



IMCAS-BRC: toward better management and more efficient exploitation of microbial resources

Xiuzhu Dong

**Biological Resources Center
Institute of Microbiology,
Chinese Academy of Sciences**

中国科学院微生物研究所
Institute of Microbiology



中国科学院微生物研究所
Institute of Microbiology, Chinese Academy of Sciences



◆ Challenges

- ◆ Global worming & environmental pollution
- ◆ Energy security
- ◆ New emergency of infectious diseases



◆ Strategies on sustainable development

- ◆ Biotechnology



**Microbial resources:
the headspring of bio-technology & bio-industries**





Microbes produce natural bioactives

Source	All known compounds	Bioactives	Antibiotics
Natural products	>1000,000 (1 M)	200,000-250,000	25,000-30,000
Microbes	>50,000	22,000-23,000	~17,000
Algae, Liches	3000-5000	1500-2000	~1,000
Higher plants	500,000-600,000	100,000	10,000-12,000
Animal	300,000-400,000	50,000-100,000	~5000

J Antibiot 58, 1–26, 2005

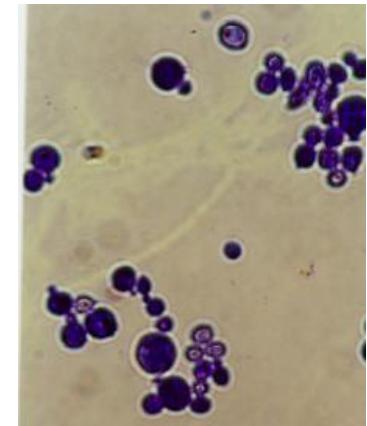


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Microbes: powerful bio-catalyzers

- ◆ ***Candida tropicalis*: dicarboxylic acids for chemical & medicine industries**
- ◆ The technology developed in IMCAS has been translated to industries:
 - Invested 3 billions RMB, annual production 60,000 Ton



Candida tropicalis



Shandong Hanlin biotechnology Ltd



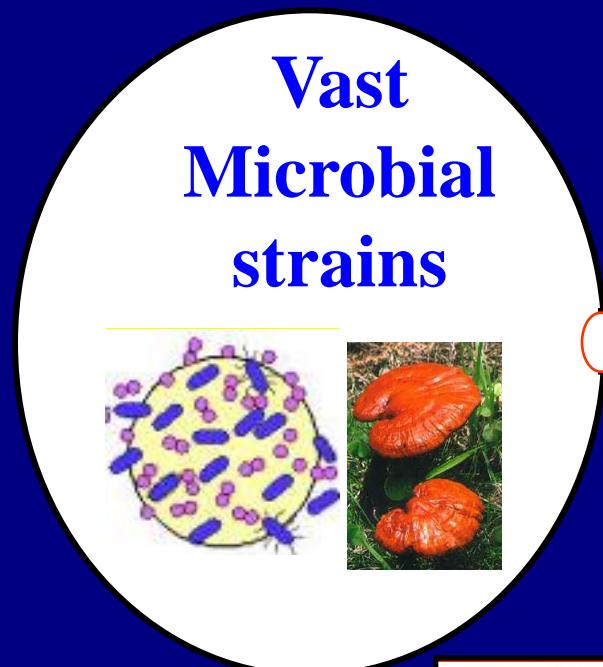
Culture collections in China

Collection centers	Strains
China General Microbial Culture Collection (CGMCC)	35,000
China Agricultural Microbial Culture Collection (ACCC)	21,000
China Industrial Microbial Culture Collection (CICC)	9,300
China Medical Microbial Culture Collection (CMCC)	14,900
China Pharmaceutical Microbial Culture Collection (CPCC)	27,000
China Veterinary Microbial Culture Collection (CVCC)	7,000
China Forestry Microbial Culture Collection (CFCC)	15,000
China Type Culture Collection (CTCC)	14,600
China Marine Microbial Culture Collection (MCCC)	10,100
Total (2008)	153,900

