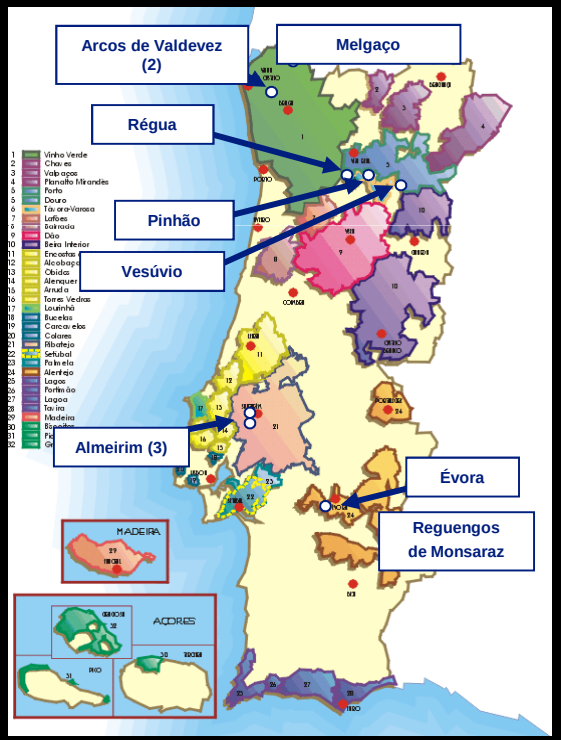
4 Wine Regions



Fungi Isolates

4450 grape berries studied

11138 fungal strains isolated

39 Genera found in the berries

56% of berries with *Cladosporium*

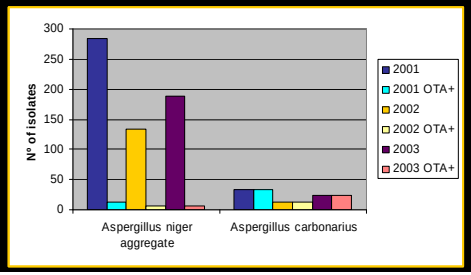
52% of berries with *Alternaria*

35% of berries with *Botrytis*

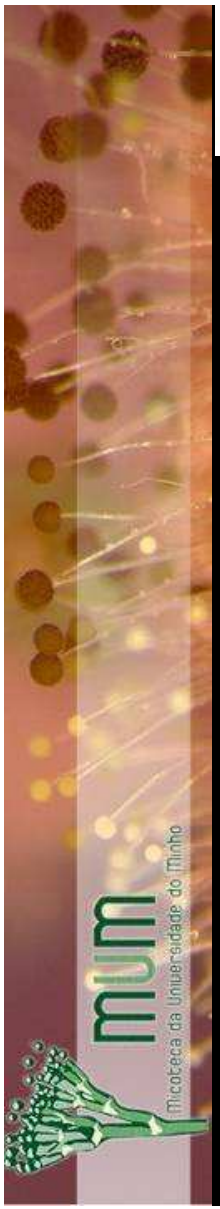
23% of berries with *Penicillium*

17% of berries with *Aspergillus*

Aspergillus niger 5% OTA^{+}



GRAS ??



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Aspergillus SECTION *Nigri* IDENTIFICATION USING POLYPHASIC APPROACH INCLUDING MALDI-TOF

(Matrix Assisted Laser Desorption Ionization – Time of Flight)

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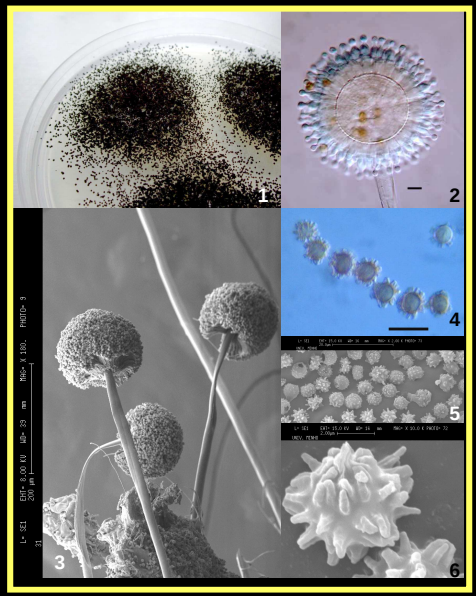
Species of the *Aspergillus* section *Nigri* have been extensively used for various biotechnological purposes and are among the fungi best studied causing biodeterioration of commodities and food spoilage.

Recently, *Aspergillus ibericus* was described as a new species in the section. This new species was not only separated from their relatives in the section by morphological distinction but also from molecular point of view: briefly, *A. ibericus* among other morphological differences has 5-7 µm conidia size which allows separate this *taxon* from *A. carbonarius* (7-9 µm) and *A. niger* and its aggregate species (3-5 µm).

Aspergillus ibericus

1. Colony grown in CZ (9 days).
2. Biseriate aspergilli of a 4 days old culture in CZ (bar = 10 µm).
3. Aspergilli at SEM (bar = 200 µm).
4. Conidia seen at Nomarski microscope (bar = 10 µm).
5. SEM picture of the conidia with variable ornamentation at different maturation stages (bar = 20 µm).
6. SEM picture of a mature conidium (bar = 2 µm).



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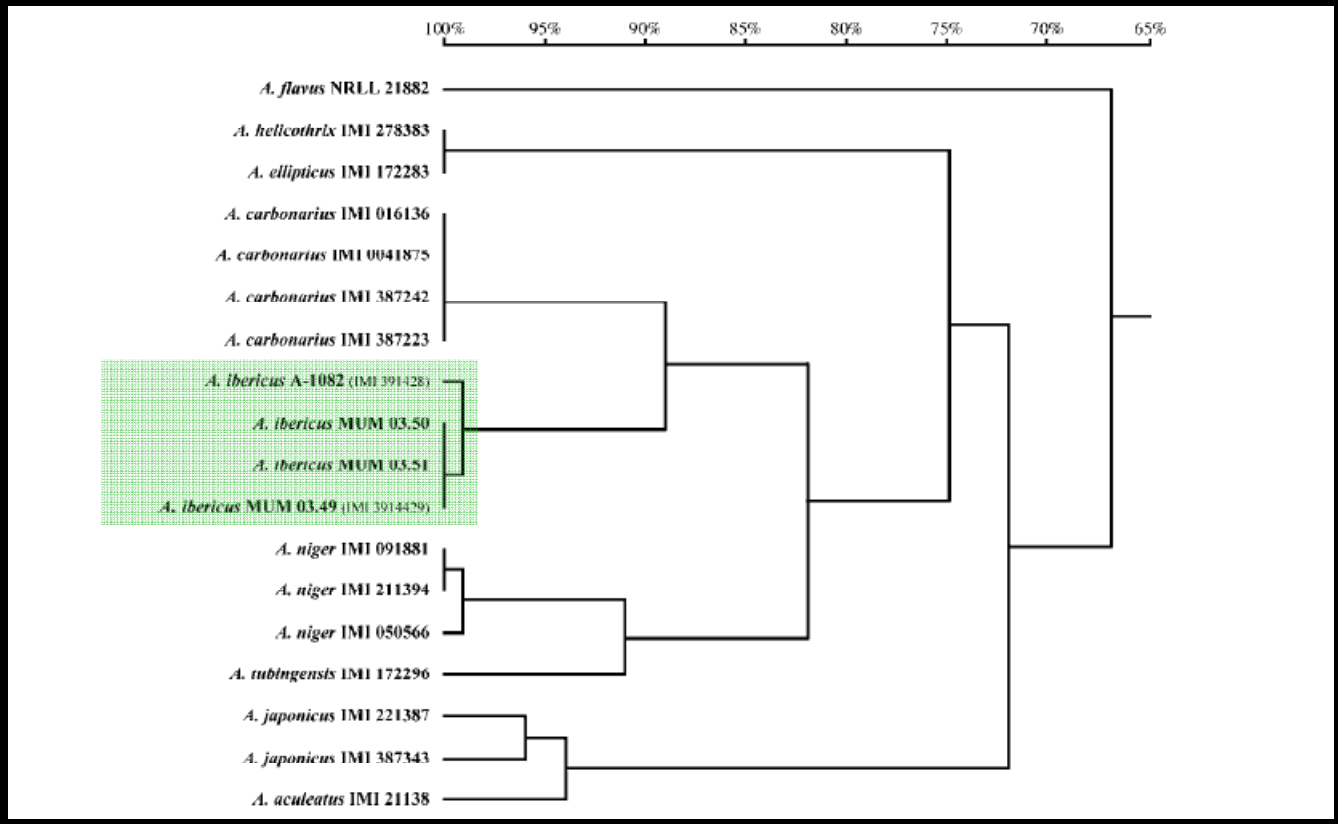
Homology tree obtained by comparison of partial calmodulin gene sequences. The dendrogram obtained clearly separated the four atypical strains (*A. ibericus*) from *Aspergillus carbonarius* strains and also from other closely related species.



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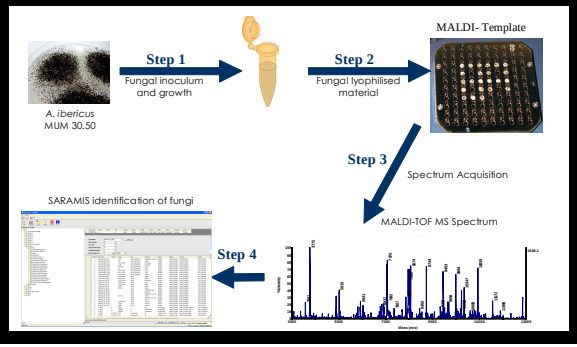
List of strains used for MALDI-TOF Mass Spectrometry analysis.

Species	Isolate number	Geographical origin	Source
A. ibericus	MUM 03.49 (IMI 391429, ITEM 4776) (T)	Portugal	Wine grapes
	MUM 03.50 (IMI 391430, ITEM 6601)	Portugal	Wine grapes
	MUM 03.51 (IMI 39143,1 ITEM 6602)	Portugal	Wine grapes
A. carbonarius	MUM 03.06 (IMI 016136, NRRL 369) (T)	Unknown	Paper
	MUM 05.18 (IMI 387223)	Portugal	Wine grapes
	MUM 03.59 (IMI 387242)	Portugal	Wine must
A. niger	MUM 03.01 (IMI 050566, NRRL 326) (T)	USA	Tannin-gallic acid fermentation
	MUM 03.57 (molecular pattern N)	Portugal	Wine grapes
	MUM 05.13 (molecular pattern T)	Portugal	Wine grapes
A. sclerotioniger	MUM 06.151 (CBS 115572) (T)	India	Arabic coffee, green
A. lacticoffeatus	MUM 06.150 (CBS 101883) (T)	Indonesia	Coffee robusta, surface sterlized beans
A. tubingensis	MUM 06.152 (CBS 134.48) (T)	Unknown	Unknown
A. vadensis	MUM 06.153 (CBS 113365) (T)	Unknown	Dead plant tissue
A. ellipticus	MUM 03.12 (IMI 172283, NRRL 5120) (T)	Costa Rica	Soil
A. japonicus	MUM 03.02 (ATCC 1042) (T)	Puorto Rico	Soil
A. aculeatus	MUM 03.11 (IMI 211388) (T)	Unknown	Tropical soil
A. phoenicis	MUM 03.05 (<NRRL 365)	Unknown	Unknown
A. flavus (outgroup)	MUM 00.06	Portugal	Cheese repining chamber

(T) Type strain.



1. Isolation of fungi, mycelium growth
2. Lyophilised mycelium, addition of matrix solution, transfer the material onto the MALDI sample plate
3. Air drying and transfer into the MALDI-TOF mass spectrometer and MALDI-TOF MS measurement
4. Editing of spectra (baseline correction, smoothing, peak detection), export of peak lists and import of peak lists to SARAMIS software
5. Automated identification / archiving / data storage / dendrogram calculation / search and comparison routines

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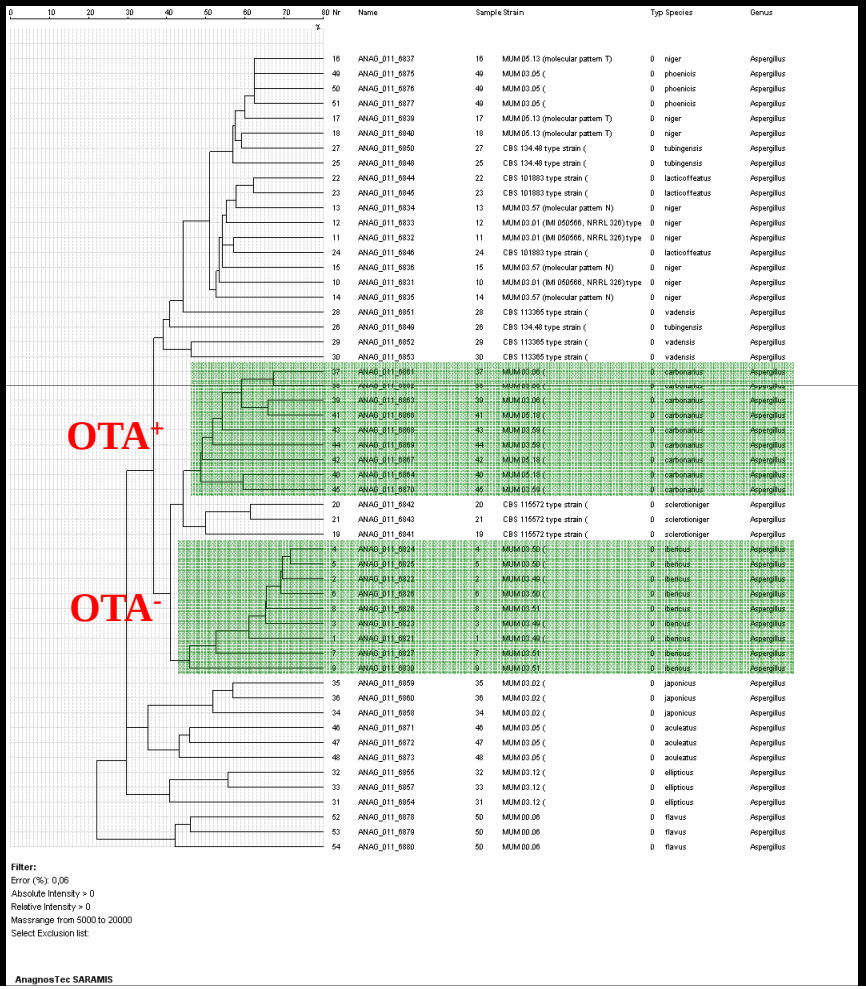


Dendrogram of relatedness between members of section *Nigri* based on MALDI-TOF MS analysis.

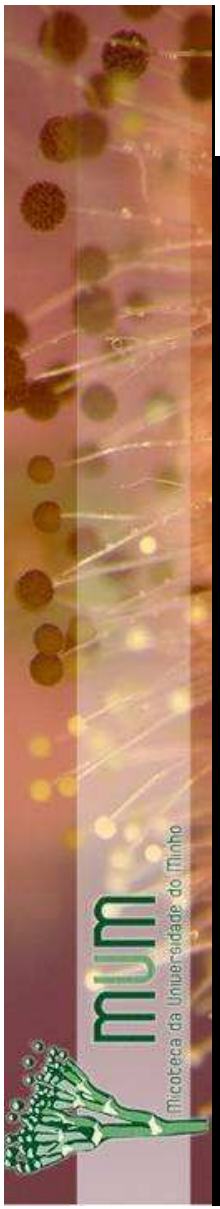
Success story

- Results of MALDI-TOF Mass Spectrometry analysis using mass range from 5000 – 20000 Da were similar to those of phylogenetic analysis giving a sound input for *A. ibericus* characterisation and showing the potentialities of this new method for taxonomic purposes
- To perform this study was necessary use related well characterised species deposit in different collections in order to compare their traits giving continuity to the taxonomic studies
- To have an informed decision and a right food risk assessment is absolutely necessary that the contaminants are correctly identified to the species level

EUROPEAN MICROBIAL COLLECTIONS

- a high added value for science -

Cantacuzino Institute, Bucharest, Romania, 8-9 March 2010



www.cabi.org

EUROPEAN MICROBIAL COLLECTIONS

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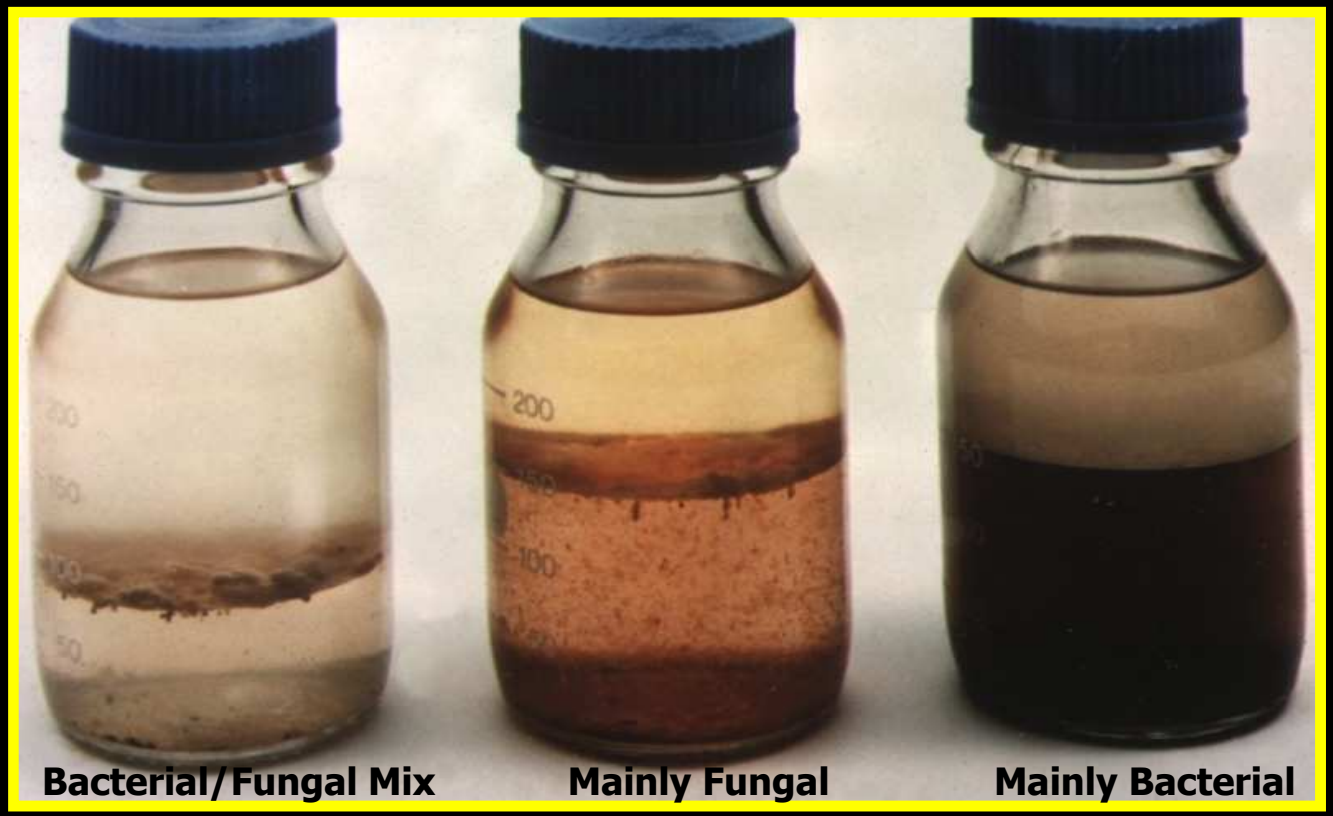
Cantacuzino Institute, Bucharest, Romania, 8-9 March 2010

