

# The ComBase project to pool food microbiology data and expertise

*József Baranyi*

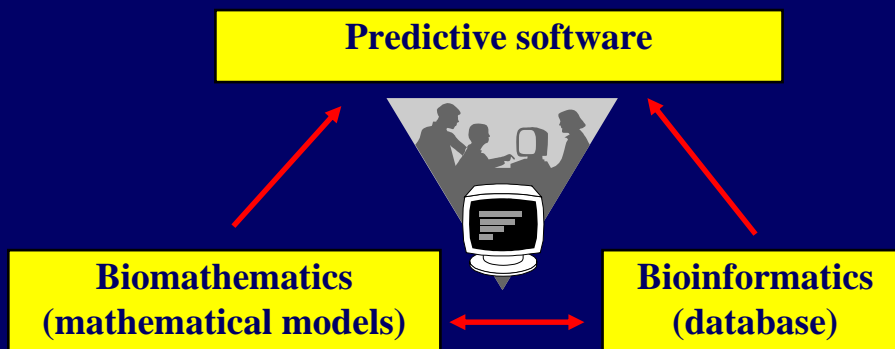
Institute of Food Research, Norwich, UK



[www.combase.cc](http://www.combase.cc)

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## Software packages for QMRA

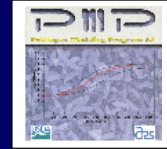


Appropriate presentation of software packages makes technology transfer more efficient

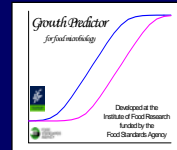
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## Currently available Predictive Microbiology packages

**Pathogen Modeling Program ( USDA-ARS ERRC, US )**  
<http://www.arserrc.gov/mfs/pathogen.htm>



**Growth Predictor (FSA-IFR, UK), the successor of Food MicroModel**  
<http://www.ifr.ac.uk/Safety/GrowthPredictor>



**Forecast** (Campden and Chorleywood, UK):  
+44 (0)1386 842071 (Buro service, not software).

**Seafood Spoilage Predictor** (Institute of Fisheries Research, Denmark):  
[www.dfu.min.dk/micro/ssp](http://www.dfu.min.dk/micro/ssp)

**Food Spoilage Predictor** (University of Tasmania, Australia):  
[www.hdl.com.au/html/body\\_fsp.htm](http://www.hdl.com.au/html/body_fsp.htm)

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**MAFF Predictive Microbiology Programme 1987 - 1992**  
taken over by the  
**Food Standards Agency**

Similar initiative at **USDA**

**Food MicroModel vs.**  
**Pathogen Modeling Program**

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## Database structure developed at IFR to archive the Food MicroModel data

		Environment			Response	
<b>Database core</b>						
organism	media_food	temperature	pH	dbl time	logcounts	comments
<i>B.thermosphacta</i>	TSB	temp1	7		br1	
mix_1	STAA	temp3	pH1		br3	
<i>B.thermosphacta</i>	beef	6	6	12		
mix_1		temp1			br1	
<b>organism</b>		<b>time</b>	<b>temperature</b>		<b>time</b>	<b>Logcounts</b>
<i>Kurthia gibsonii</i>		0	22.5		0	4.81
<i>Kurthia zopffii</i>		7	22.5		1	5.06
<i>Kurthia zopffii</i>		7.03	7		2	5.41
<i>Kurthia zopffii</i>		7.11	5		4.5	6.27
<i>Kurthia gibsonii</i>		56.5	5		7	7.12
<i>Kurthia gibsonii</i>					8.5	7.09
<i>B.thermosphacta</i>					22.75	7.71
<i>B.thermosphacta</i>					25	7.96

An entry can be either categoric or numeric value, or a reference to a table, representing a composite entry, a dynamic environment or response



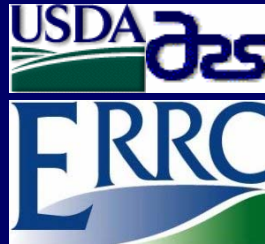
## ComBase Consortium, 2003



FSA, UK



Institute of Food Research, Norwich, UK



US Department of Agriculture, Agricultural Research Service

Eastern Regional Research Center Wyndmoor, PA, USA



e-ComBase: 2yrs Accompanying Measures project to populate ComBase by data from Supporting Partners