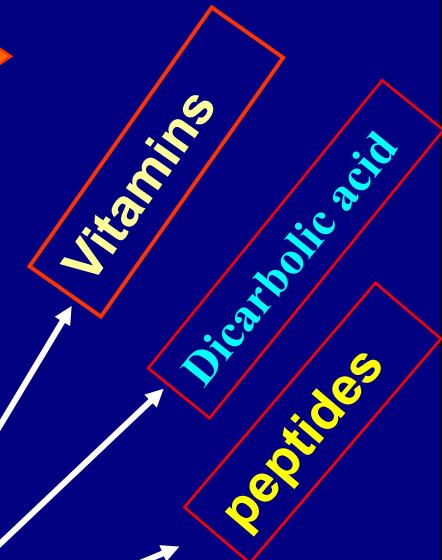
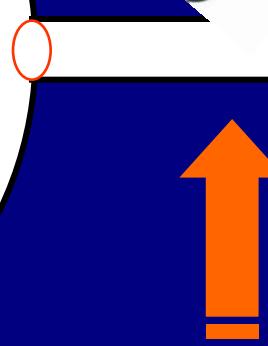
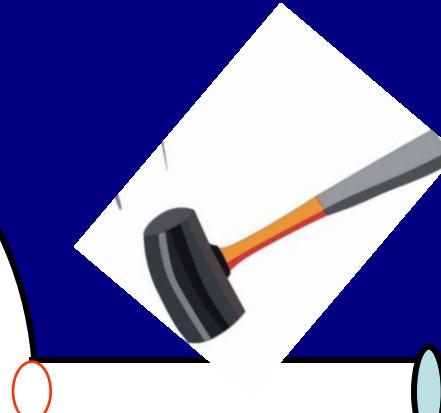
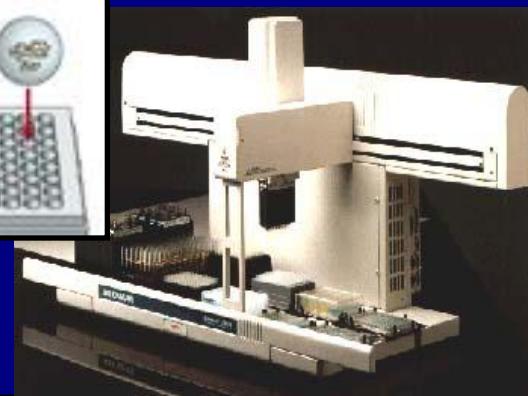
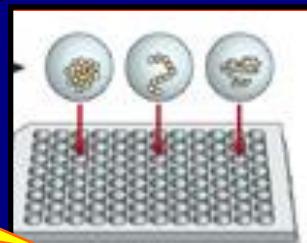