Solving problems: Microbial Fuel Contaminants



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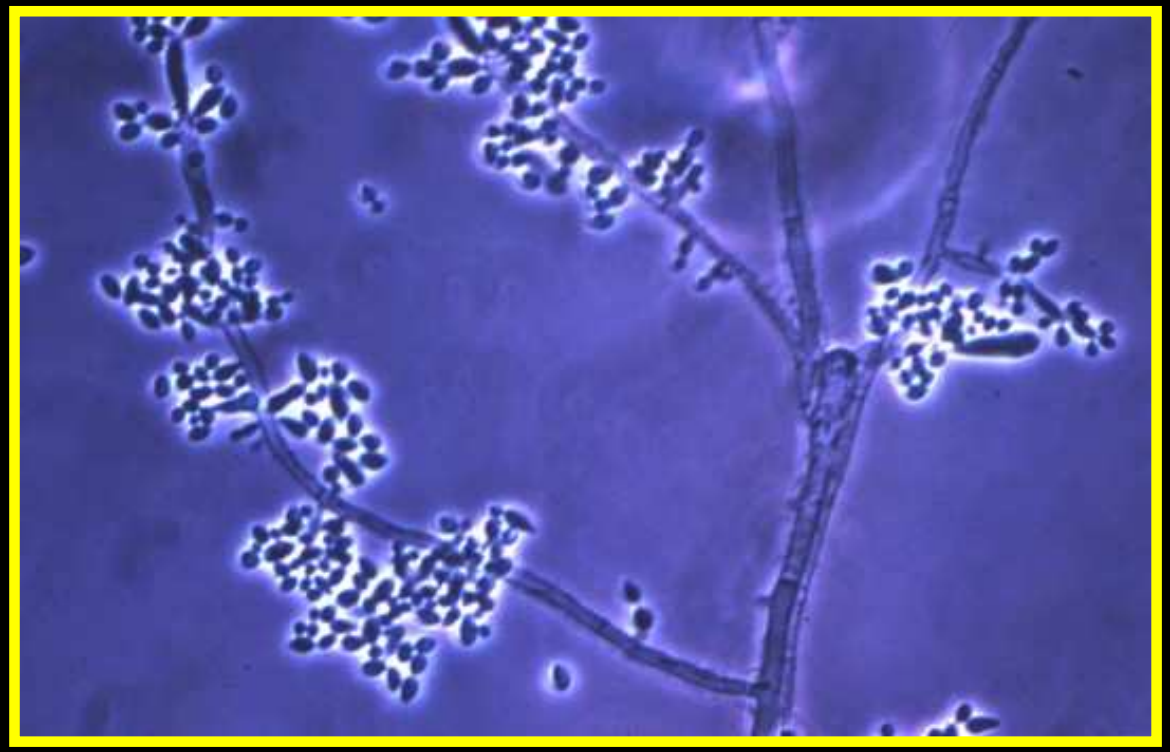
The fungal threat *Hormoconis resinae*



The solution: FUELSTAT™ resinae Detection Kit

Success story

- Isolates collected and stored from the 1960's
- Nan Onions asked to investigate
- Industrial laboratory established at CABI 1982
- Joan Kelley investigated detection kits to reduce time on the ground for aircraft while the fungus was detected via growth tests
- Fuelstat developed taking 10 minutes to determine if any fuel contamination and to what degree

The problem

- Desert locusts can invade 20% of the world land surface
- Their swarms can cover more than 100 km²

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- a high added value for science -
Cantacuzino Institute, Bucharest, Romania, 8-9 March 2010

Ultra-Low Volume (spraying) application of Green Muscle

Biopesticide based on spores of a naturally occurring entomopathogenic fungus *Metarhizium* in an oil formulation

EUROPEAN MICROBIAL COLLECTIONS

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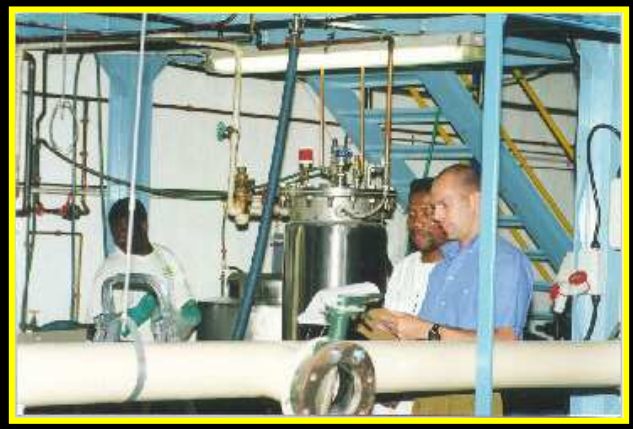

Biological Control Products SA (Pty) Ltd

PO Box 15132, Ashwood
South Africa 3605
Phone: +27 31 7004825
Fax: +27 31 7001338
mailto:info@biocontrol.co.za

Success story

- Partners got together to develop a control for African locust
- Fungal isolates examined from collections
- Most appropriate fungus selected and spray formulations developed
- The product “Green Muscle” seeing extended use in other areas of Africa and now Europe
- Profits from sale go into African Diversity Fund to fund African Biodiversity projects

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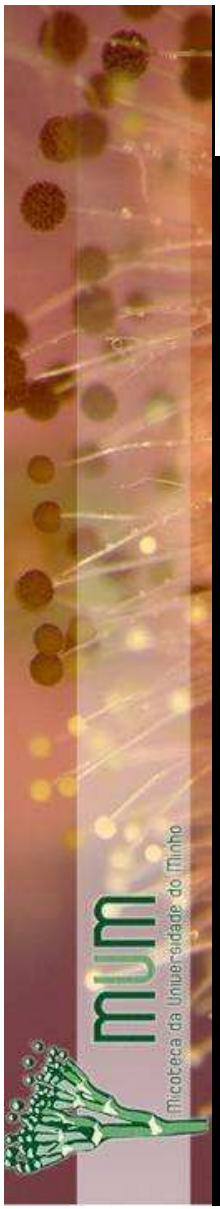

CAPACITIES

EMbaRC

INRA

CIRM
Centre International de Ressources Microbiennes

EUROPEAN MICROBIAL COLLECTIONS

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Collecting biodiversity in tropical area

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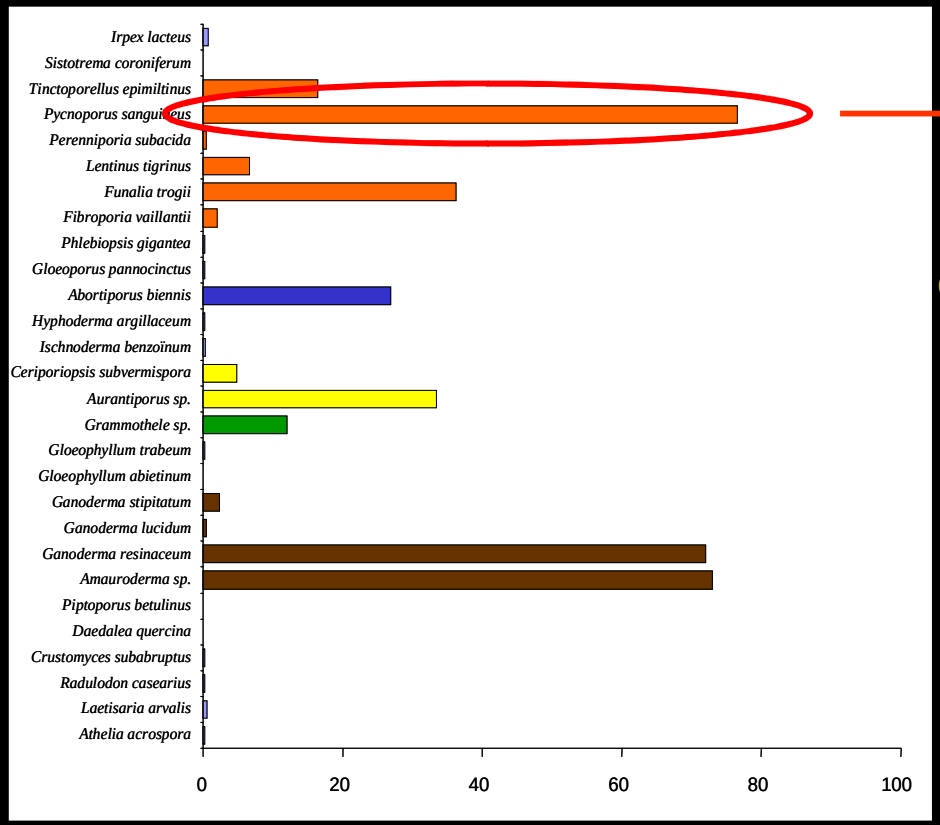
Screening of tropical species of basidiomycetes order Polyporales



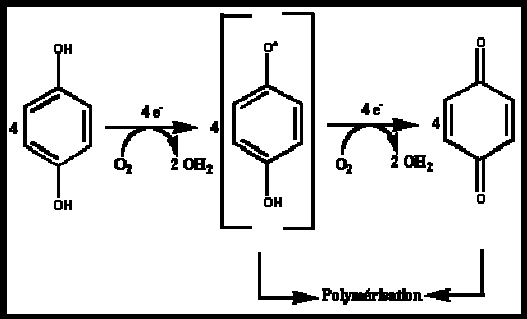
Pycnoporus sanguineus

Laccase

(Lignin oxidoreductase)

Using ABTS as chromogenic substrate

(2,2'-azino-bis-(3-ethylbenzothiazoline-6-sulfonic acid)

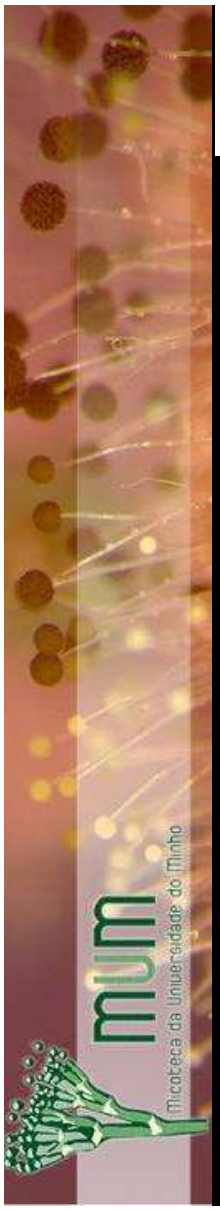


- Laccase purification
- Laccase characterization

Success story

- **New biochemical and biotechnological laccase properties**
- - High thermostability
- - High pH stability
- - Resistance to alcoholic solvents
- - Degradation of polyphenolic dyes
- - Oxidation of non-phenolic lignin model compounds (i.e.veratrylic alcohol)

Lesage-Meessen et al. (2008) 4th European Oxizymes Meeting 16-18 June, Helsinki
Uzan et al. (2010). Journal of Applied Microbiology (in press)



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CAPACITIES

EMbaRC

INRA

CIRM_BIA
CENTRE INTERNATIONAL DE RESSOURCES MICROBIENNES
BACTÉRIES D'INTÉRÊT ALIMENTAIRE

•Research programmes supported by French National Research Agency

ANR

Some examples of valorization for food related bacteria

Strategy:

Screening a collection of strains of food related bacteria the most diverse possible in terms of biotope and geographic origin.

Development of High throughput screening methods using specific equipment

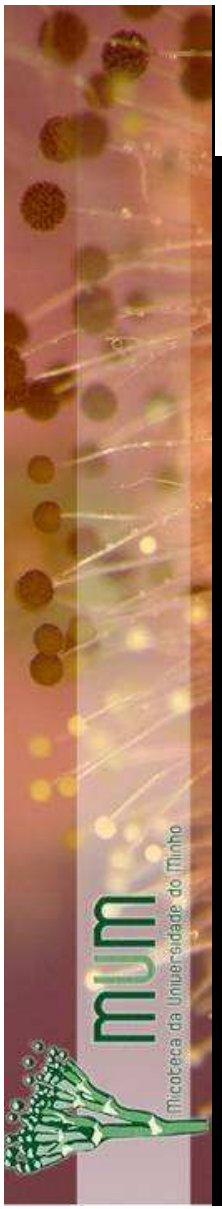
Success stories

Improved preservation of fermented dairy products

- development of antifungal bacterial cultures (bioprotective)

Non-antibiotic strategies against pathogenic bacteria

- exploration of inhibitory capabilities of natural ecosystems against contamination by *S. aureus* in dairy environment



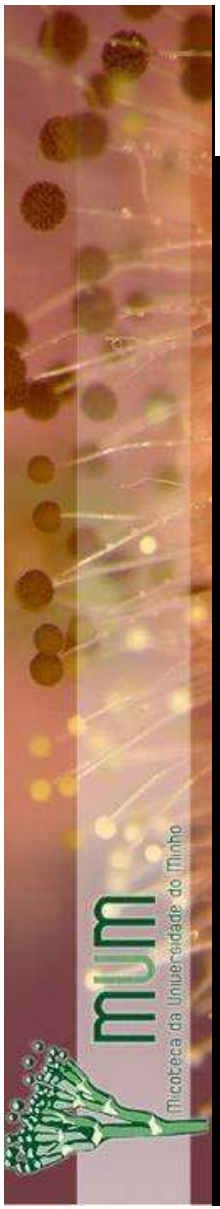
Keys features of Culture Collections

-Collect and preserve microbial cultures well identified and their associated information.

-Supply microbial strains with high quality and authenticity.

-Problem-solving oriented

-Engaged in the valorization of the chain-of-knowledge: *Research, Development & Innovation.*



Thank You For Your Attention

Global Networking of Collections
WFCC and GBRCN perspectives

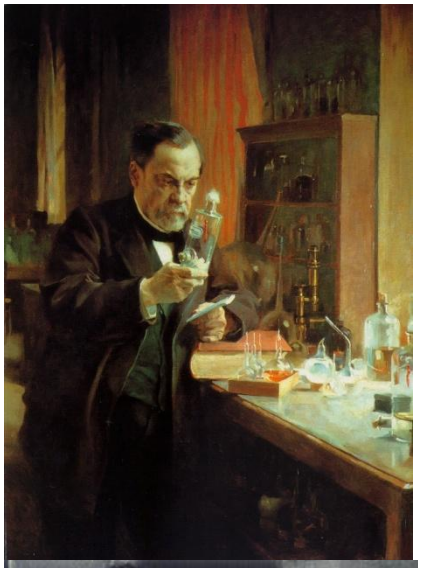
EMbaRC Seminar
David Smith
Cantacuzino Institute, Bucharest, Romania
8-9 March 2010

Summary

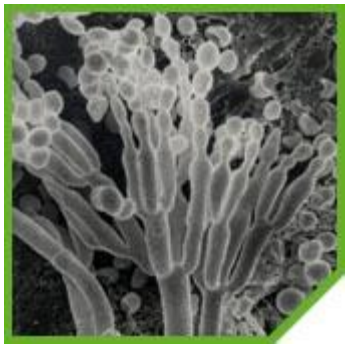
- Challenges need collaboration
- Networks
- The WFCC
- The GBRCN
- The new (revitalised) dimension in life sciences research

Provision of Microbial Resources

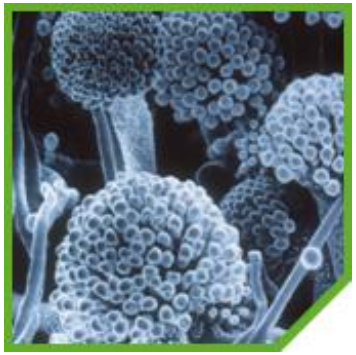
- Collections must provide the basic tools for research and development
- Biotechnology depends upon our ability to harness the potential of biodiversity and all it has to offer
- Understanding the microbe; accessing their chemistry for humankind
- Comprehensive coverage needs a strategy and networking
- Characterisation needs partnerships
- International access needs common policy



Operating environment – policies and strategies



- **Authenticated and well-managed organisms are essential**
  - **to guarantee quality and safety in areas of application**
  - **to allow controlled access to potentially hazardous organisms**
  - **to ease and improve their utilisation**
- **Facilitating policy from Governments is needed**
- **Need a legal operational framework and strategies to**
  - **Encourage deposit**
  - **Encourage adding value**
  - **Encourage data and material sharing**
  - **Encourage development – and environment of improvement**
  - **Encourage innovation**



Why do we need networks

- **Biodiversity challenge is enormous**
  - **Need to focus – 1400 years to describe the 1.4 million fungi**
  - **Need to share task – limited expertise – co-ordinated effort**
- **Human Resources**
  - **Taxonomist: the endangered species**
- **Modern technologies**
  - **Genomics, metabolomics, proteomics – high through put characterisation and sequencing – Need patnerships**
- **More demands**
  - **Quality; Legislation; Biotechnology – common approaches**
- **Capacity building**
  - **Facilities; Technologies; Skills; Knowledge; Protocols; Policies**

Opportunity for networking

- National Organisations – 20 countries
- European Culture Collection Organisation (ECCO) – 24 countries, 66 collections similarly ACM in Asia
- World Federation for Culture Collections (WFCC) – 68 countries, 564 collections – 1.5 million strains
- More formal agreements
  - e.g. UKNCC, BCCM, CABRI
- Regional projects e.g. EBRCN; EMbaRC

World Federation for Culture Collections

Meeting the challenge at the global level

The largest independent global organisation that represents professional individuals and culture collections that preserve biodiversity and enable proper use

- **Routes in 1968 founded in 1972**
- **Inter union commission of the International Union of Biological Sciences (IUBS) and the International Union of Microbiological Societies (IUMS)**
- **It seeks to promote and foster activities that support the interests of culture collections and their users**
- **WFCC web site: http://www.wfcc.info**
- **Member collections of the WFCC register with the World Data Center for Micro-organisms (WDCM)**

WFCC achievements

- World Data Centre for Microorganisms ; a registry for all microbial and cell culture collections
- Publications such as Technical Information sheets, Resource Books, Newsletter
- Guidelines for the establishment and operation of culture collections
- WFCC web site – an information resource
- International Conference for Culture Collections
- Contribution to international initiatives: GBIF; ECSDG (shipping); OECD; WIPO
- Training courses on all continents
- 120 affiliated culture collections
- 600 corresponding members

Does the WFCC deliver all that is needed: Lessons learned

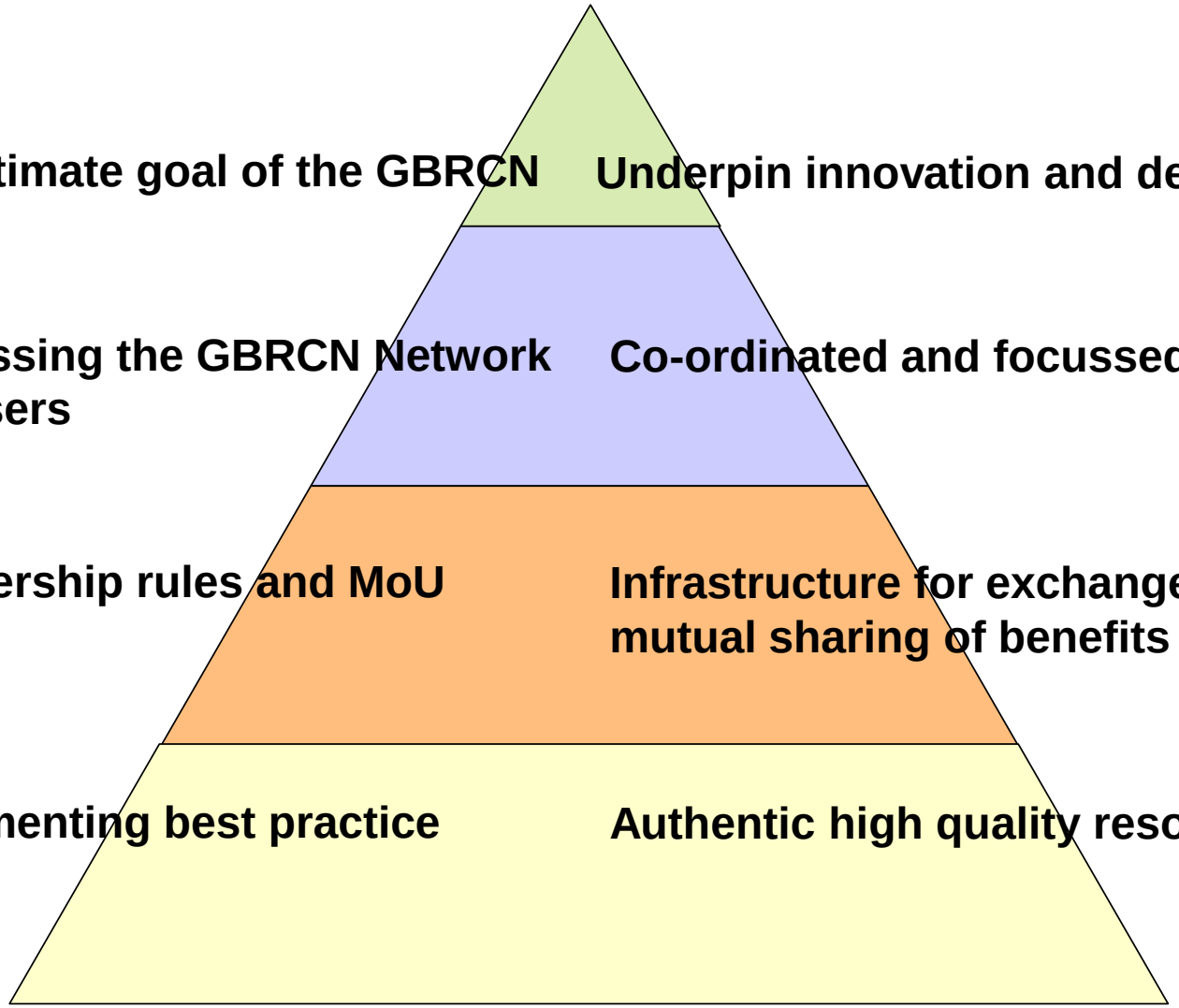
- Relies on individual voluntary input
- Needs
  - Permanent employed staff
  - Mandate to implement common standards and procedures
  - Strong Governance
  - Manageable agreed action plan
  - Adequate funding
  - Strong linkage to users and policy makers
  - A strategy to encourage deposits
  - Co-ordination of tasks