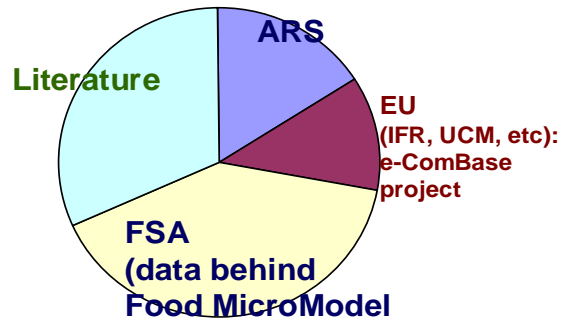
EC Quality of Life and Management of Living Resources (QoL)  
Key Action 1 - Food, Nutrition and Health



## Situation at the launch of ComBase 16<sup>th</sup> of June, 2003

### Data source:

4,000 records: ARS;  
3,000 records: EU inst.  
10,000 records: FSA  
8,000 records: Literature



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## Data in *ComBase*, June 2003

**24,000** records on both growth and survival

**18,000** records on pathogens; **6,000** on spoilage organisms

**16,000** full log-count curves; **8,000** growth/death rates.

*Aeromonas hydrophila, sobria, caviae*

*Bacillus cereus* (spores and veg)

*Clostridium botulinum*

*Clostridium perfringens*

*Escherichia coli* (also NPEC)

*Listeria monocytogenes and innocua*

*Staphylococcus aureus*

*Shigella flexneri*

salmonellae

*Yersinia enterocolitica*

*Brochothrix thermosphacta*

*Pseudomonads*

Lactic acid bacteria

*Enterobacteria*

Total meat spoilage flora

psychrotrophic bacteria

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## ComBase: a depository of raw data to help generate specific / combined tools

ComBase

- Predictive models (PMP, GrowthPredictor, Seafood Spoilage Predictor, etc)
- Combined packages (e.g. Sym'Previous)
- Used by expert systems and other methods (e.g. Bayesian Belief Networks)
- Links to other databases (NelFood: Food composition database; Antimicrobials Online)
- Applications for specific use (self-tailored packages)
- Risk Assessment tools

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## ComBase roadmap

- ca 10,000 more records each year;
- [www.combase.cc](http://www.combase.cc) hosted at IFR, serves for a hub linked to related applications;
- a main link is the actual database that can be browsed on the ARS web site;
- ComBase raw data on CD is available to Supporting Institutes submitting data and to the Advisory Group;
- *Pathogen Modeling Program* (PMP - US) and *Growth Predictor* (GP - UK) carry on (only prediction, no raw data) ;
- In 2 years: ComBase-PMP: *Combined database and Predictive Microbiology Program*

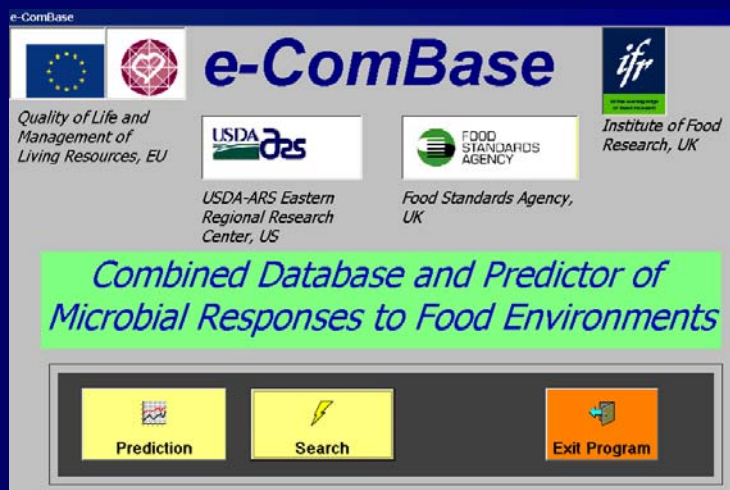
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## ComBase: system of data and programs

- **Excel version of the database:** connected sheets (tables). This version is used for modelling, since maintenance programs and statistical, mathematical macros (for modelling purposes) are easily available for Excel.
- **Access version of the database:** The same tables as in Excel. After inputting, checking in Excel, the data are transferred to the Access, which has higher capacity and faster search speed.
- **ComBase Browser:** Built on the Access version, navigates in the database in a user-friendly way.
- **Maintenance and modelling kit:** Excel add-ins, developed at IFR.