To accelerate Resources → Biotechniques



High throughput potentials evaluation



Enzymes

Amino acids

Organic acids
antibiotics

bioenergy

Bioremediation



Transform Culture Collection Center to BRC: IMCAS-RBC

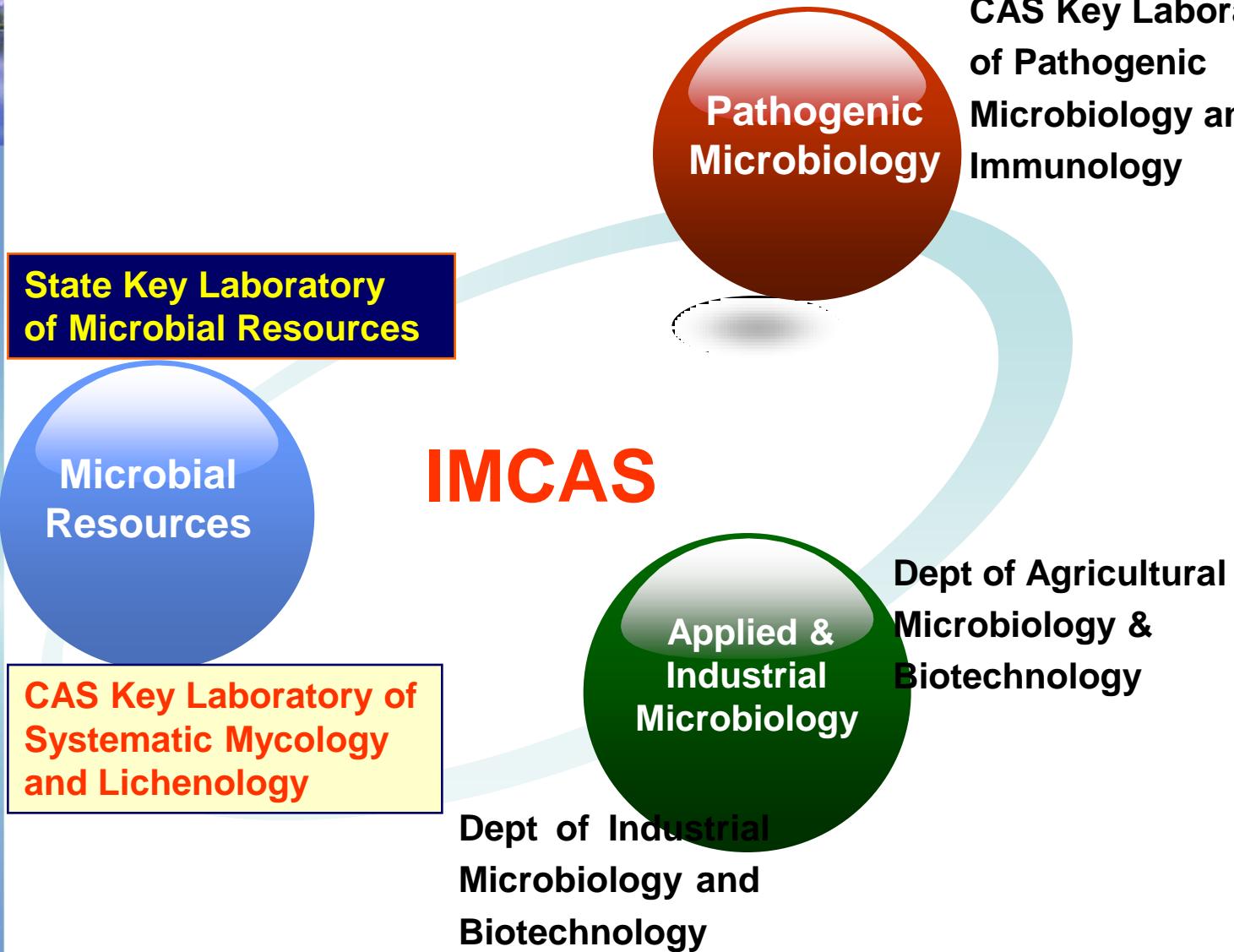


Jul 10, 2009



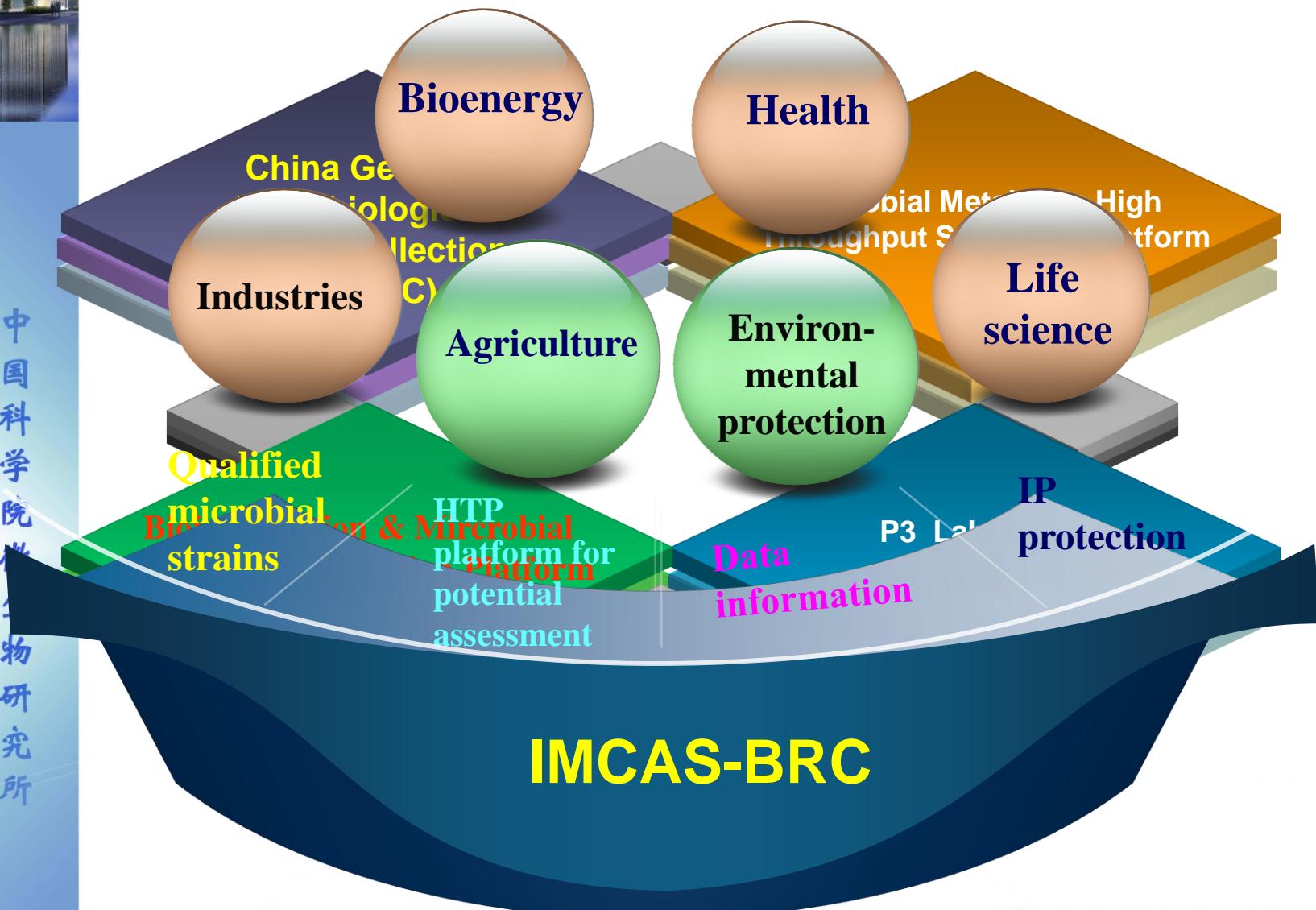


Three Research Fields





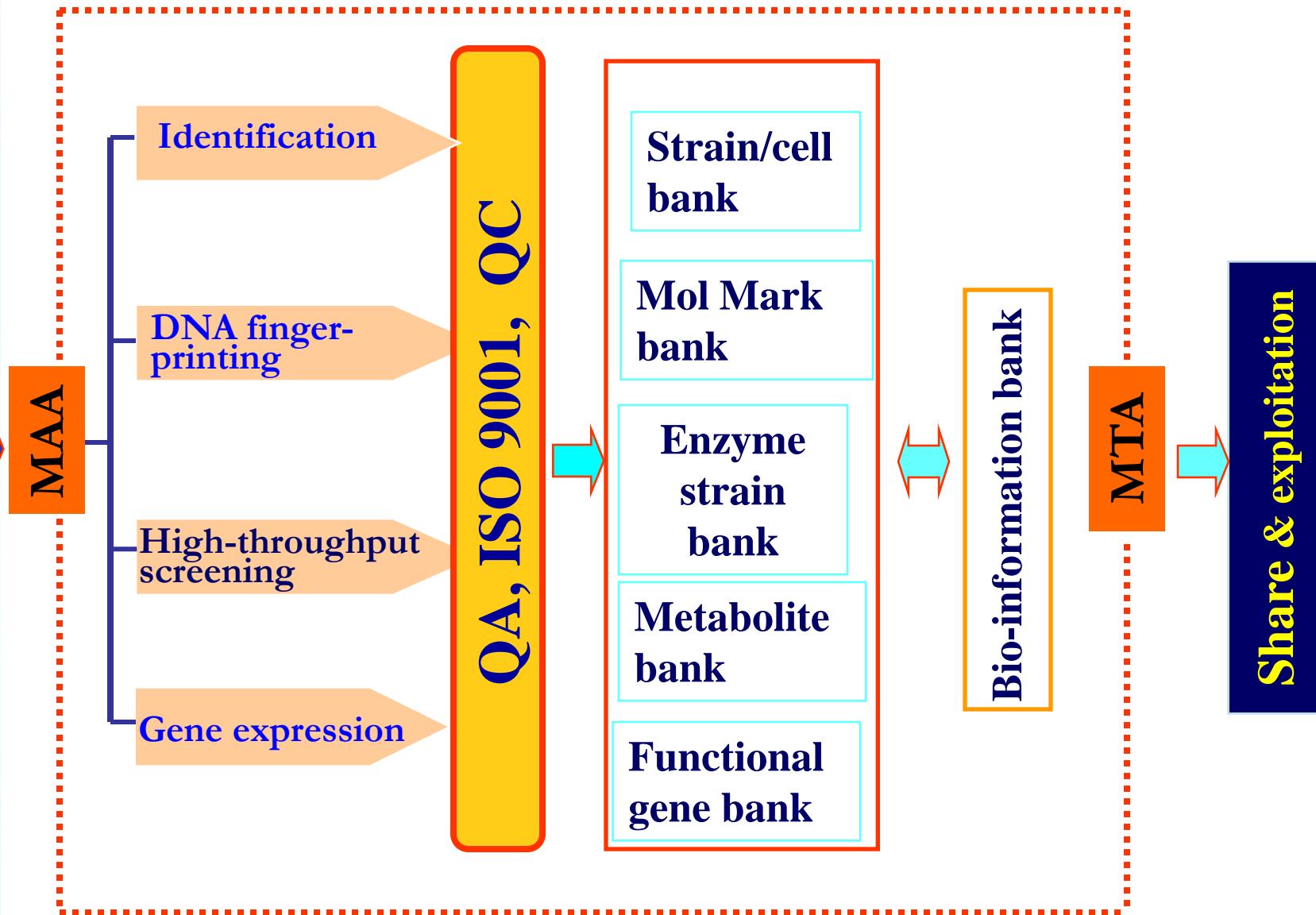
Four Supporting Platforms





IMCAS-BRC framework

strain/cell/DNA collection





IMCAS-BRC

advisory committee

Office of management and quality assurance

Culture collection
Division

Function evaluation
Division

Information
Division

High-throughput culturing

Rapid characterization

Environment gene

Cell culturing

High-throughput screening of Enzymes

High-throughput screening of metabolites

Metabolite preparation

Biological information

Resource information

Information service

Strain bank

Gene bank

Cell bank

Metabolite bank

Compound bank

Data base bank

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Yuguang Zhou



Division of Culture Collection

- Setup based on China General Microbiological Culture Collection Center (CGMCC).
- Mission: collect and preserve a variety of microbial strains and genes, and animal cells.



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CGMCC

12/2009	Genera	Species	Strains
Bacteria	403	1180	9900
Actinomycetes	101	1150	6500
Yeast	116	530	4200
Filamentous fungi	413	1280	12900
Patent deposit			3600
Total	1033	4240	37200

- Preserved 80% species in China
- As one of 37 IDAs ratified by WIPO.