The GBRCN Demonstration Project

- Builds upon the OECD BRC initiative to address all organism domains, Animal; Plant; Microbes; Human derived material
- Initial focus on microorganisms
- Global co-ordination of laboratory-based microbial resource collections

- The German Government BMBF funds a small Secretariat to co-ordinate activities
  - Demonstrate that the GBRCN will deliver something new
  - A network to give better access to high quality materials
  - 22 candidate microbial domain BRCs in 15 countries contributing at their own cost

Underpinning life science research



Demonstration Project Partners and key activities

Brazil Belgium Canada China Finland
France Germany Italy Japan Kenya
The Netherlands Portugal Spain Uganda

- **Microbial culture collections at different stages of development with different remits**
- **Developing a common operational framework**
- **Implement best practice**
- **Test mechanisms for third party independent review**
- **Establish governance structures and membership requirements**

Establish the Global BRC Network 2012

European Microbial Resources Consortium – EMbaRC

European platform of future GBRCN

Improved protocols, authentication, preservation

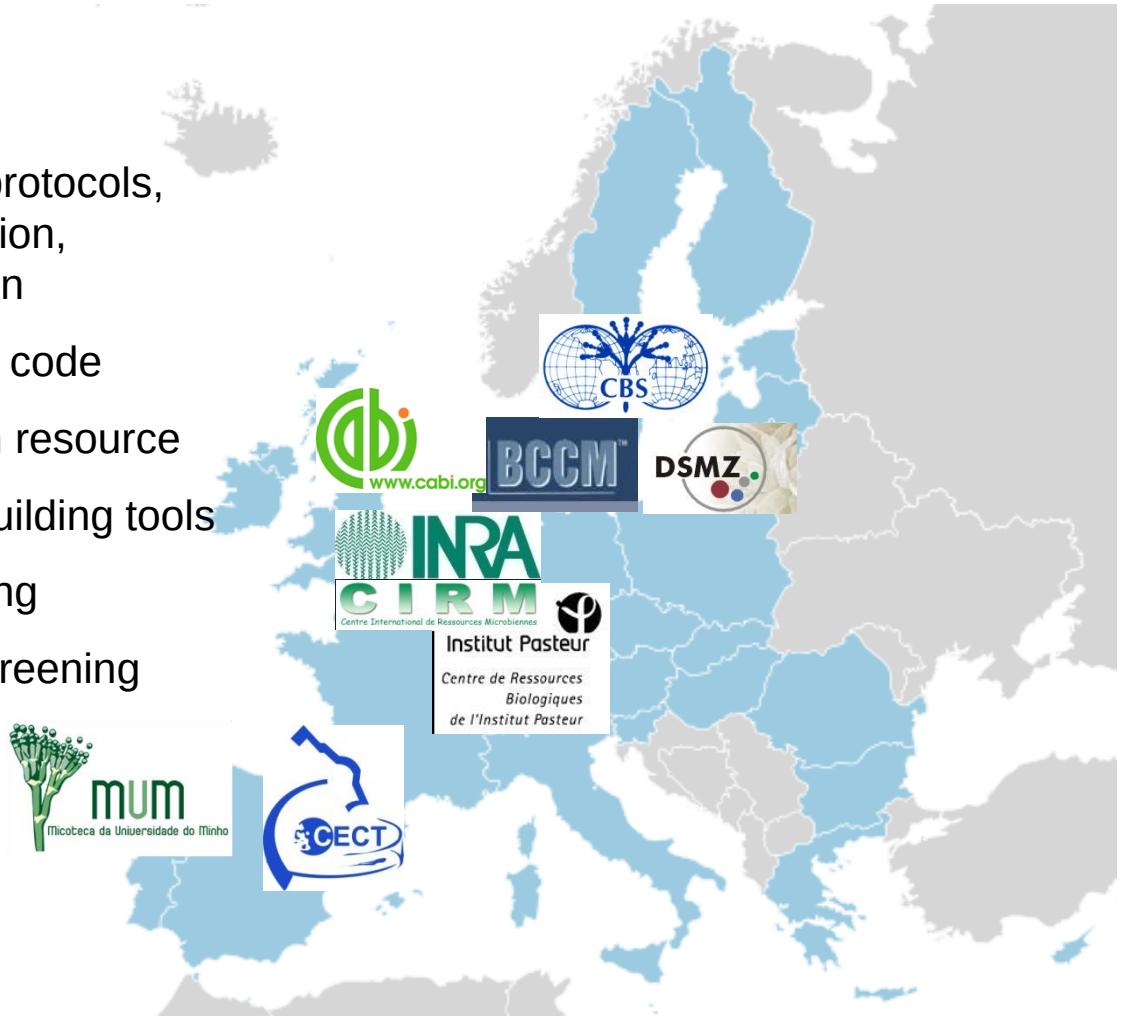
Biosecurity code

Information resource

Capacity building tools

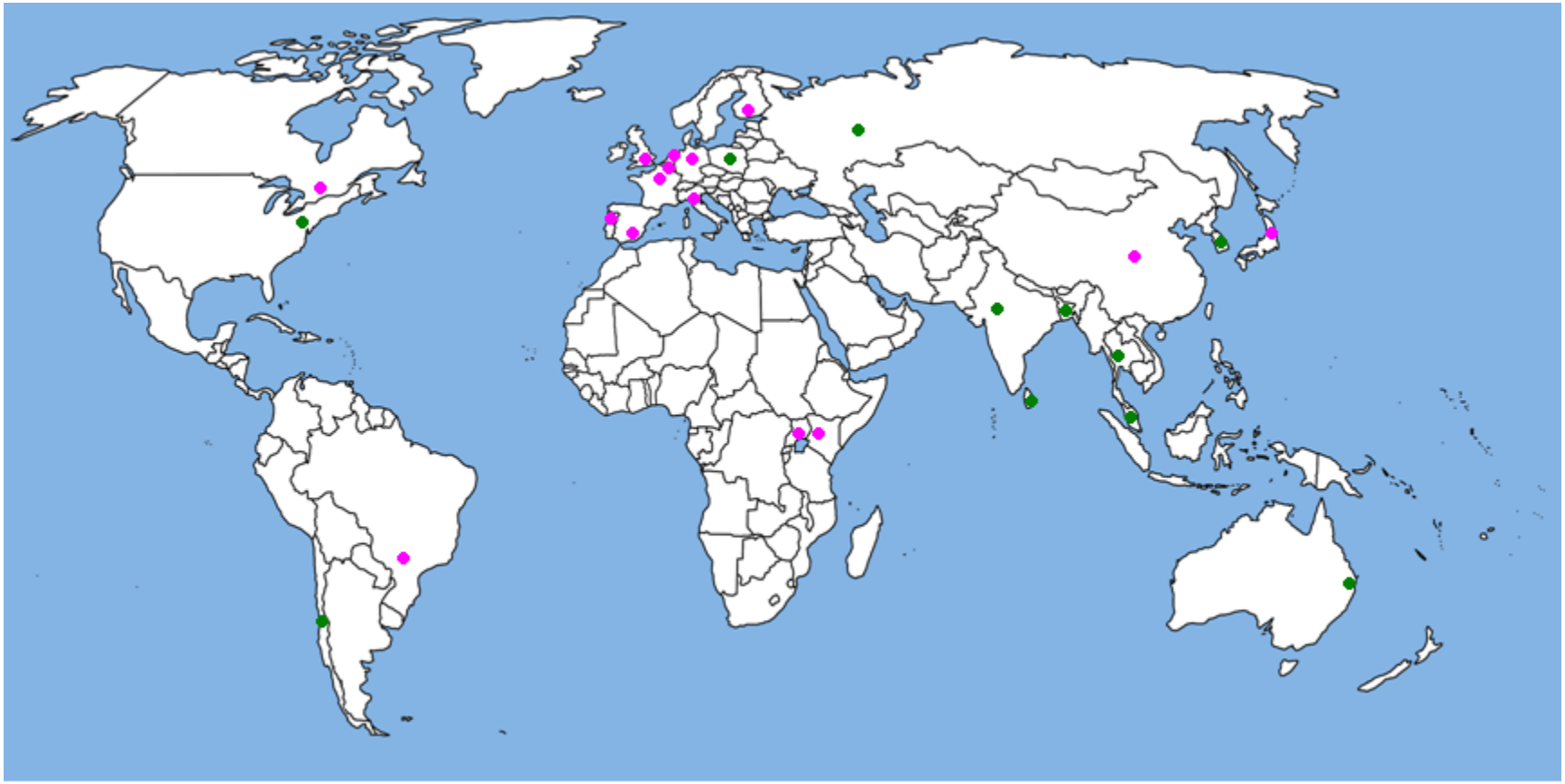
DNA banking

Enzyme screening



INRA, FR
Institut Pasteur, FR
CABI, GB
KNAW-CBS, NL
BCCM, BE
(3 legal entities: SPP-PS, UGent & UCL)
DSMZ, DE
UVEG-CECT, SP
UMinho-MUM, PT

Candidate BRCs



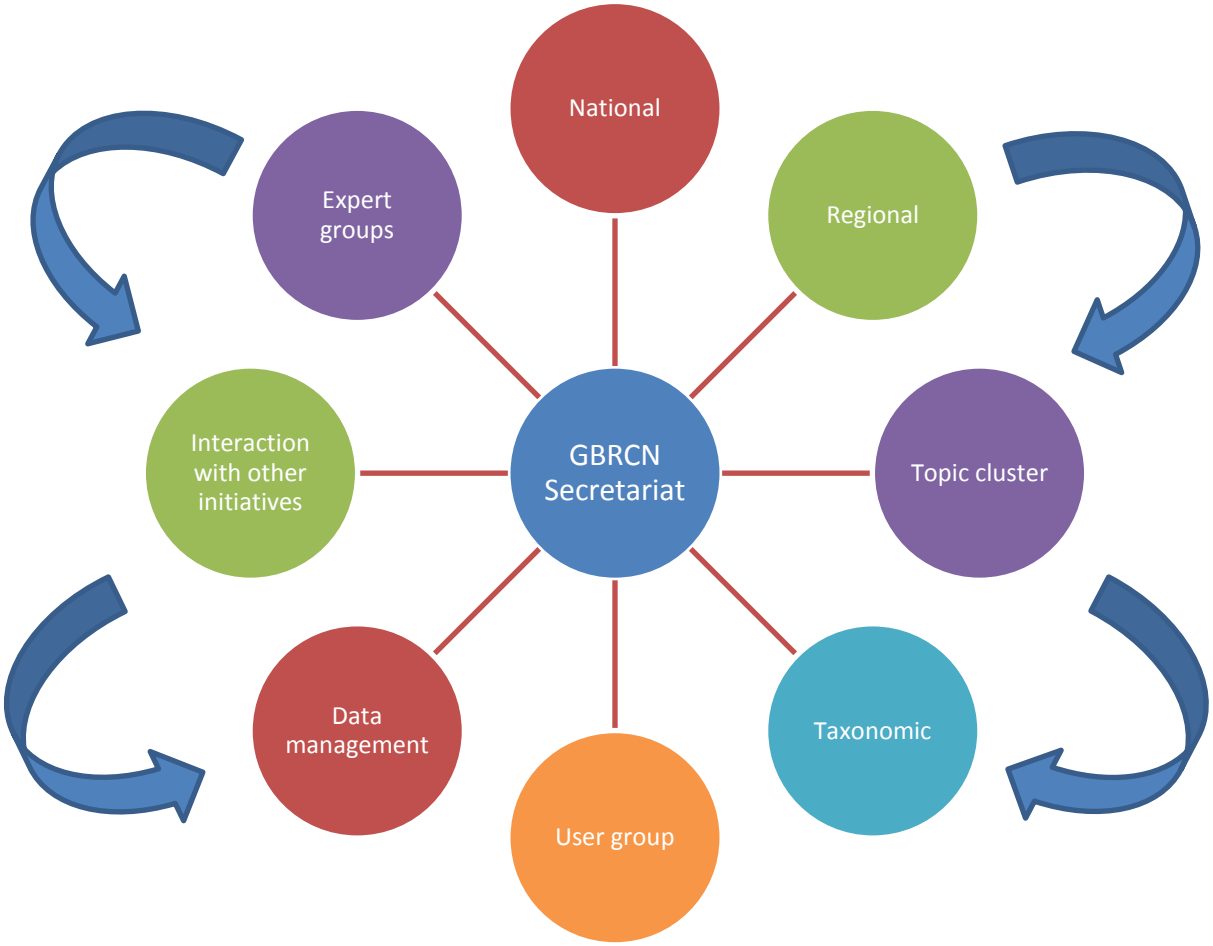
- GBRCN partners
- Interested in joining GBRCN

The future GBRCN goals:

- A network facilitating legal access to microbial resources
- User interface to develop improved output
- Common operations delivering best practice
- Harmonised mechanisms for compliance with legislation e.g. biosafety and biosecurity
- Common rules for materials and data exchange; user and member confidence
- A single voice to facilitate input to international initiatives
- A mechanism for capacity building
- A shared work programme to address key challenges

The aim to provide better defined resources and services with broader coverage to facilitate innovative research

GBRCN cluster operation



Transition of culture collections to BRCs

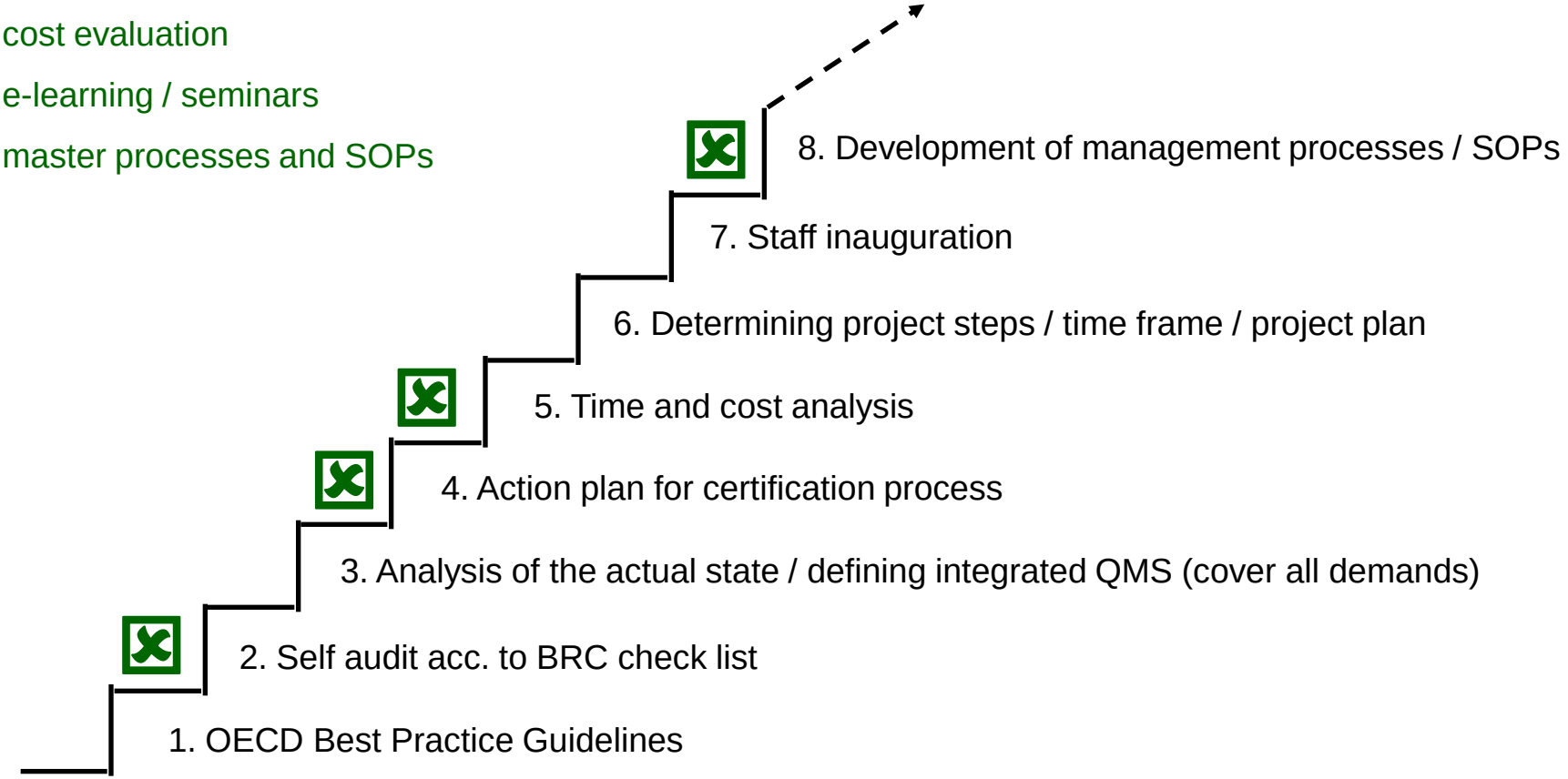
- Implement Best Practice to deliver authentic materials, preserved by state of the art techniques with validated information
- Assessment programme
- Share GBRCN protocols
- Training and facility enhancement
- Participation in research programmes to add value

The BRC - the next generation culture collection

Steps for implementing and auditing the OECD BRC Best Practices

☒ possible assistance by GBRCN

- checklists
- master project plan
- cost evaluation
- e-learning / seminars
- master processes and SOPs



Steps for implementing and auditing the OECD BRC Best Practices

☒ possible assistance by GBRCN

- checklists
- master project plan
- cost evaluation
- e-learning / seminars
- master processes and SOPs
- audit assistance by members
- contact to registrars

Revision audits

☒ 16. Certification audit -> 3rd Party Audit

15. Adoption of the system

☒ 14. Management-Review

☒ 13. QM-Assessment and weak point analysis

12. Internal Audits

☒ 11. Staff training and launch of the new inetgrated BRC QMS

10. Creating documentation

GBRCN member collections

- Associate culture collections
- Candidate members
- Implementation of the threshold level: the ABC of BRCs
  - **A**uthentication procedures implemented
  - **B**est practice in preservation
  - **C**onfirmed and validated information
- Certified BRCs - ISO 9001, AFNOR NF 596-900 – supplemented by OECD Best Practice
- Accredited BRCs – ISO 17025, ISO Guide 34 - supplemented by OECD Best Practice

The GBRCN Capacity building programme

The elements

- The BRC - the human resources, facilities, technologies and knowledge necessary for development
- Network capacity

The programme must use existing opportunities whilst upgrading mechanisms and reducing costs

Phased implementation programme as we grow

- An initial focus on implementation of best practices
- Electronic tools e.g. an initial interactive self-check on compliance
- Information system
- A second phase could help develop network synergies