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## PC-based combined browser and predictor for *e-ComBase* data



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Institute	Support
Rutgers University, New York. USA	Pathogens in broth and food
USDA-ARS ERRC, Wyndmoor. USA	Internet browser; data behind PMP
Szent-István Univ., Budapest. Hungary	Pathogens in Food
Complutense University of Madrid. Spain	Pathogens, mainly in MA; viable count curves and doubling times measured by OD
Danish Inst. Fish. Research. Denmark	Spoilage organisms in broth and seafood
INRA, Avignon. France	Growth and survival of various pathogens
Agricultural University of Athens. Greece	Spoilage organisms, mainly in olives
Technical University of Bratislava . Slovakia	Pathogens and spoilage organisms, in broth and milk
Public Health Laboratory Services - University of Bristol. UK	Pathogens, in broth and food, at low water activity
Metropolitan University. London UK	Spoilage organisms in broth and food
University of Reading. UK	Pathogens in broth, inactivation and survival, under various stress conditions
Unilever Research Sharnbrook. UK	Pathogens in food
Campden and Chorlywood FRA. UK	Spoilage organisms



## Some quotes

**"ComBase can be a watershed in the development of Predictive Microbiology"**

**Prof McMeekin, Director of Australian Food Safety Centre of Excellence**

**"ComBase is an exemplar of the way that governments and the research community can successfully work together to help improve the safety of food products. The Food Standards Agency strongly supports this initiative, its widespread application and its use to reduce foodborne disease."**

**Jon Bell, CEO Food Standards Agency, UK**

## ComBase seminars and workshops 2003-2004

Philadelphia  
Washington  
New Orleans

Norwich  
London  
Quimper  
Madrid  
Budapest  
Bologna  
Crete

Mark Tamplin, József Baranyi  
Tom Ross

Kuala Lumpur

Sydney  
Melbourne  
Hobart

ComBase  
COMBINED DATABASE FOR  
PREDICTIVE MICROBIOLOGY

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## Effects of an Internet database

### ➤ **Milky-way effect**

*(putting pieces of information together - a pattern may emerge)*

### ➤ **Platonian effect**

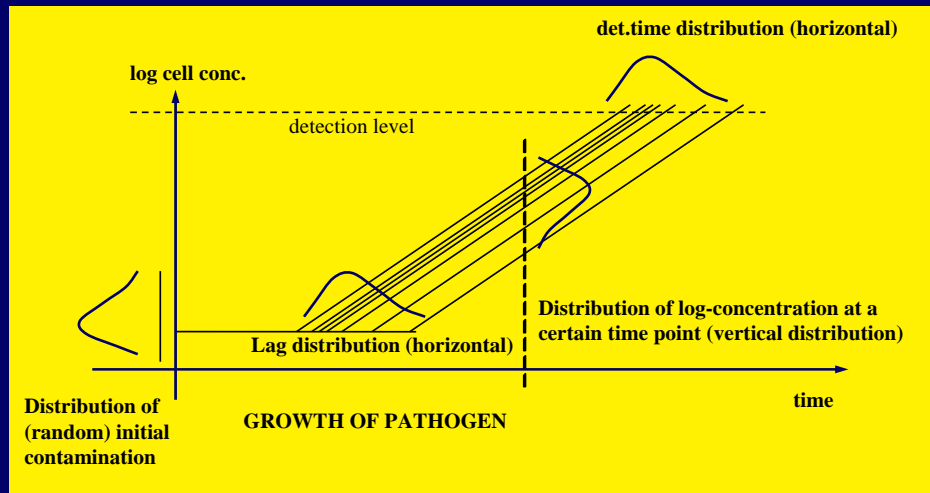
*(omitting the unnecessary - not "data dump" what we want)*

### ➤ **Gutenberg effect**

*(accessible for many)*

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## Propagation of probability distributions



The probability of the event "**Log(conc)>Threshold**" can be estimated by means of (A) initial distribution; (B) lag distribution; (C) spec.growth rate

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## Acknowledgement

- ComBase Consortium (FSA-UK; USDA-ARS; IFR)
- EU Quality of Life and Management of Living Resources, Project No: QLAM-CT-2002-30513 (*e-ComBase*)
- e-ComBase Supporting Institutes
- Biotechnology and Biological Sciences Research Council, United Kingdom
- Food Safety and Computational Microbiology Section, Institute of Food Research
- [www.combase.cc](http://www.combase.cc)

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