2 metagenomic libraries: 349,000 clones, 8.9Gbp DNA insert



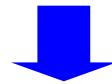


Bio-techniques development on the gene bank of IMCAS-BRC

Rumen microflora
BAC library, DNA
Insert 3.3 Gb



Screened and
sequenced cellulase
genes > 500



Contract project with
GENENCOR on
mining enzyme genes

Hot spring microflora
BAC library, DNA
insert 5.6 Gb

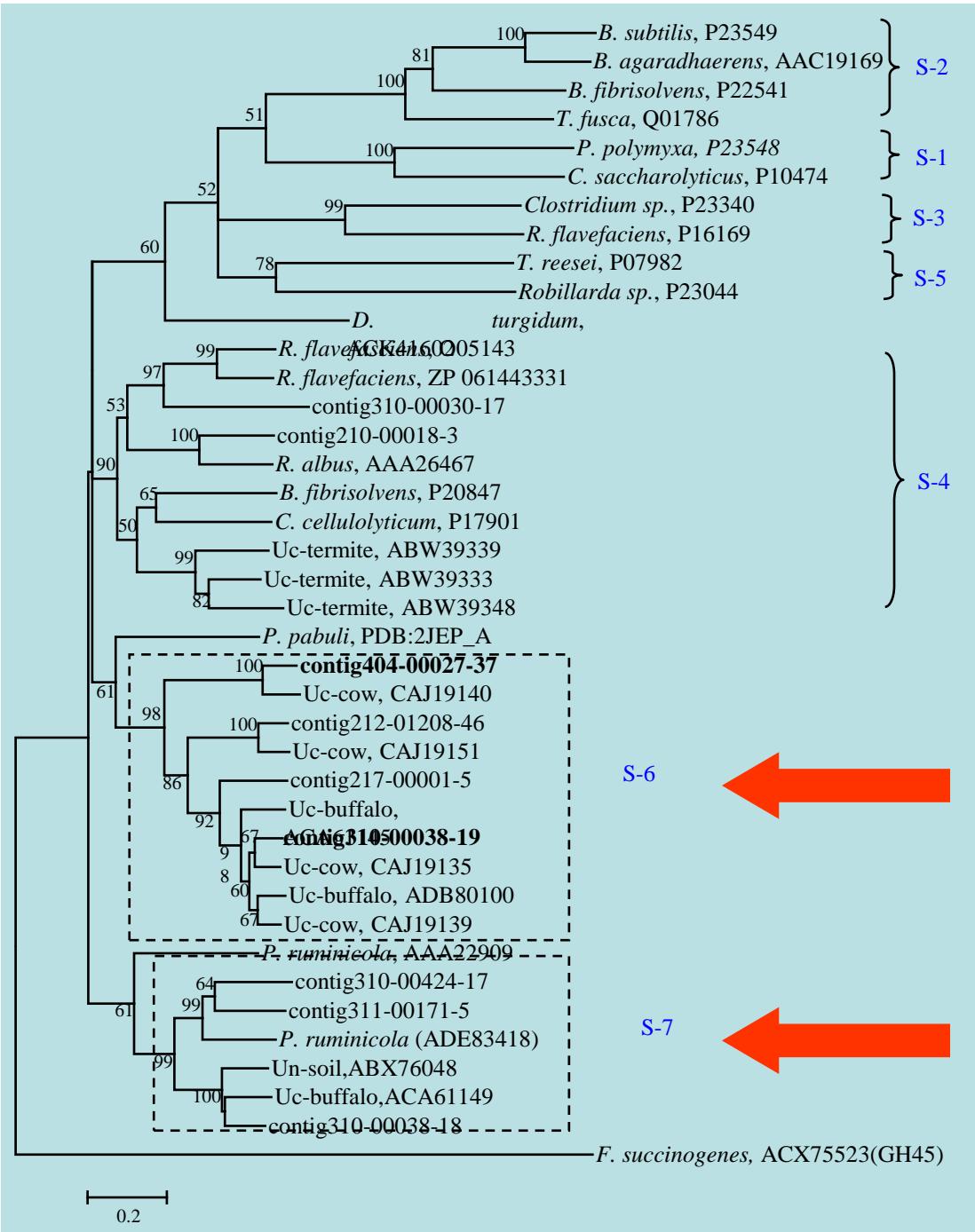


Screened and
expressed thermo-
stable SOD gene



Translated to a bio-
industry

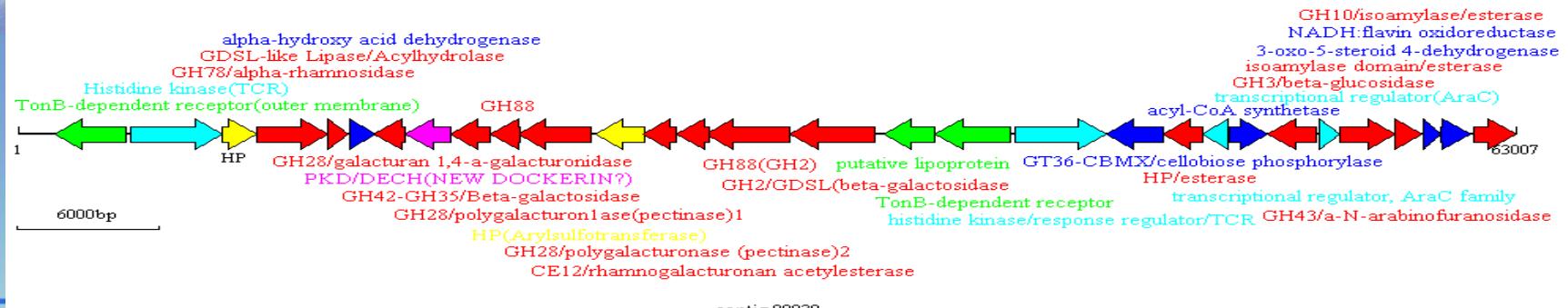




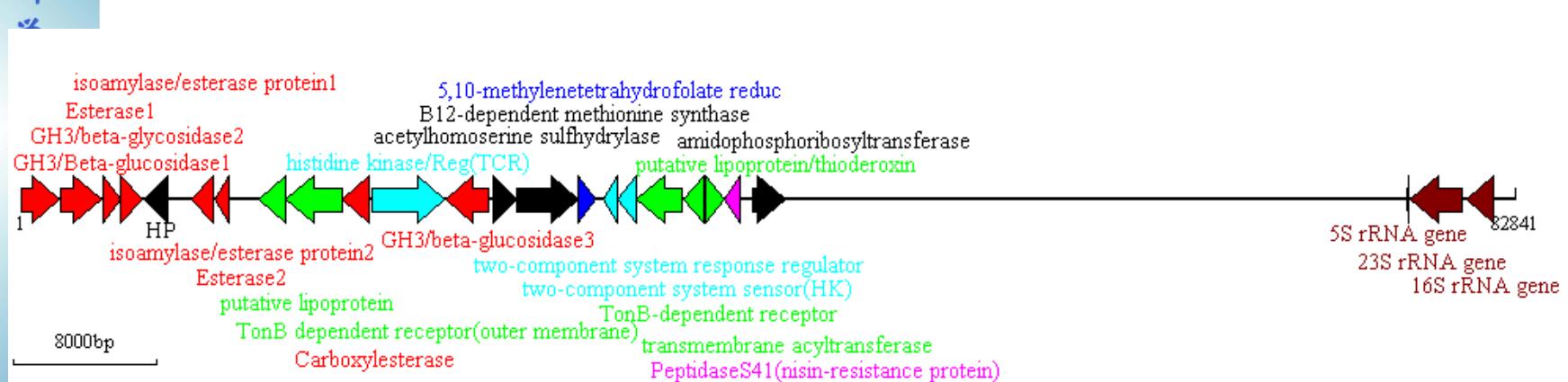
Novel
cellulase
subfamilies
detected in
the rumen
BAC library



Cellulase gene clusters in the rumen BAC library



Cellulase genes in cluster linked with regulator and activators



Cellulase genes in cluster linked with 16SrRNA gene



Division of Culture Collection

Technical platforms

- Culturing and preserving fastidious and extreme; environmental microbes,
- Rapid identification techniques;
- Environmental genome construction.

Identification & fingerprinting





Dr. Y.Che

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Division of Function Evaluation

- Mission: establish screening and evaluation platform and discover bioactive and functional microbial metabolites from resources in CGMCC.