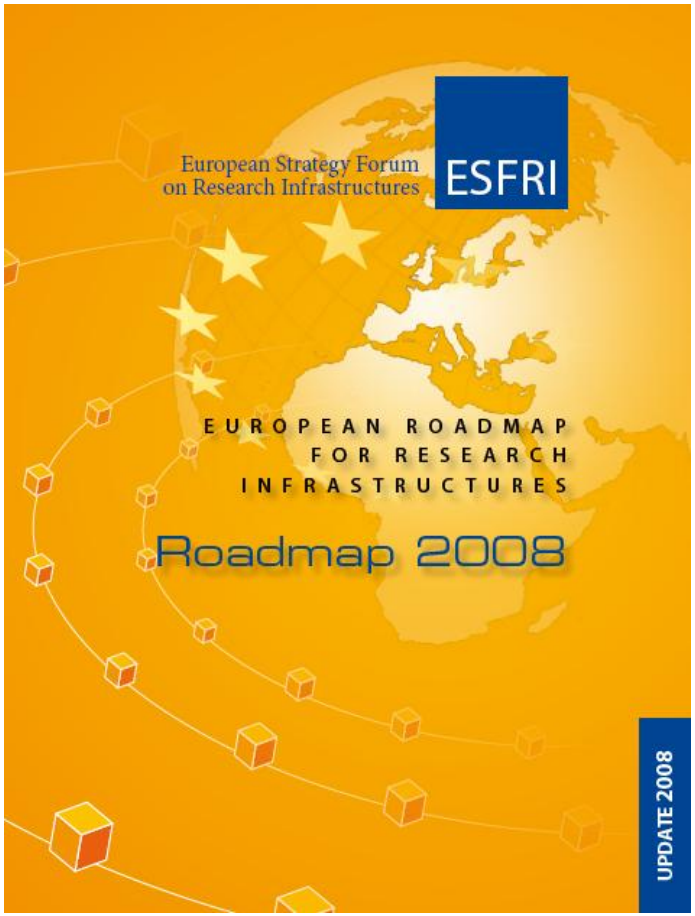
To be effective

- Engage current systems and funding mechanisms
- Requires co-ordination at an international level

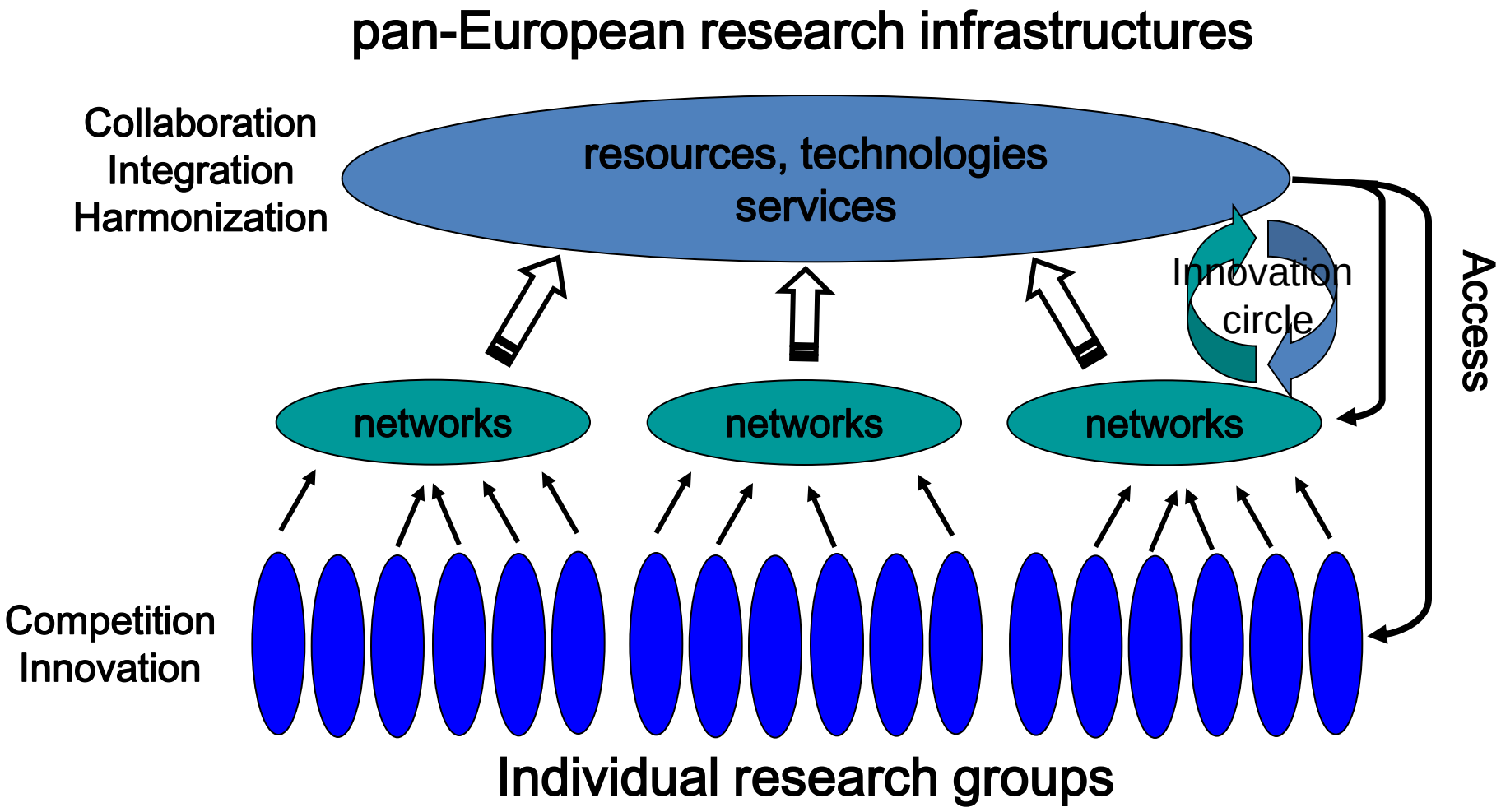
Implementation through funded projects

Managing Microbes

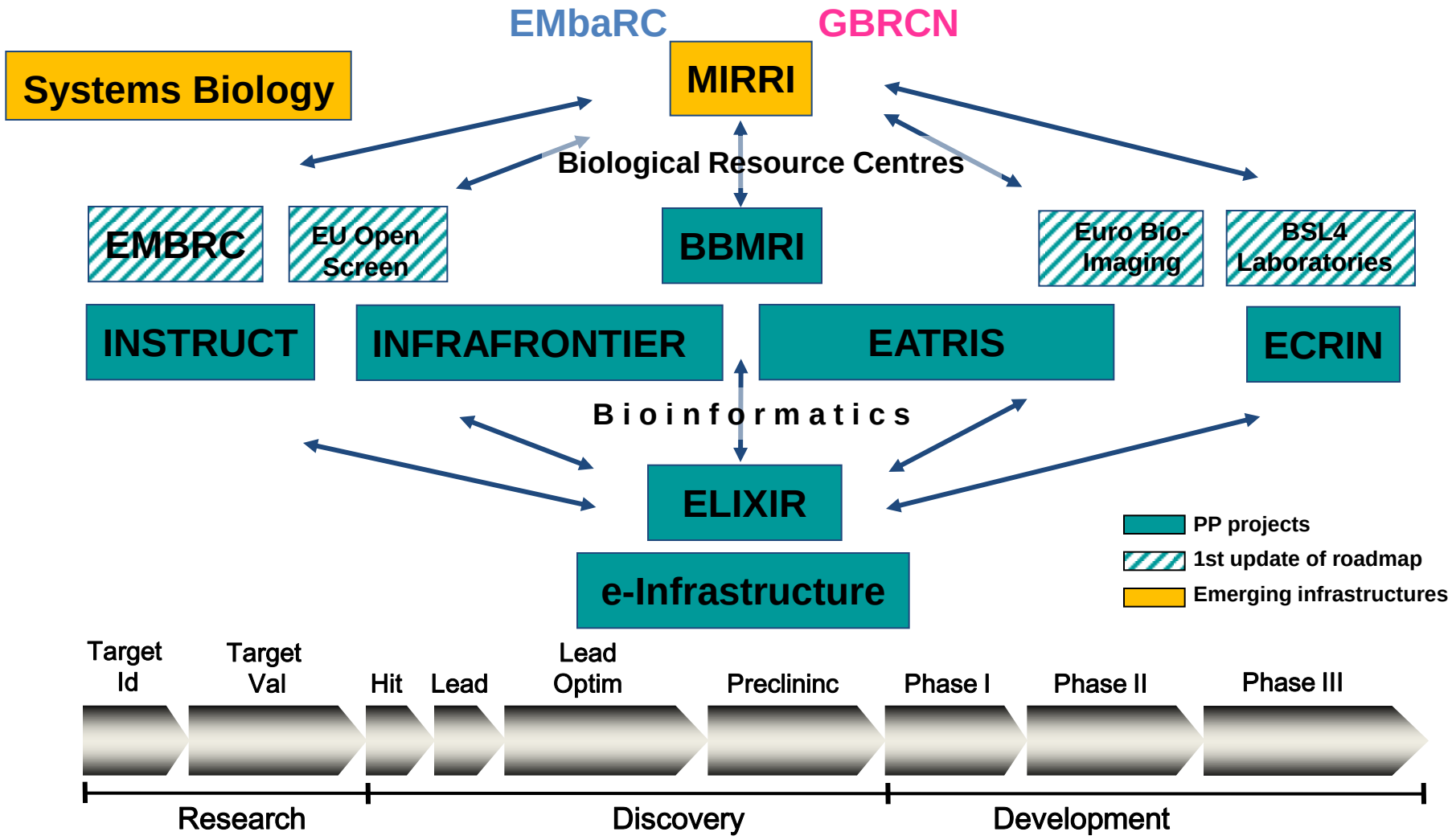
Securing the future: Update of the ESFRI Roadmap



The New Dimension in Life Sciences Research



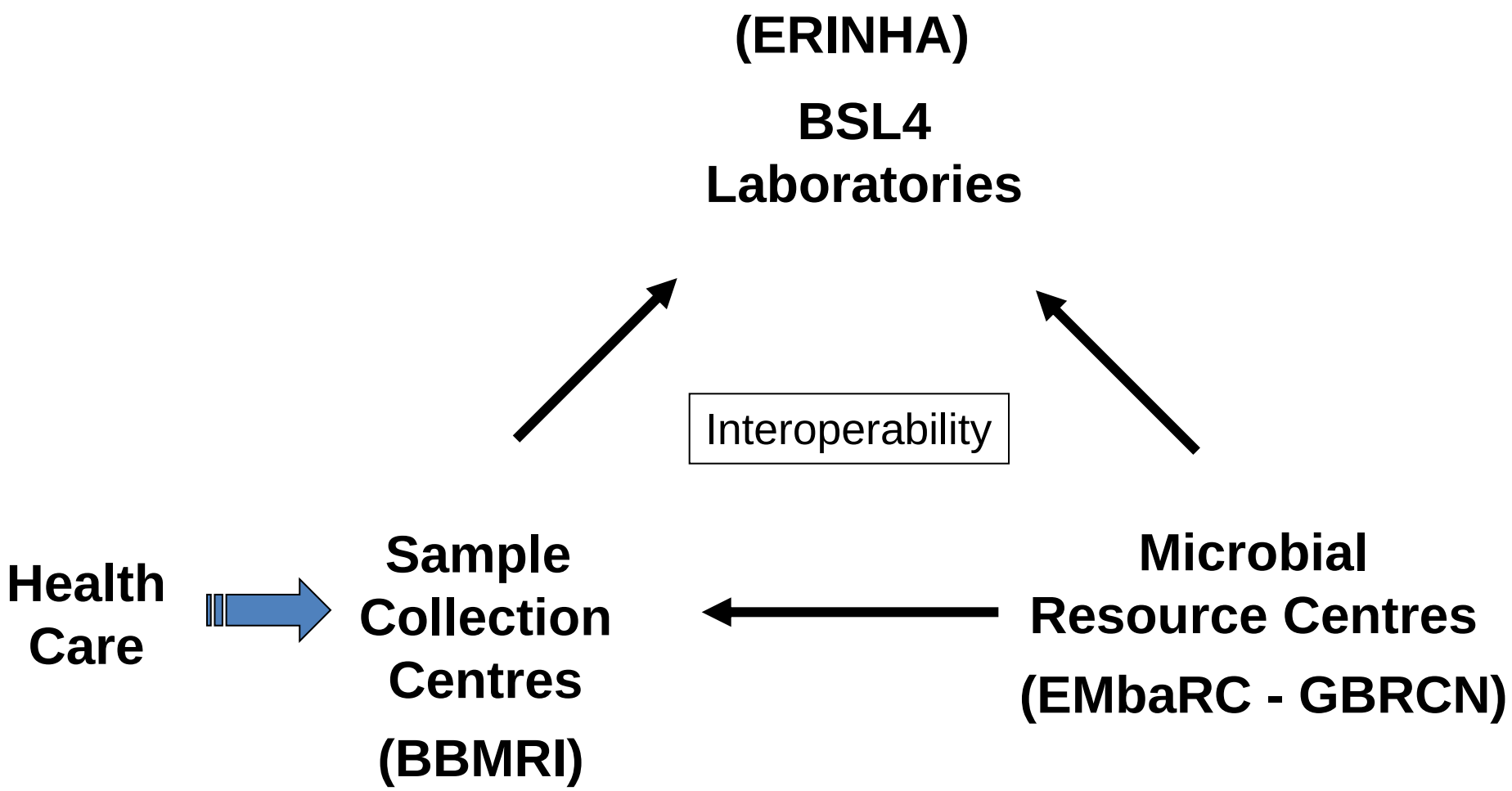
Synergies of ESFRI BMS Research Infrastructures



Microbial Resources Research Infrastructure - MIRRI

- **Enhancement of BRCS and broadening of resources and information**
  - **Investment by nations in facilities and human resources**
- **Co-ordination and focus of activities on resource and service provision towards key issues**
  - **guided by policy makers, programme funders and users**
- **Common policy on key issues of biosafety, biosecurity and legislation compliance**
  - **Facilitated and guided by policy makers**
- **Operational framework that facilitates exchange of materials and information**
- **Partners - 66 European BRCS – addition 400 globally**
  - **Policy makers, funders, International Organisations, Scientific communities, sector representatives**

A Concept for Europe

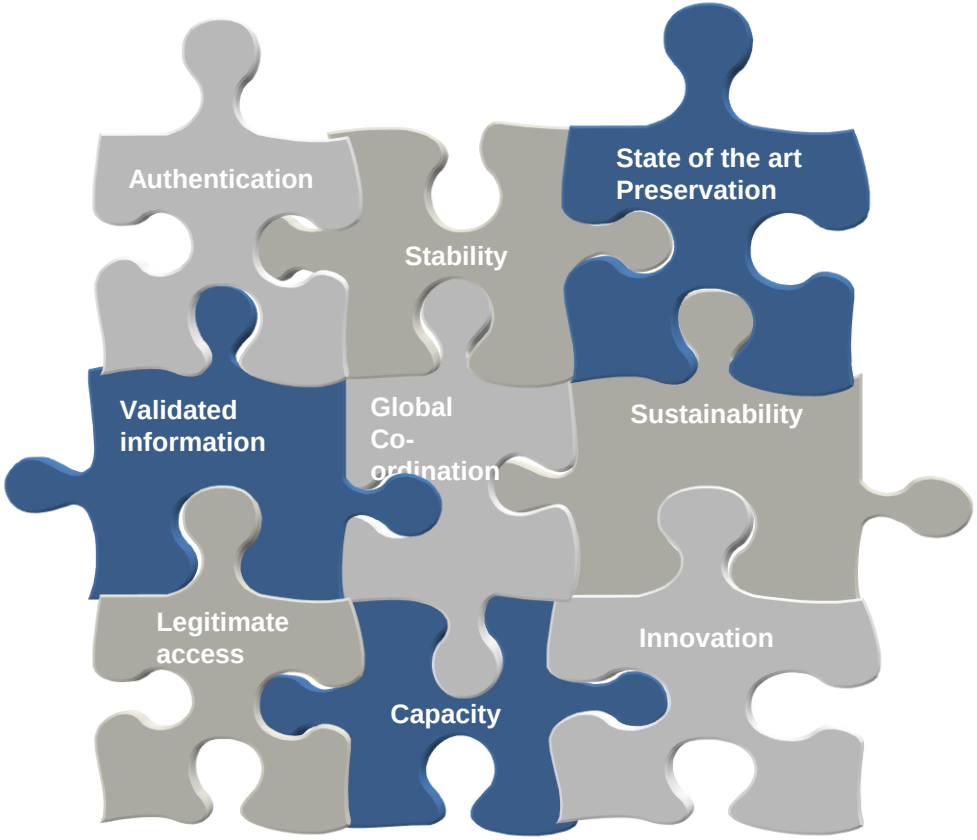


What a GBRCN will do for us

- **The GBRCN will strengthen global collaboration between collections and their users**
- **Prepare the resource centres**
  - **To be engines of innovation and burden sharing for efficiency and help deliver innovative solutions**
  - **To enable targeted action to global challenges**

Bringing it all together

WFCC as a scientific forum for discussion and advice representing collections, collection staff and users



GBRCN as an implementor and coordinator of common practice and standards

http://www.gbrcn.org

Bundesministerium für Bildung und Forschung

BRCs underpin the life sciences

Need to work together to address the challenges

Thank you

EMbaRC

- Come to the International Conference for Culture Collections Brazil 2010
  www.iccc12.info

Biosecurity and Microbial Collections

Joost Stalpers

CBS-KNAW Fungal Biodiversity Centre, Utrecht

Biological warfare: history -1945

- Romans: used dead animals to foul enemy water supplies (botulism)
- Medieval: Tartars used catapults to throw bodies of plague victims over wall into city of Kaffa
- 1500s: Aztecs conquered by Spanish explorers (Diego Velasquez, Hernan Cortes), carrying measles/ chickenpox/ smallpox/ etc.
- 1700s: Smallpox in blankets given to native Indians, by British army during the French & Indian war (1754-1763)
- 1918-42: Japanese army Unit 731, used plague on China, via spraying from planes, bombs and releasing rats
- 1943: British bioweapons testing using anthrax on Gruinard Island, off the Scottish coast. Backfired when the mainland was also contaminated with anthrax spores.
- 1942-1969: US bioweapons program based at Fort Detrick, Ma: showed in 1966 that release of *Bacillus subtilis* at one subway station could infect the whole system

Biological warfare: history >1945

- 1972: Biological Weapons and Toxin Convention
- 1972: Yugoslavia, smallpox outbreak, 175 cases, 35 deaths
- 1973-74: Russian Biopreparat biological weapons R & D program (Novosibirsk)
- 1979: Accidental release of inhalation anthrax (spores) from bioweapons plant in Sverdlovsk, USSR - 66 deaths
- 1984: Rajneeshee, *Salmonella typhimurium* food poisoning of salad bars, The Dalles and Wasco County, Oregon - to incapacitate voters to win local election
- 1988-90: Iraqi Al-hakam Factory, producing anthrax, botulinum toxin. Viruses added in 1990.
- 1990-95: Aum Shinrikyo: Ebola expedition to Zaire; botulinum toxin and anthrax tested around Tokyo (failed attempts); sarin nerve gas attack, in Tokyo, on 5 converging trains: 3800 affected, 1000 hospitalised, 12 dead - to attack national police/ ministries
- 2004: Antonina Prenyakova (Vector labs, Russia) died after sting incident while experimenting with Ebola

CBS

Biosecurity: classification

- **Biowarfare:** military conflict between nations: Iraq against Kurds
  – short to long term goals
- **Bioterrorism:** religion/ political/ ideological/ environmental groups attacking civilians: Aum Shinrikyo, metro attacks
  – short term goals
- **Bioattacks:** on individuals, e.g. HIV + man deliberately infects women (or vice versa), assassination (political), murder (personal), revenge etc.
  – short term goals

Bioweapons: advantages

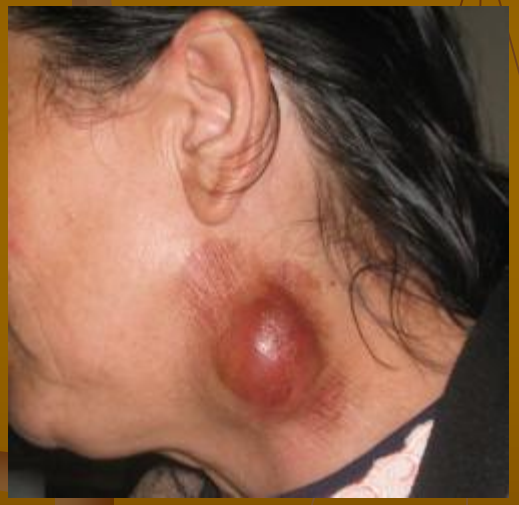
- No destruction of buildings (cf. nuclear/ conventional)
- Immunise/ prophylaxis for own side possible (cf. nuclear/ chemical)
- Self-perpetuating (c.f. nuclear/ chemical)
- Easy/ cheap to produce (cf. nuclear/ chemical / conventional)
- Delayed onset for: dissemination/ escape (incubation time)

Bioweapons: requirements

- Easy dissemination/ transmission, person to person (highly contagious)
- High mortality and major public health risk
- Causes public panic and social disruption
- Causing major damage to human environment
- Special action needed for public-health 'preparedness'

Category A Organisms

- Smallpox (*Variola major*)
- Marburg/Ebola (filoviruses) and Lassa/Junin (arenaviruses)