 - targeting infectious diseases microbes-produced molecules, cancer and others;
 - targeting infectious enzymes for industrial applications.
 - Establishing efficient protein expression technology platforms.

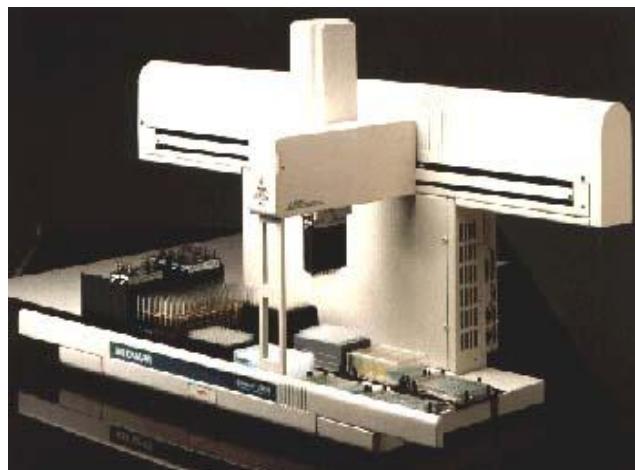


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Division of Function Evaluation

- Libraries of microbial secondary metabolites
 - crude extracts: 15000 samples
 - partially purified fractions: 5000 samples
 - pure compounds 700 samples
- Bioassays on screening the metabolite libraries.



High throughput screening



Chemical identification





Dr. J. Ma

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Division of information

- Mission: develop the management platform of microbial resource database, the data standardization as well as microbial resource database and information sharing gateway.
- Data Banks (total 1Tb):
 - Microbial Culture Information Database,
 - Strain physiological Database,
 - Nucleic Acid Sequence Database,
 - Culture Marketing Database,
 - Client Management Database,
 - CAS Type Culture Collection Database,
 - Asian Microbial Resources Catalog Database,
 - largest information sharing network in microbiology.