- Anthrax (*Bacillus anthracis*)
- Tularaemia (*Francisella tularensis*)
- Plague (*Yersinia pestis*)

- Botulism toxin (*Clostridium botulinum*)

Targets

- Humans (direct)
- Economical/environmental (indirect)
  - lifestock
  - crops
  - human environment

- viruses
- bacteria
- fungi

Controled of Dual-use Goods

A BRC has procedures to check the validity of customers that wish to receive dangerous organisms and if in doubt does not supply

- Australia Group (1990), now 34 members
  - to prevent supply of substantial harmful organisms to mala fide third parties
- Biological and Toxin Weapons Convention (BTWC), now 162 signatories
  - prohibits the development, possession and use of biological weapons

BRC and Dual-Use

- Accept only written orders
- Check if customer's country is an embargo country
- Inform after intended purpose and use of strain
- Restrict distribution of strains to shipping department
- In case of doubt, contact relevant national office

Biosecurity principles for BRC's

- Physical security
- Security management of personel
- Security management of visitors/guests
- Material control
- Material supply
- Transport security internal and external
- Information security
- Risk assessment

Biosafety Classification of Hazardous Micro-organisms

- 1. Most unlikely to cause human disease
- 2. May cause human disease
  - a possible hazard to laboratory workers but unlikely to spread in the community. Laboratory exposure rarely produces infection and effective prophylaxis or treatment is available
- 3. May cause severe human disease
  - a serious hazard to laboratory workers. Presents a risk of spread in the community but usually effective prophylaxis or treatment.
- 4. Causes severe human disease

  a high risk of spread in the community and there is usually no effective prophylaxis or treatment

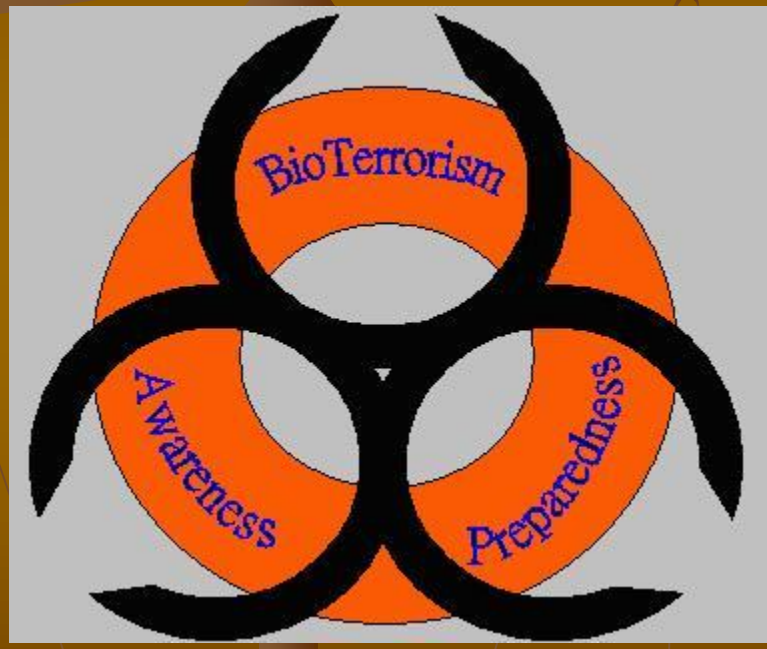
Hazard classification for biosecurity

- 4 categories: Neglegible, Low, Moderate, High

However: based on threats against human, not for example crops

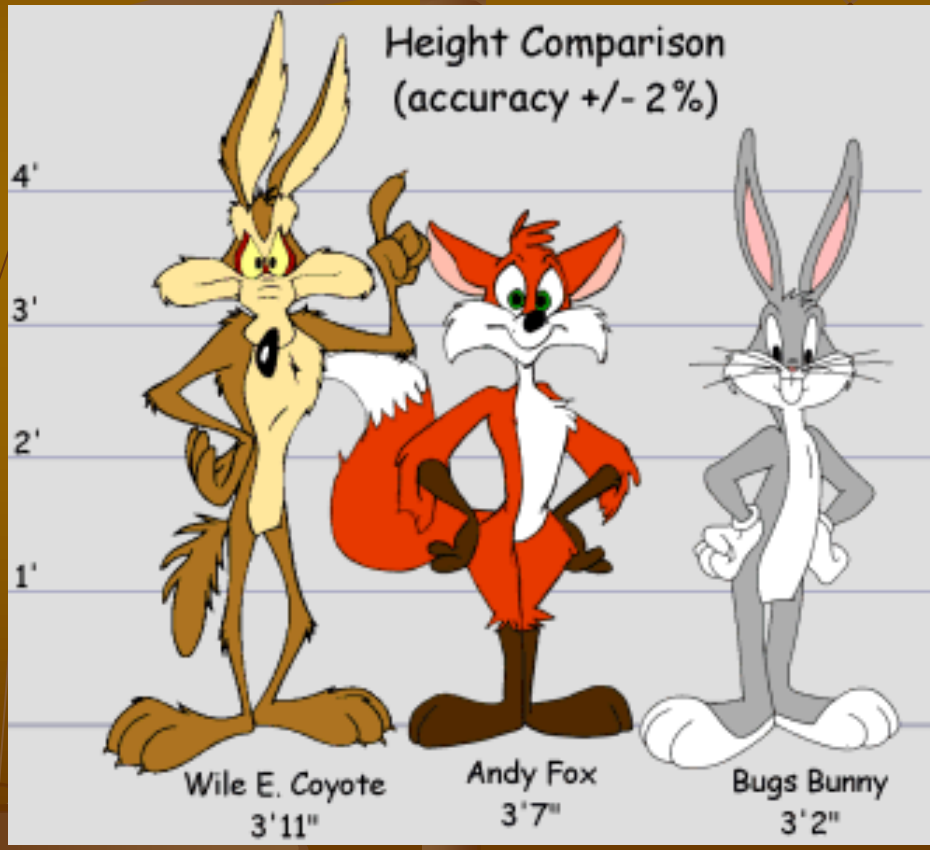
No common lists for human or animal diseases (no agreement among countries)

No uniform evaluation for plant pathogens possible (host, presence, possible occurrence, invasion risk etc.)



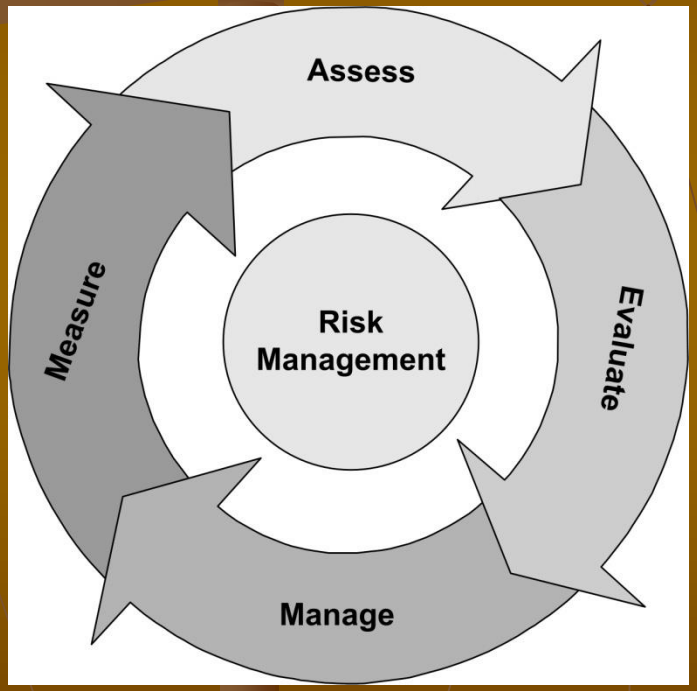
Risk Assessment, current practice

- Intended for biosafety, not biosecurity
- Assessment by comparison
  - Substrate
  - Relatives
  - Tests (toxin production)
  - Stay on the safe side
- It worked, up to now



Expected Risk Assessment by BRC's

- Identify sources of potential harm
- Assess potential misuse
  - availability, amplification, necessary skills and knowledge, dispersal, environmental viability (survival chances), effective countermeasures
- Assess virulence
  - infective dose, pathogenicity, lethality, incubation time, transmissibility



What do BRC's need?

- Information
  - Appropriate legislation in various countries
  - Lists of quarantaine organisms (WFCC, GBRCN)
  - Access to external experts
- Testing
  - Access to testing laboratories or possibility to delegate such tasks

How can BRC's cope?

- Strict application of conditions impossible
- No education in 'terrorist thinking'

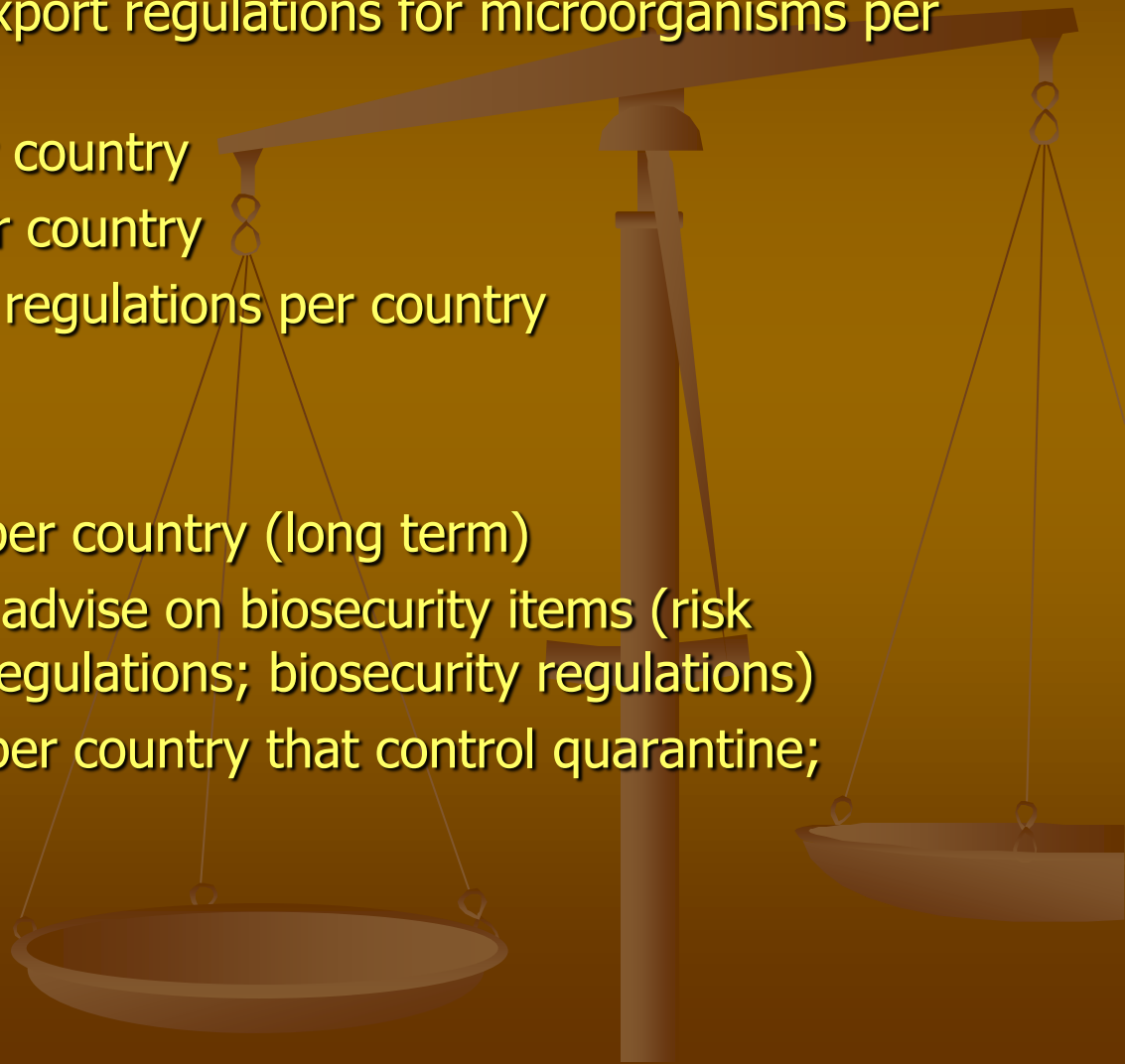
- Communication essential (GBRCN)
- Panels of experts

- Stay in contact with authorities
- Avoid panic-inspired actions (IATA, WHO)

- BRC's should develop a Code of Conduct

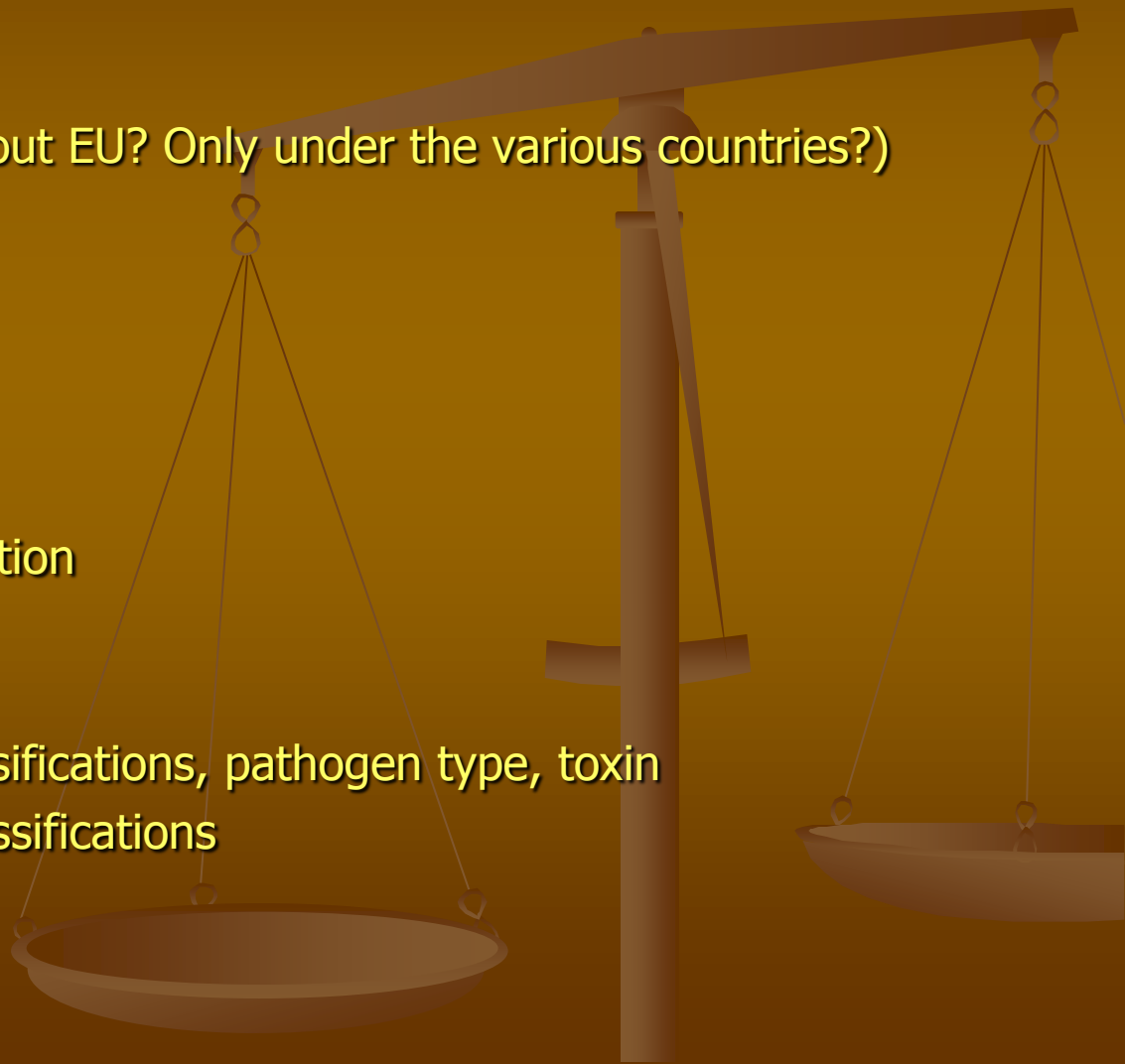
Biosecurity Database - GBRCN

- Legislation: import and export regulations for microorganisms per country
- Transport regulations per country
- Quarantine organisms per country
- Biosafety and biosecurity regulations per country
- List of human pathogens
- List of animal pathogens
- Lists of plant pathogens per country (long term)
- List of experts that could advise on biosecurity items (risk assessment; quarantine regulations; biosecurity regulations)
- Addresses of authorities per country that control quarantine; biosecurity; biosafety



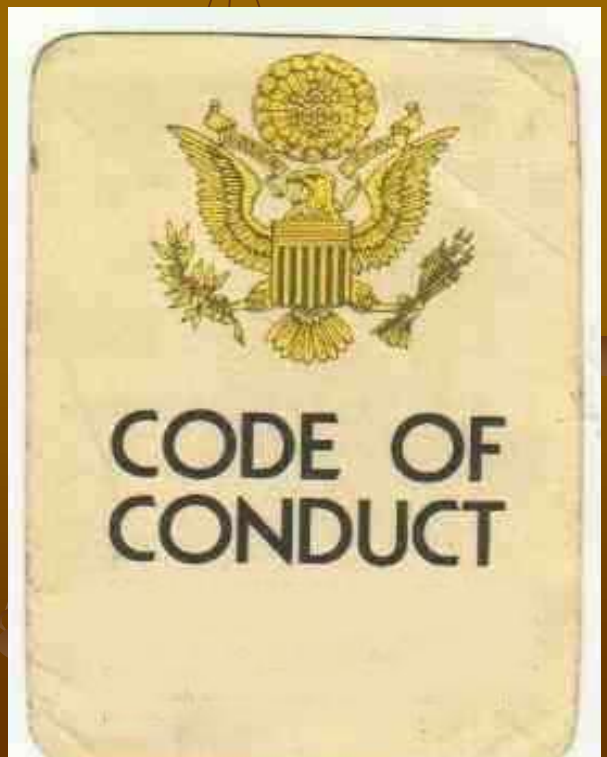
Structure of database

- Fields
  - Name organism
  - Name country (what about EU? Only under the various countries?)
  - Pathogen type
  - Toxin
  - Legislation identity
  - Biosafety classification
  - Biosecurity classification
  - BSL (handling) classification
- Connections between fields
  - Country - Legislation
  - Organism – various classifications, pathogen type, toxin
  - Legislation – various classifications



EMbaRC and GBRCN

- List of relevant literature (December 2009)
- Publication of database (April 2010)
- Draft Code of Conduct
- Workshop
- Final text



Microbial Culture Collection of "Cantacuzino" Institute

Present and perspectives of development

Olguta Dracea, Camelia Babes, Rodica Oancea, Anca Israil, Irina Codita, Adrian Onu, Gabriel Ionescu

"Cantacuzino"
National Institute of Research & Development
for Microbiology and Immunology

"Cantacuzino" Institute (C.I.) as National Research Institute in Microbiology and Immunology

- **The largest** in Romania in the field of medical microbiology
- **Main activities** since it has been founded in 1921

  - **Basic and applied research** in medical microbiology and immunology

  - **Production** for national purposes:

    - vaccines
    - therapeutic sera
    - media and biological reagents for diagnostic in medical microbiology
    - animals for experiment and control of biologicals used in human

  - **National reference activity in medical microbiology** and rapid answer for epidemiological purposes

  - **Training** in medical microbiology and immunology

Department of Microbial Culture Collection

- **Founded in 1921**
- **Main duties**
  - supplier of reference strains for microbiological laboratories at a national level
  - safety conservation for production strains of C. I. laboratories
  - taxonomic identification of the new isolated strains
  - collaboration to other C. I. laboratories for the study of:
    - antibioresistance factors
    - bacteriological virulence factors,
    - genetically modified microorganisms etc.