Office of Quality Assurance



- **Quality assurance system of resources and services:**

ISO 9001

OECD BRC Best Practice Guideline

ISO14001

ISO18000

- **Bio-security**

- **IP management**

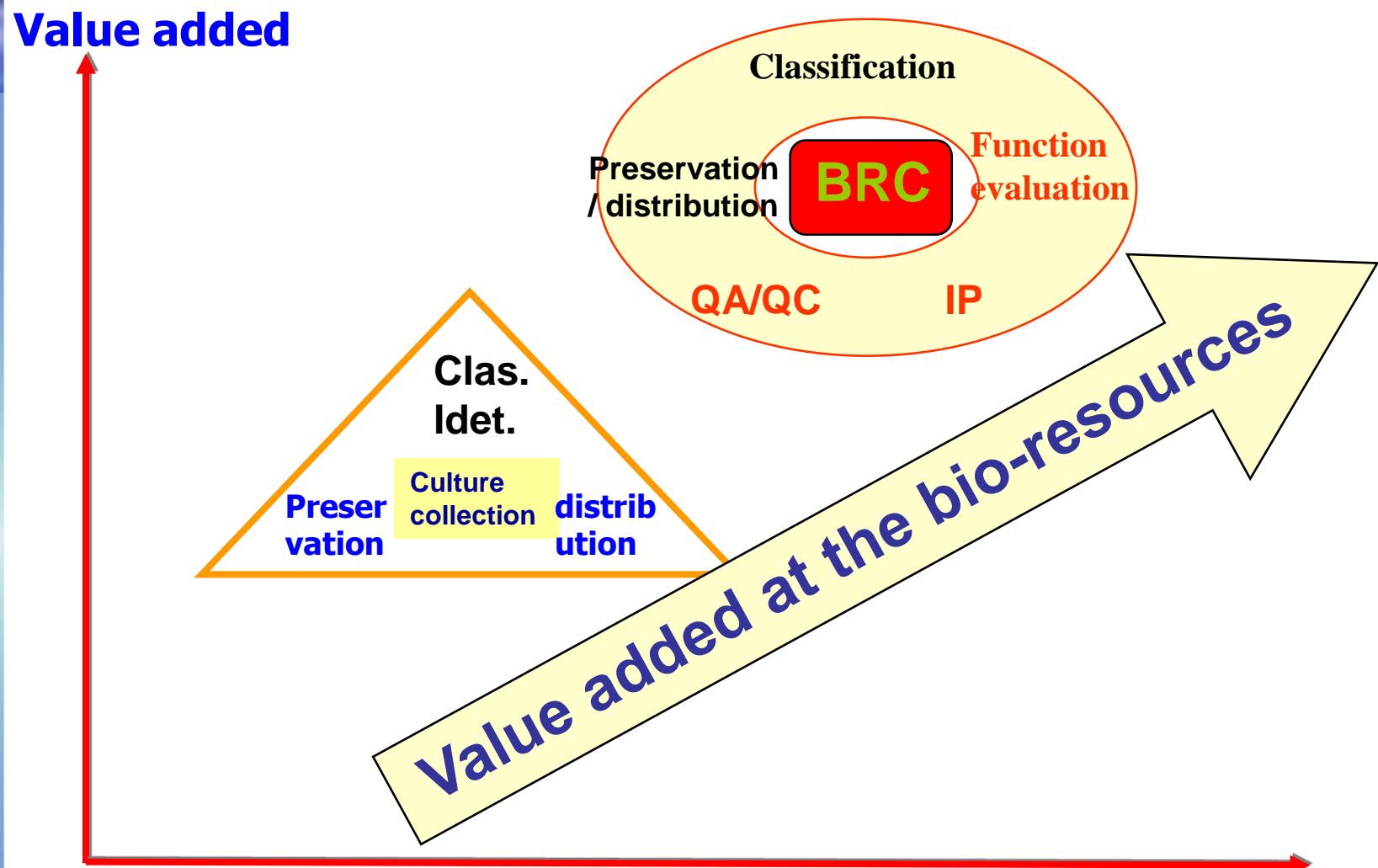
Dr. L.Zhang

MAA/MTA





Goal of IMCAS-BRC





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Thanks!



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