Contribution to development of medical and academic activities, scientific research in Romania

Storage of reference strains

- 1550 microbial cultures preserved by freeze drying
    - 35 bacterial genera
    - 17 fungal genera

Mainly, this collection included:

- Antibioresistant strains (*S. aureus, Pseudomonas aeruginosa)* isolated from nosocomial infections in different periods of time
- Enteric bacteria - reference antigenic cultures for Enterobacteriaceae (*Salmonella* sp. especially), *Vibrio* sp. obtained from the other international collection or particular strains isolated in large epidemics in Romania
- Some other bacterial cultures pathogenic in humans and animals with particular reference to genus *Bacillus*

Supplier of reference strains

A new updated catalogue of microorganisms (**2006)**, available to be distributed by request to:

- Research centers in medical and academic institutes

- Clinical hospital laboratories

- Regional laboratories for epidemiological microbiology and quality control (reference strains)

Present and perspectives of development

In **2005**, within BIOTECH project, a pilot collection was initiated, based upon the Microbial Culture Collection founded in 1921, intended to become the starting point for the future modern microbial collection of C.I. in accordance with the international requirements

- Objectives:
  - the phenotypical re-characterization of microbial strains from collection **(145 microbial strains during 2006-2008)**
    - **the strain characterization recording card** (for being used in the electronic databases)
  - freeze-drying strains preservation
  - determining: - the purity
    - the viability index after freeze drying
  - quality control certificate for strains supplied
  - storage

Present and perspectives of development

In **2008**, a collaboration with Centre for Scientific Medical-Military Research has started

- identification of microorganisms from Microbial Culture Collection using protein "fingerprints" determined by matrix-assisted laser desorption ionization–time of flight (MALDI-TOF) mass spectrometry.

Perspectives in near future

- The participation of the personnel of Microbial Culture Collection at EMbaRC training programme in collection management, authentication, characterisation, preservation, databasing storage of micro-organisms

- A new location of Microbial Culture Collection in the purpose to be achieved an adequate space according to legal requirements and OECD and WFCC guidelines

Perspectives in near future

- Double preservation system :
  - freeze dried
  - deep-frozen at - 80°C or in liquid nitrogen

- Molecular identification based upon sequencing of 16S rRNA gene

(method established in Medical Epidemiology Laboratory by Monica Straut and colab.)

Perspectives in near future

- Improvement of the strains transfer system according with the new regulation of biosafety and biosecurity
- Improvement the informatics system for data registration and set up of an electronic archive
- Create the web site of the Microbial Culture Collection
- Certification of the Quality Management System (ISO 9001:2008)

SCIENTIFIC AND TECHNICAL EXCHANGE A POTENTIAL IMPACT ON NON PROLIFERATION REGIME

M. Neguț, G. Ionescu

CANTACUZINO INSTITUTE
BUCHAREST, ROMANIA

BIOAGGRESSION CONCERNS

DERIVED OF

AGGRESSIVE

- MILITARY
- TERRORIST

PROLIFERATION
REAL THREAT

DUAL USE OF BIOLOGICAL AGENTS

PEACEFUL

- SCIENTIFIC, PRODUCTION, DEVELOPMENT
- ACTIVE EXCHANGE SCIENTIFIC / TECHNOLOGICAL (GLOBALIZATION)

Applications far different from those originally intended

NON PROLIFERATION ART.III

BTWC PROVISIONS

COOPERATION ART.X

BIOAGGRESSION POTENTIAL

MICROBIOLOGICAL AGENTS

NATURAL
- EXISTING
- DISCOVERED

GENETICALLY
- OBTAINED
- MODIFIED
- SYNTHETIC

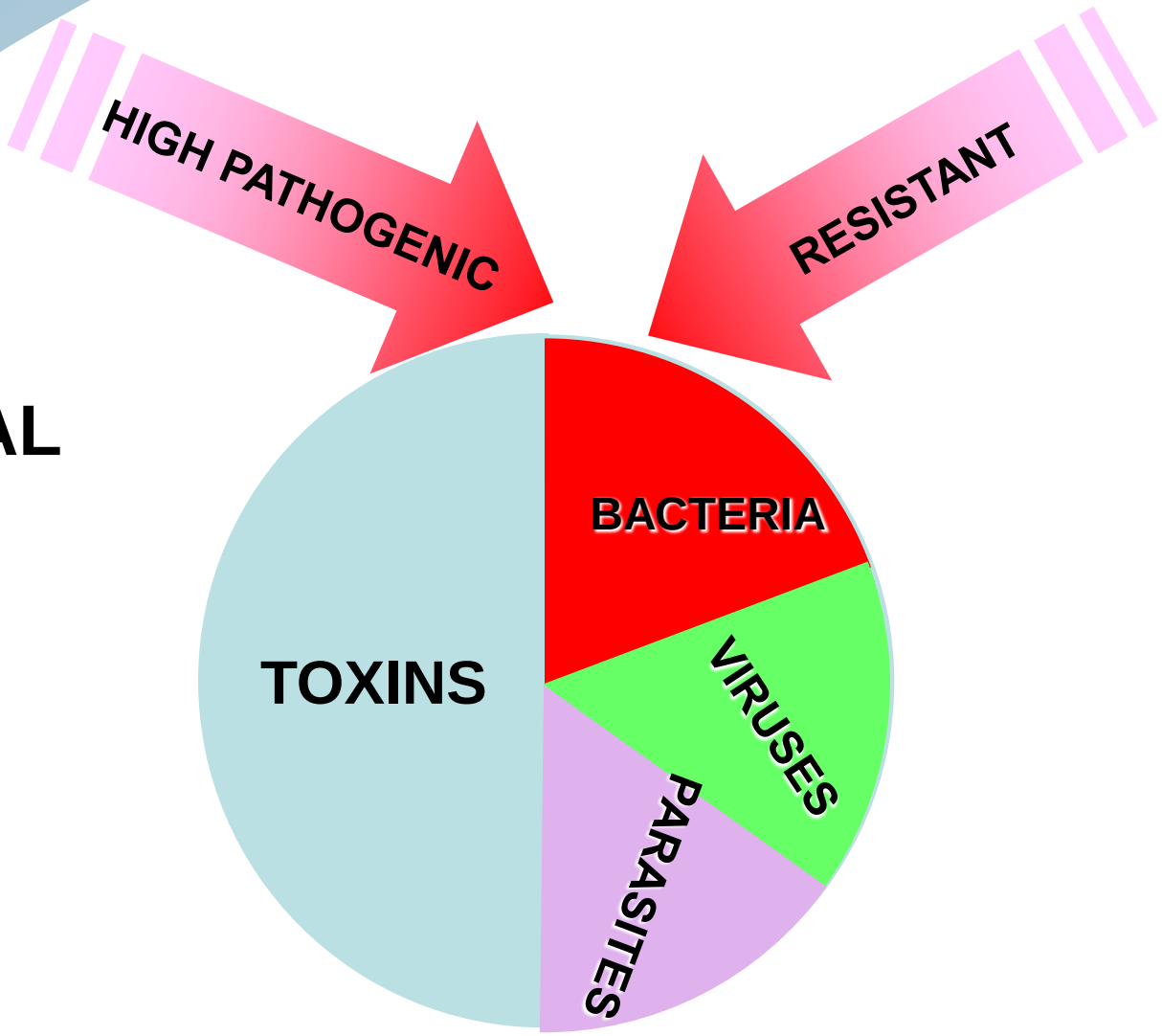
BIOREGULATORS

MEDIATORS
- CYTOKINES
- NEUROTRANSMITTERS
- PEPTIDES-HORMONES

(New technological developments / dissemination of these mediators)

BIOAGGRESSIVE AGENTS POSSIBLE

A. NATURAL



BIOAGGRESSIVE AGENTS POSSIBLE

TOXIN PRODUCING

- NEW – UNKNOWN
- VERY AGGRESSIVE

B. GENETICALLY MODIFIED

HIGH VIRULENT

PATHOLOGY SEVERE
- **ATYPICAL**

PROPHYLAXY:
- **MISSING**

NEW ?

CURRENT DETECTING/ IDENTIFYING METHODS

- **PHENOTYPING - UNEFICIENT**
- **GENOTYPING - USEFUL**

THERAPY UNADAPTED

DRAMATICAL INCREASE OF NUMBER AND VARIETY OF PATHOGENS

BIOAGGRESSIVE AGENTS POSSIBLE

GENETICALLY OBTAINED

SYNTHETIC MICROORGANISMS / RESEARCH

RARE ENCOUNTERED HIGH PATHOGEN (NEW ENTITIES)

- TAXONOMIC UNKNOWN
- PATHOGENIC DIFFERENT (ex. unmetilated synthetic genome / prevent the host recognition)
- AUTOMATED RESEARCH

CONTROLLED OR EXTINCT PATHOGENS

Already demonstrated

- WHO ADVISORY COMMITTEE ON VARIOLA VIRUS RESEARCH: Available technology could recreate VARIOLA VIRUS GENOME by chemicals sythensis

- ROBOT SCIENTISTS – Characterised network in biological systems

DRAMATICAL INCREASE OF NUMBER AND VARIETY OF PATHOGENS

BTWC

INFORMATION

- SCIENTIFIC MEETINGS
- INT. SOCIETIES
- PUBLICATIONS
- ELECTRONIC INFORMATION (NET)

COOPERATION TRANSFER

SCIENTIFIC

RESEARCH

COMMON PROGRAMMES
- BILATERAL
- MULTILATERAL
  - DEVELOPING STUDIES
  - DATA BASE ACCESS

EDUCATION

- GRADUATE
- POST-GRADUATE
  - SPECIALISTS
  - DOCTORAL

DEVELOPMENT

DUAL USE RESEARCH DURING THE RESEARCH PROCESS

CONCERNS

PHASE I - PREPARATION

PRESENTATION OF PRELIMINARY DATA

DISCUSSIONS WITH COLLABORATORS

DRAFT APPLICATION REVIEW BY PEERS INSTITUTION ADMINISTRATION ETC.

REVIEW BY INSTITUTIONAL COMMITTEE MEMBERS

PROJECT DESCRIPTIONS ON INSTITUTION WEB PAGE OR IN PI CV

REVIEW BY IC STAFF AND STUDY SECTION

RESEARCH AWARD NOTICES/DESCRIPTION ON CRISP ETC.

DUAL USE RESEARCH DURING THE RESEARCH PROCESS

TRAINING OF LAB STAFF, STUDENTS, VISITING SCIENTISTS

PRESENTATION AT DEPARTMENTAL SEMINARS

PHASE II - ONGOING RESEARCH

PRESENTATIONS OR POSTERS AT NATIONAL OR INTERNATIONAL CONFERENCES

EVALUATION BY OTHER FACULTY IF THESIS PROJECT

DUAL USE RESEARCH DURING THE RESEARCH PROCESS

PEER REVIEW OF MANUSCRIPT/ RESEARCH PRODUCT

PHASE III - DEVELOPMENT

PUBLIC DISSEMINATION OF RESEARCH FINDINGS OR PRODUCTS

BTWC

COOPERATION TRANSFER

TECHNICAL

TECHNICAL PROCEDURES

PRODUCTION
- KNOW HOW
- CONTROL
- BIOSAFETY

BIOLOGICALS

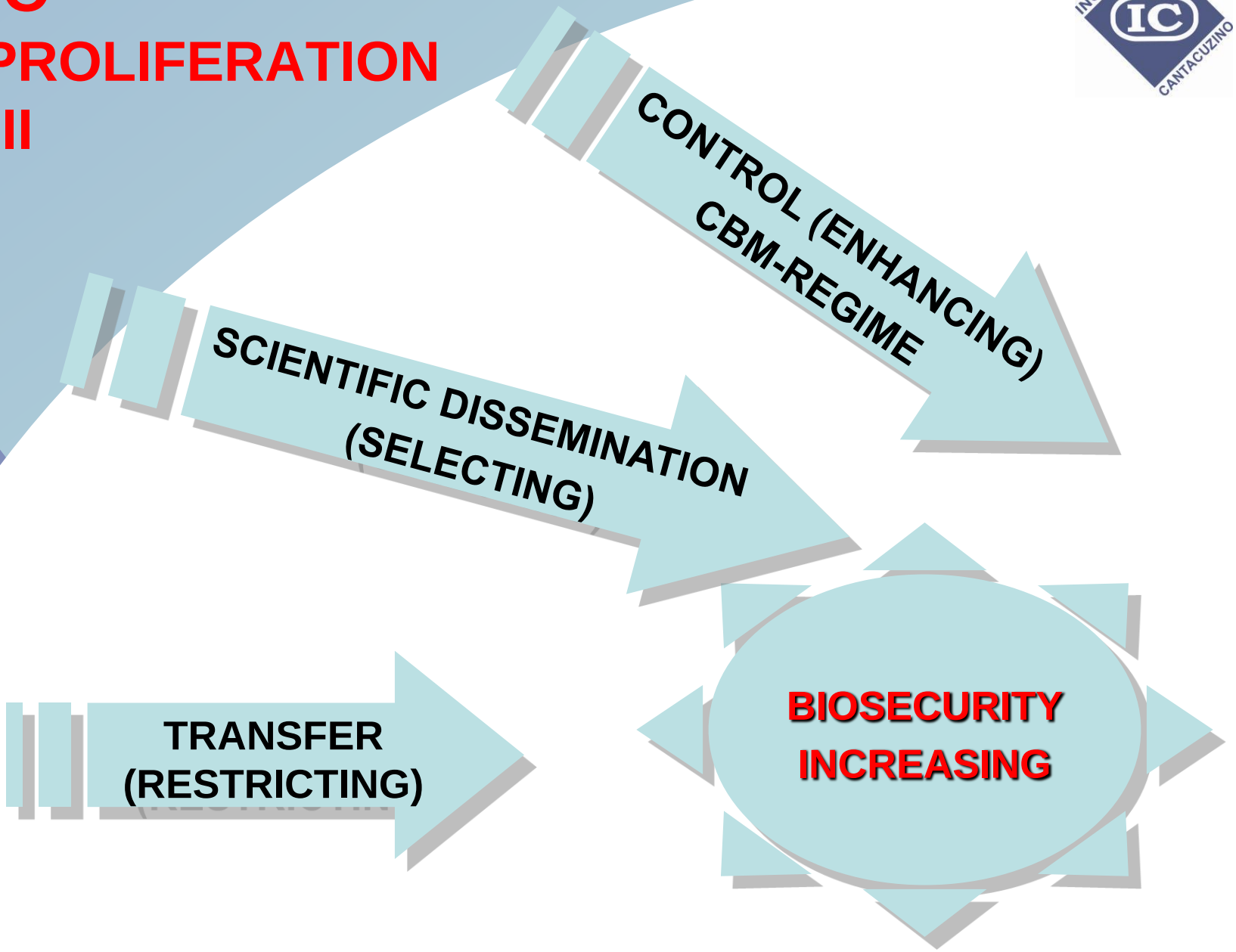
REAGENTS
- CULTURE MEDIA
- ENZYMES
- NUCLEIC ACIDS
- CULTURES
  - MICROBIAL
  - CELL

HIGH TECH

EQUIPMENT
- PERFORMANT (SYNTHETIZERS)
- TARGETED
- AUTOMATED

DEVELOPMENT

BTWC
NONPROLIFERATION
ART.III



BTWC – NONPROLIFERATION REGIME

TRANSFER: RESTRICTIONS/CONTROL

KNOW HOW

- DNA DATABASE
- SEQUENCES INFORMATION
SCREENING
SYNTHESIS

TECHNOLOGICAL

EQUIPMENTS
PRODUCTION
RESEARCH
PERFORMANT IT
GENETICALLY MACHINES
(SYNTHETIC BIOLOGY)

BIOLOGICALS

- CONTROL TRANSFERS
  - Microorganism
  - Raw materials
  - Enzymes
  - Commercial genes/ sequences

CONTROL (ENHANCING)

CBM – REGIME

VISITS

- ON SITE

DATA EXCHANGE

- Research Centres
- Programmes of defence
- Informations
  - Epidemiological
  - Accidents
- Promotion
  - Contacts
  - Publication of results

DECLARATIONS

- Legislation/ Regulations
- Past activities
  Defensive / Defensive res.
- Vaccine production facilities

SYNTHETIC BIOLOGY

NEW BIOSAFETY REGULATIONS

- Genetic engineering regime
- Safety and security working recommendation

SELECT AGENTS

NEW BIOSECURITY

- Harmonization of screening strategies
- Code for providing synthetic biological products
- Automated screening of commercial gene sequences
- Licensing equipment

EDUCATING SCIENTIST ON DUAL USE ISSUES

WARSAW WORKSHOP – 2009

- Strategies
- Educational
  - Programmes
  - Practice
- Ethics

CONCLUSION

AN OLD ADAPTED PRINCIPLE TO BIOTERRORISM

PREVENTING IS BETTER THAN COMBATING

European Consortium of Microbial Resource Centres

TOP

Training and Outreach Programme
Transnational Access Grants

Training and Outreach Programme (TOP)

- An opportunity for scientists to **stay at one of 12 EMbaRC laboratories** and benefit from expert advice and advanced equipment
- **15 different training options** in collection management, identification of bacteria and fungi by state-of-the-art techniques or phenotypic screening of a collection of strains
- **Grants:** EMbaRC will cover the bench fees, travel and subsistence costs

TOP is organised with the support of the
7th Framework Programme, Research Infrastructures Action

Qualifications required for eligibility

1. The user group leader and the majority of the users must work in an institution established in a Member State (the EU-27) or an Associated State to FP7.

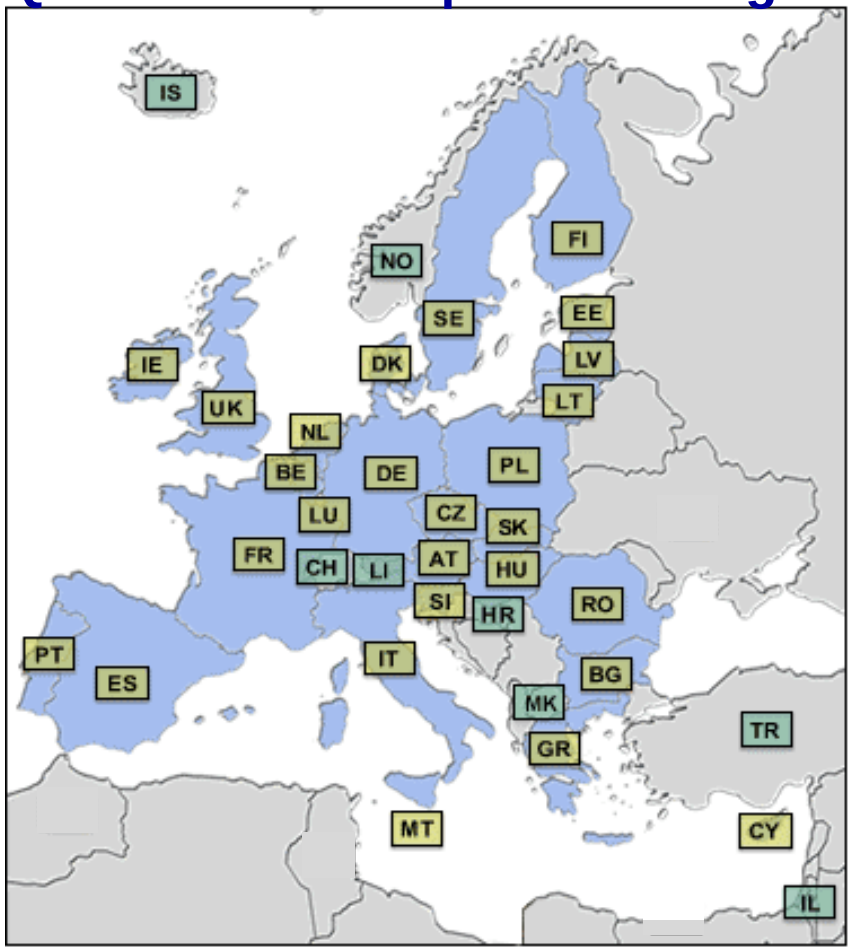
2. The user group leader and the majority of the users must work in a country other than the EMbaRC host institution.

3. The user or the user group leader shall hold a doctor's degree or have a similar research experience (minimum 5 years).

4. Some training schemes require specific skills; check these specificities in the synopsis of each work session listed on the website.

5. Only user groups that are entitled to disseminate the foreground they have generated under EMbaRC project are eligible to benefit from access free of charge to the infrastructure.

Qualifications required for eligibility

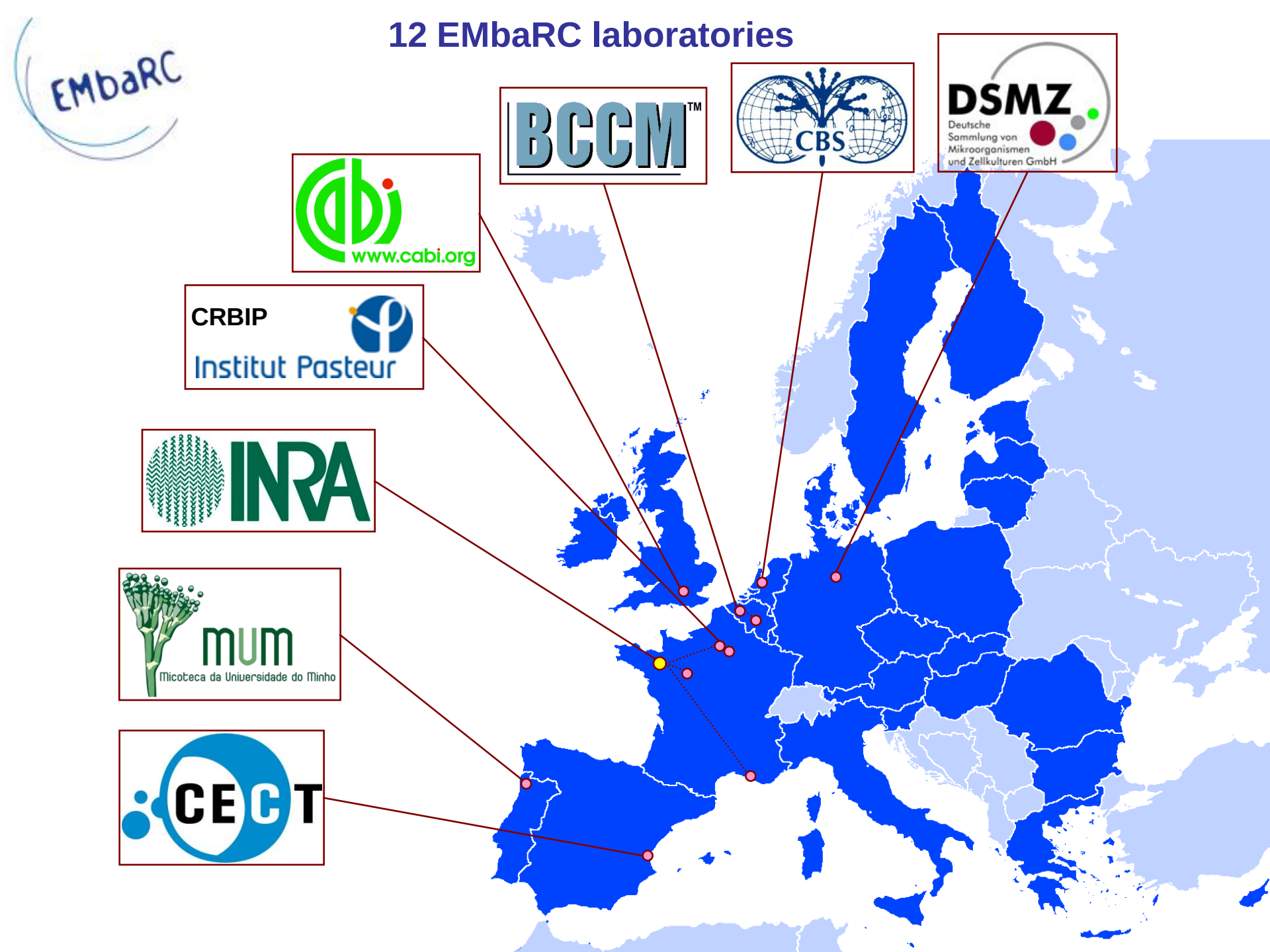


Member states
Overview Across EU Countries | EU
Austria | AT
Belgium | BE
Bulgaria | BG
Cyprus | CY
Czech Republic | CZ
Denmark | DK
Estonia | EE
Finland | FI
France | FR
Germany | DE
Greece | GR
Hungary | HU
Ireland | IE
Italy | IT
Latvia | LV
Lithuania | LT
Luxembourg | LU
Malta | MT
Netherlands | NL
Poland | PL
Portugal | PT
Romania | RO
Slovakia | SK
Slovenia | SI
Spain | ES
Sweden | SE
United Kingdom | UK

Associated
Croatia | HR
Iceland | IS
Israel | IL
Liechtenstein | LI
FYROM | MK
Norway | NO
Switzerland | CH
Turkey | TR

TOP is accessible to people working in one of the countries listed here

12 EMbaRC laboratories



TOP - List of opportunities

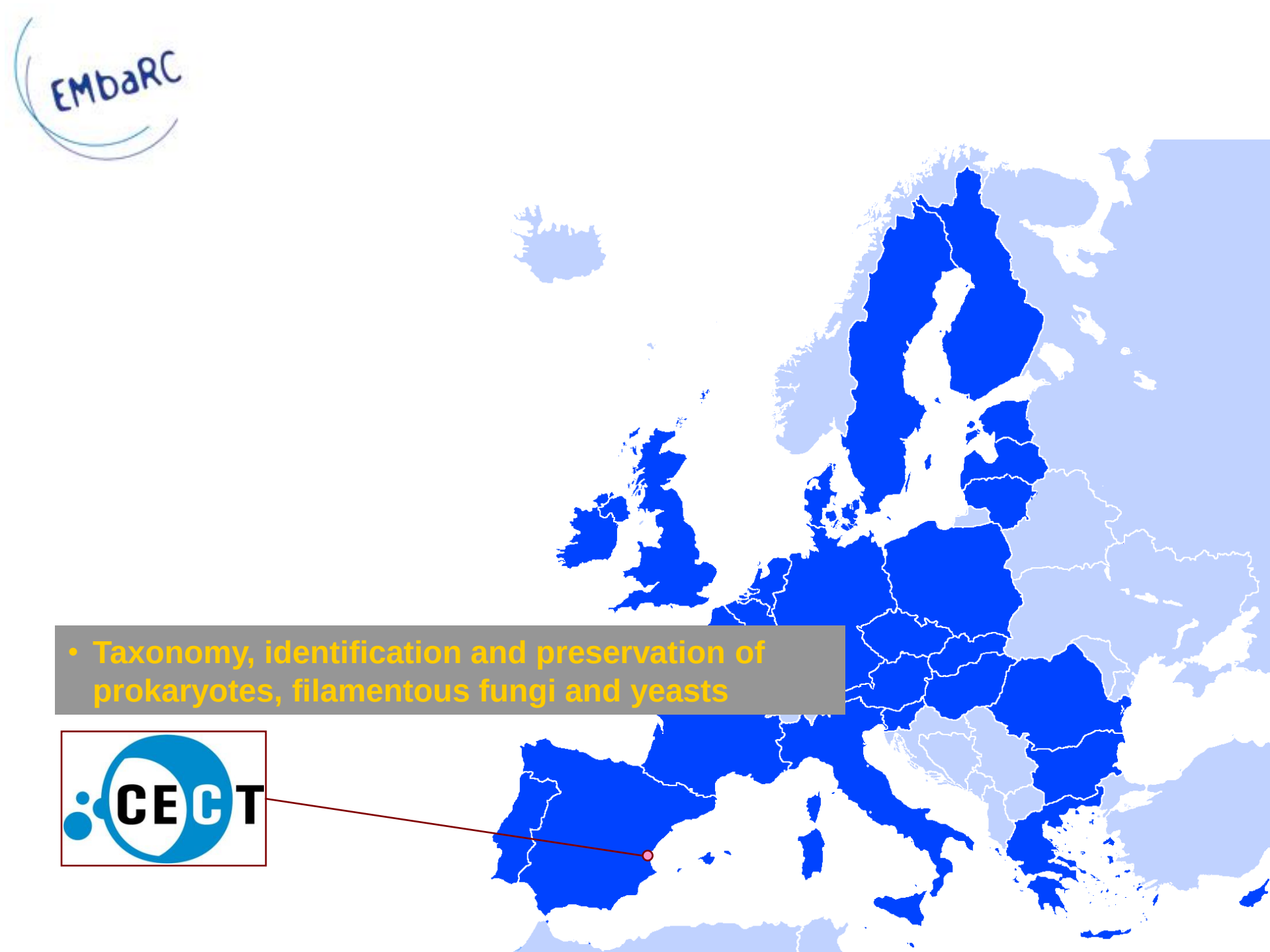
Culture Collection management

- Management of microbial strains in *ex situ* collections (CRBIP), France
- Preservation and storage of micro-organisms (CABI Bioservices), United Kingdom
- Preservation, collection management, databasing, identification (CBS), The Netherlands
- Theoretical, practical and regulatory aspects of a plasmid collection management (BCCM/LMBP), Belgium
- Operation of a bacterial collection & preservation of samples through freeze-drying (BCCM/LMG1), Belgium
- Fungal identification, preservation techniques and collection management (MUM), Portugal

TOP - List of opportunities

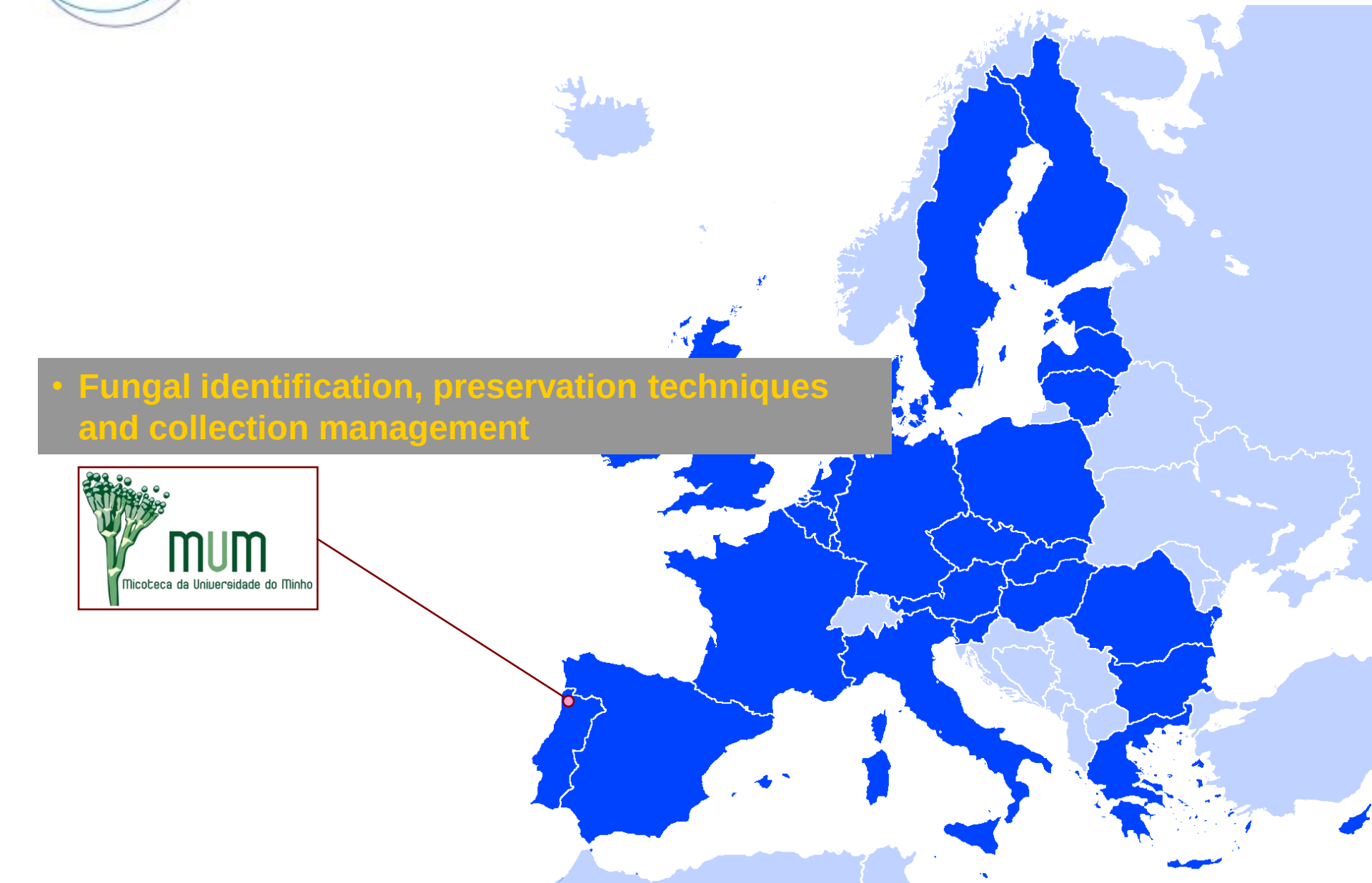
General and Applied microbiology - Taxonomy

- State of the art techniques in Bacteriology (DSMZ), Germany
- Taxonomy, identification and preservation of prokaryotes, filamentous fungi and yeasts (CECT), Spain
- Taxonomy of pathogenic bacteria relevant in food safety (CIRM-BP22), France
- Taxonomy, identification and typing of prokaryotes (BCCM/LMG2), Belgium
- Strain identification on pathogenic bacteria (CIRM-BP1), France
- High Throughput Screening of food bacteria (CIRM-BIA), France
- High Throughput Screening of filamentous fungi (CIRM-CF), France
- Initiation to handling of microorganisms of group 3 (CIRM-BP21), France
- In vitro Culture of Arbuscular Mycorrhizal Fungi (BCCM/MUCL), Belgium


EMbaRC
• Taxonomy, identification and preservation of prokaryotes, filamentous fungi and yeasts
CECT

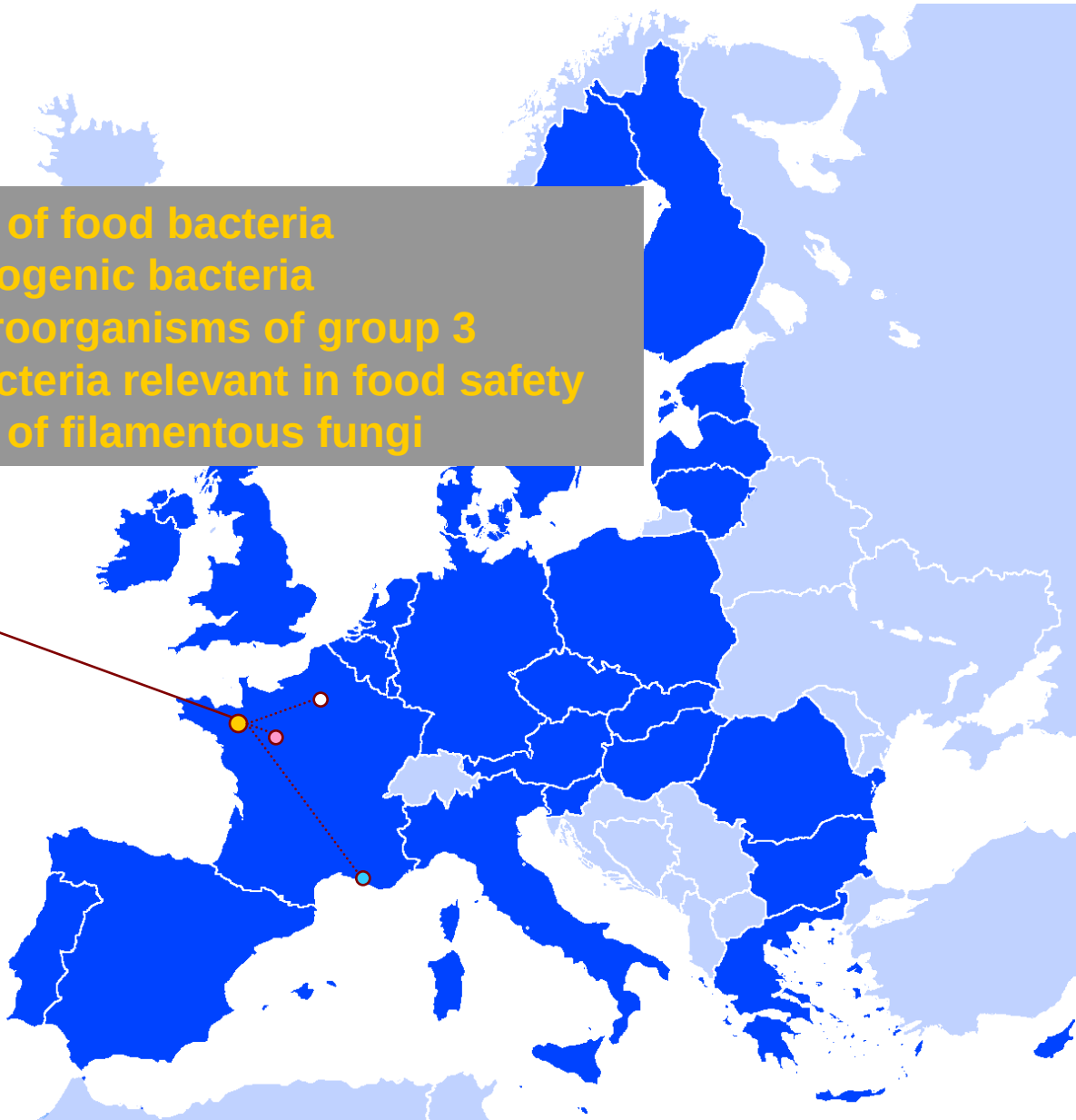
EMbaRC

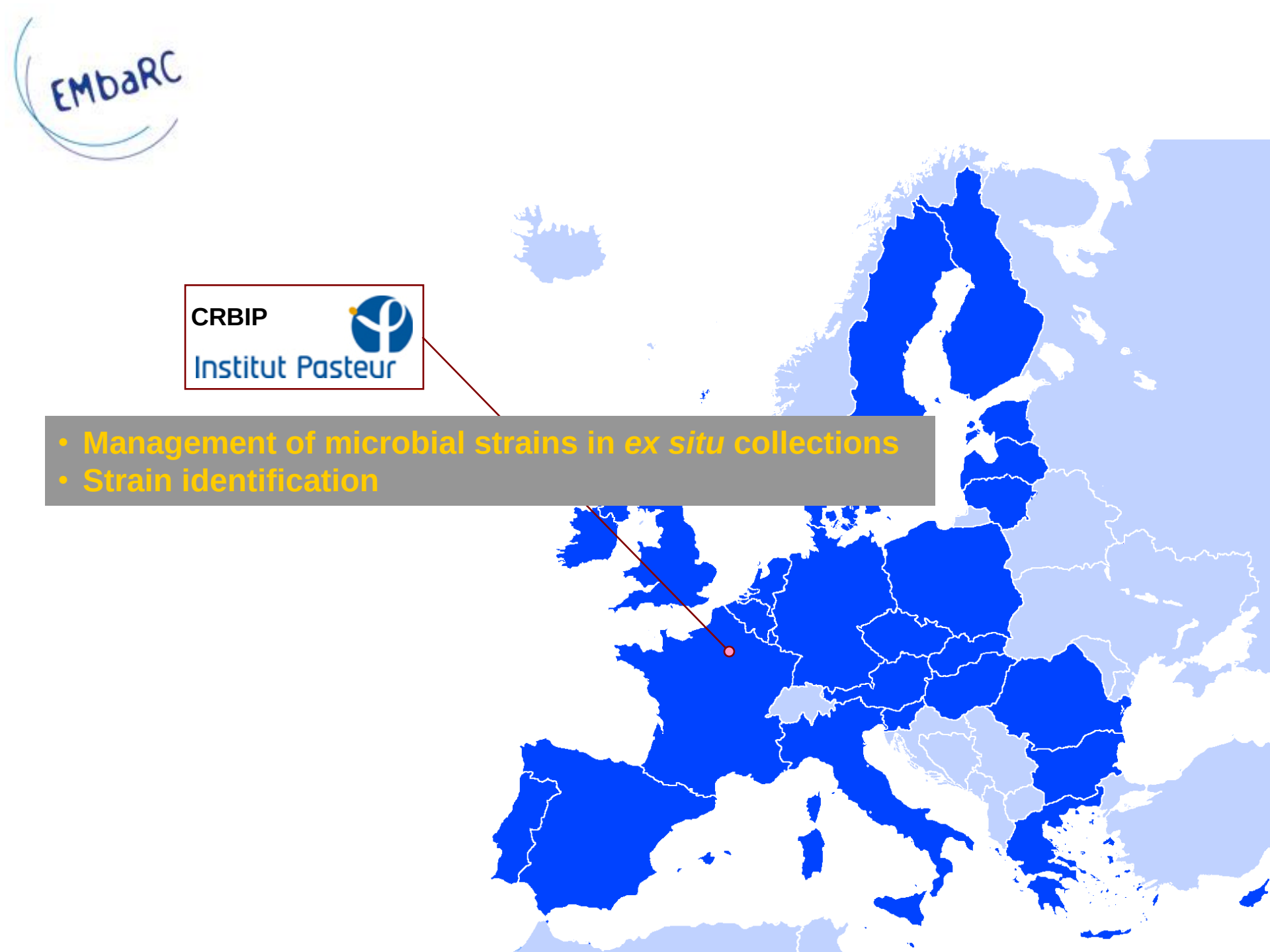
- **Fungal identification, preservation techniques and collection management**



MUM
Micoteca da Universidade do Minho

- High Throughput Screening of food bacteria
- Strain identification on pathogenic bacteria
- Initiation to handling of microorganisms of group 3
- Taxonomy of pathogenic bacteria relevant in food safety
- High Throughput Screening of filamentous fungi

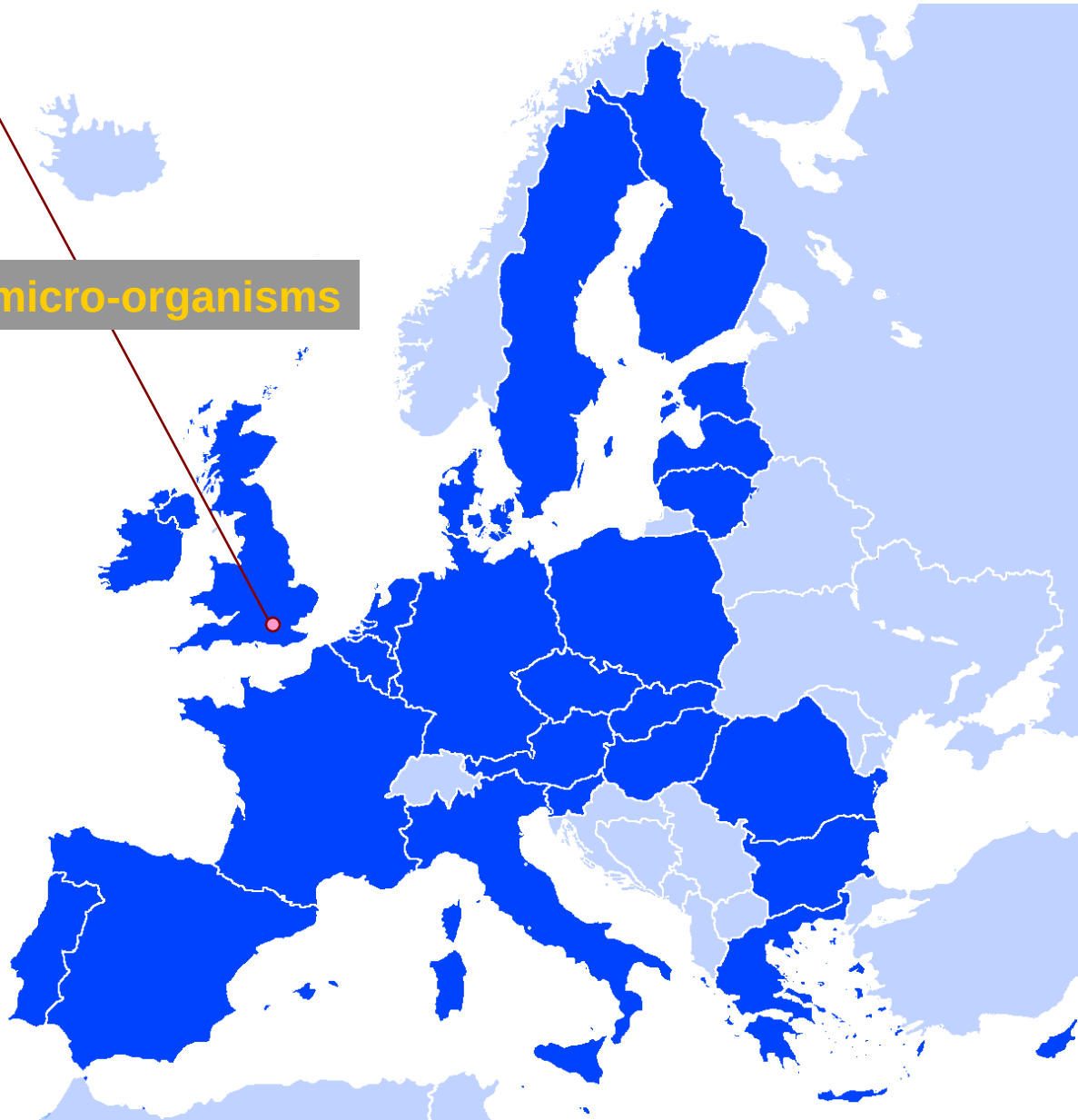



CRBIP
Institut Pasteur
• Management of microbial strains in *ex situ* collections
• Strain identification

EMbaRC

www.cabi.org

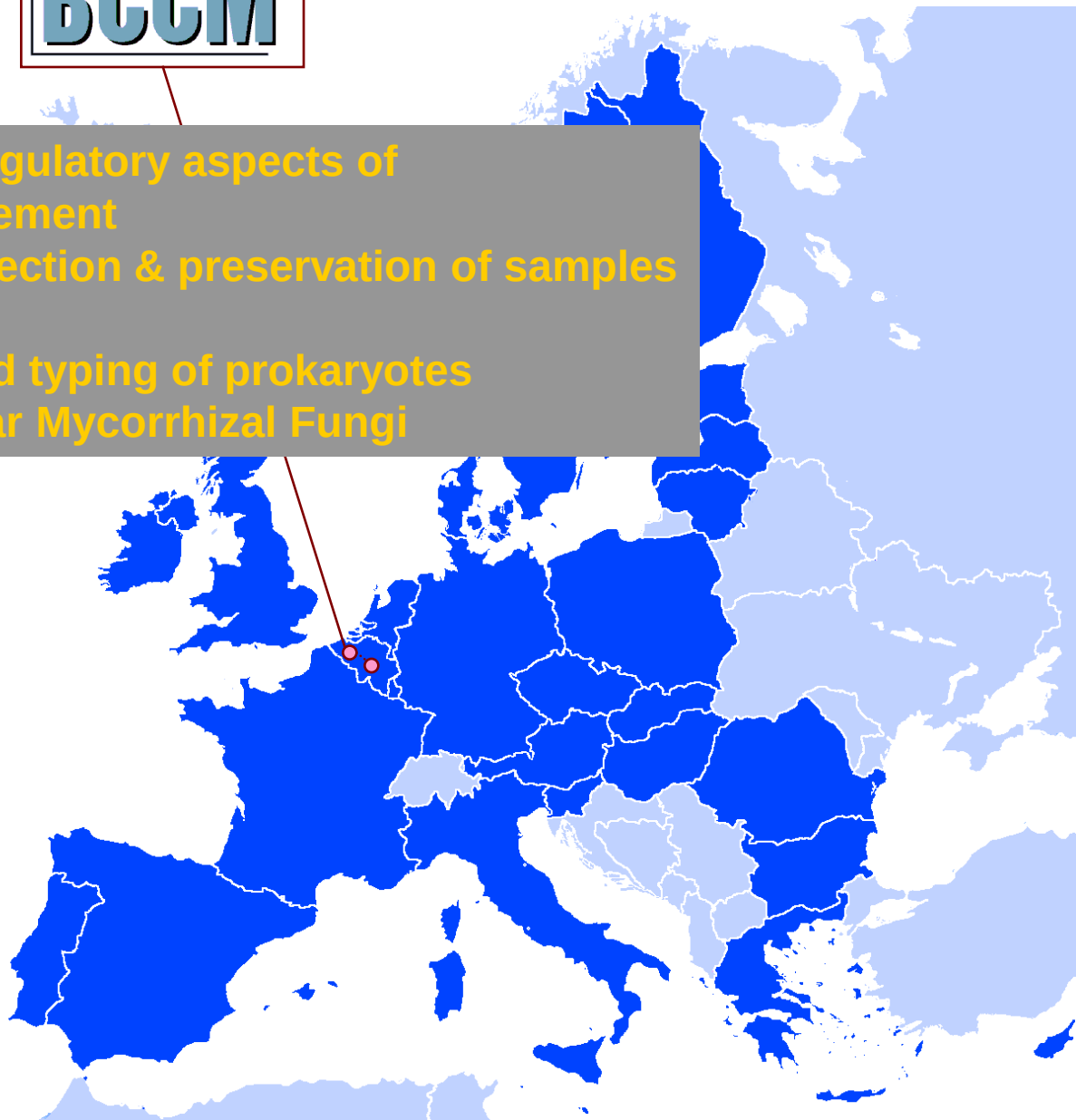
Preservation and storage of micro-organisms

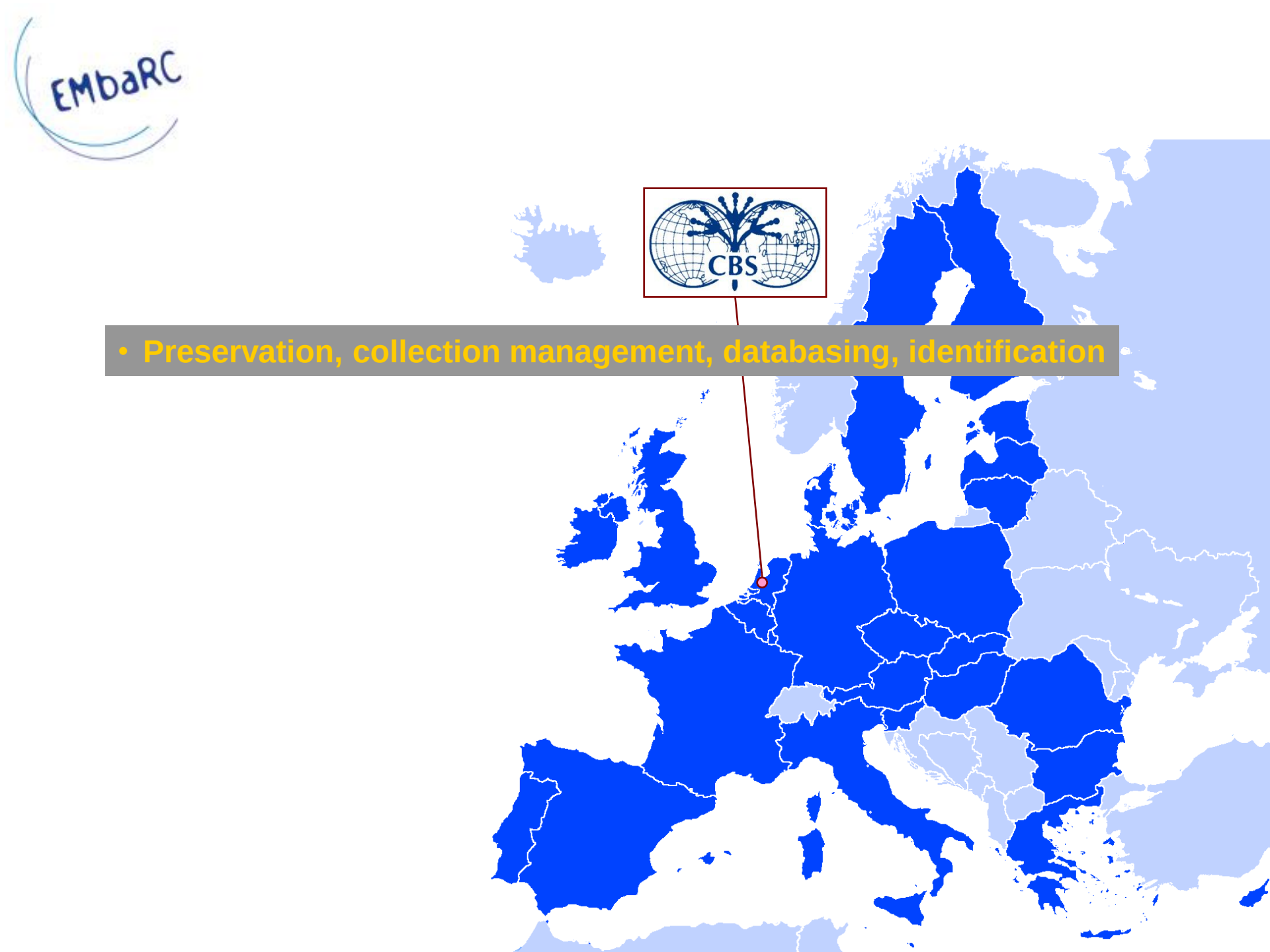


EMbaRC

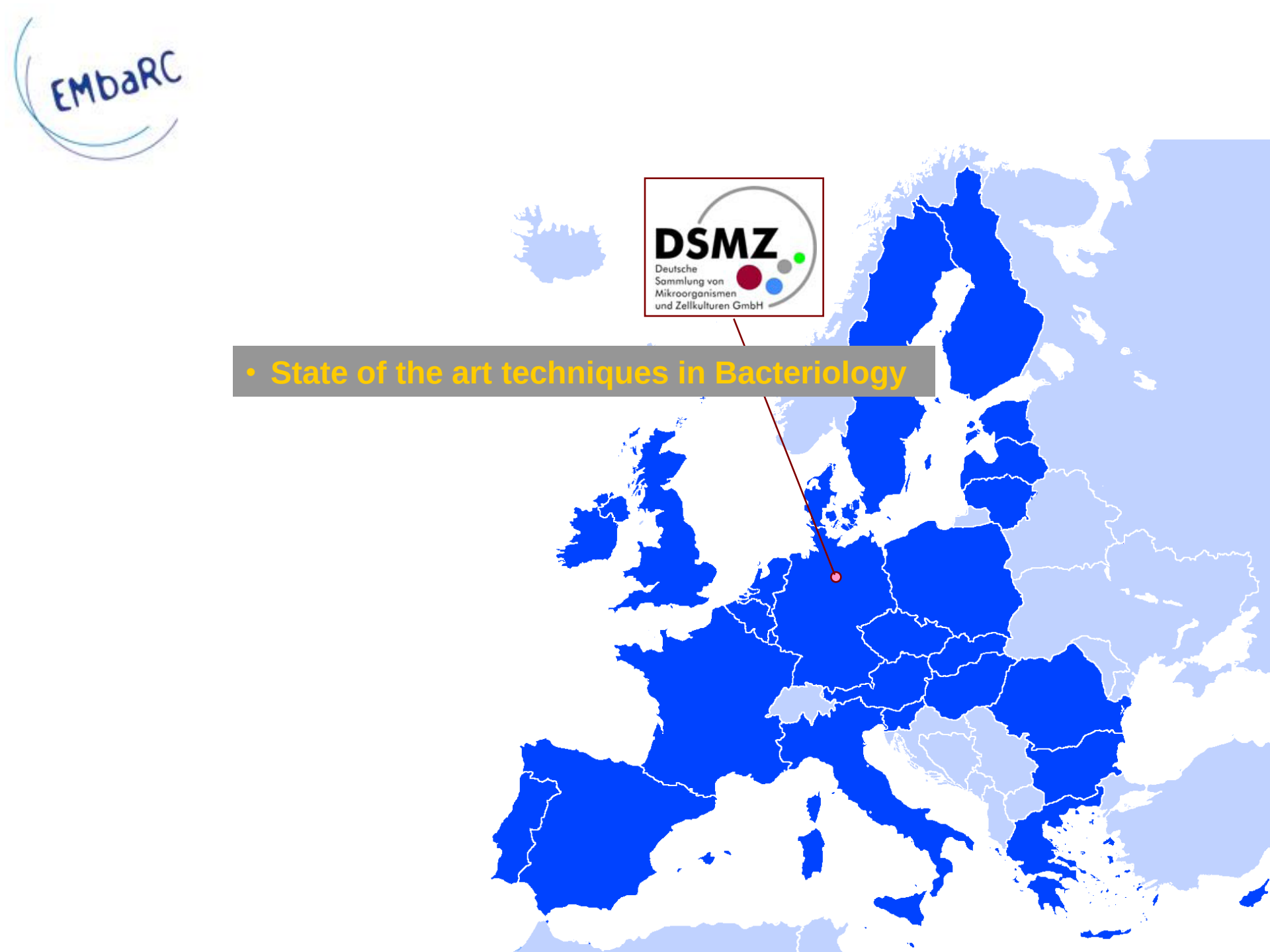
BCCM™

- Theoretical, practical and regulatory aspects of a plasmid collection management
- Operation of a bacterial collection & preservation of samples through freeze-drying
- Taxonomy, identification and typing of prokaryotes
- In vitro Culture of Arbuscular Mycorrhizal Fungi





- Preservation, collection management, databasing, identification


DSMZ
Deutsche
Sammlung von
Mikroorganismen
und Zellkulturen GmbH
• State of the art techniques in Bacteriology

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EMbaRC

European Consortium of Microbial Resources Centres

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- Expected impact
- Information Resource
- Database access
- Access Grants

All necessary information

Access Grants

EU-funded opportunities for study visits and training at partner collections

Preserving authentic materials for the future

EMbaRC brings together key microbial resource centres in Europe to improve, coordinate and validate microbial resource delivery to European and International researchers from both public and private sectors.

The conservation and utilisation of microorganisms aim to help deliver a knowledge-based bioeconomy

(c)CABI

Members Area

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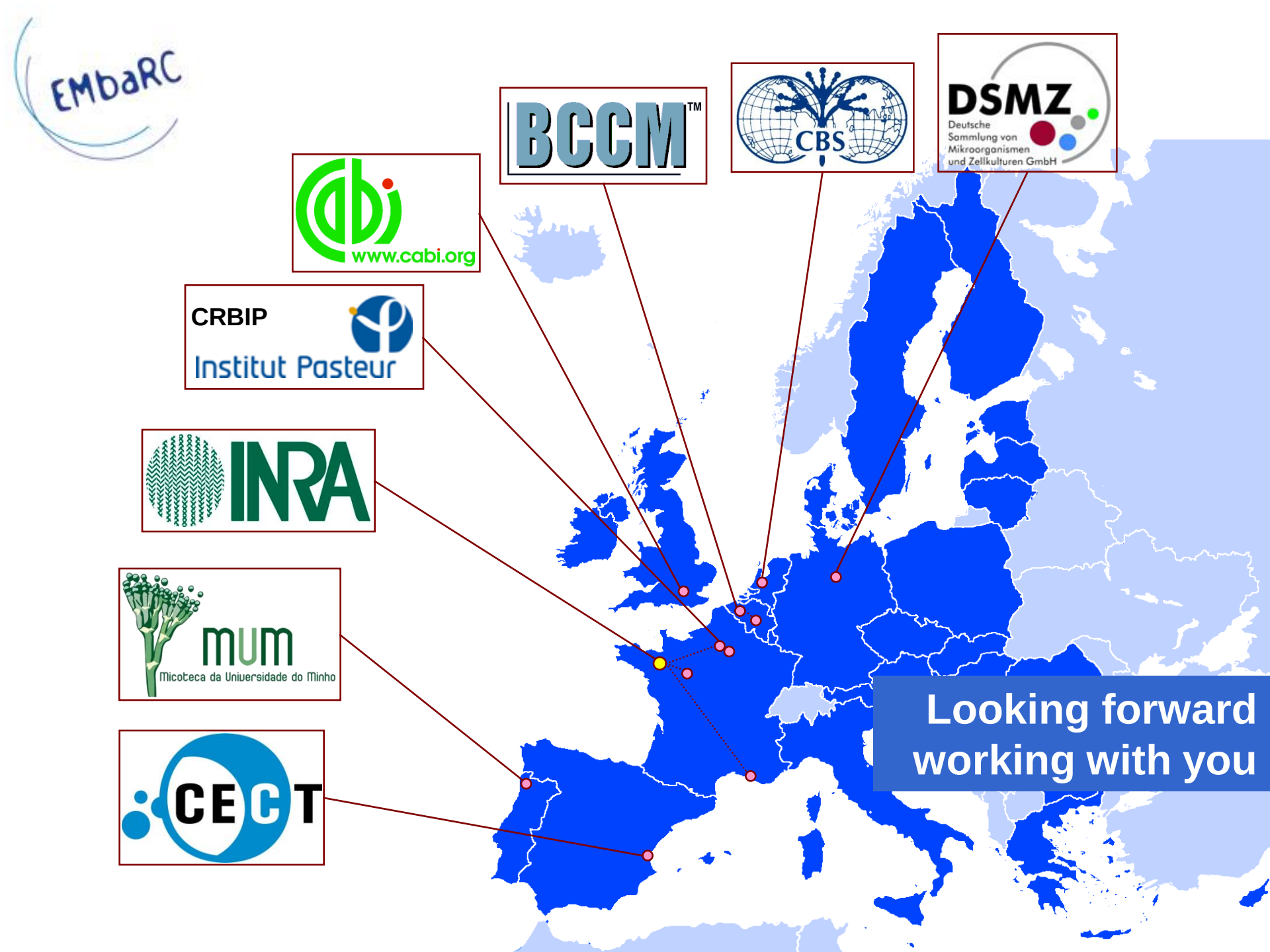
Microsoft PowerPoint ...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INRA
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CECT
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