

CHIST-ERA conference 2011



**Process understanding through data &
knowledge management in the pharma
field**

Laboratory of Integrated Bioprocessing

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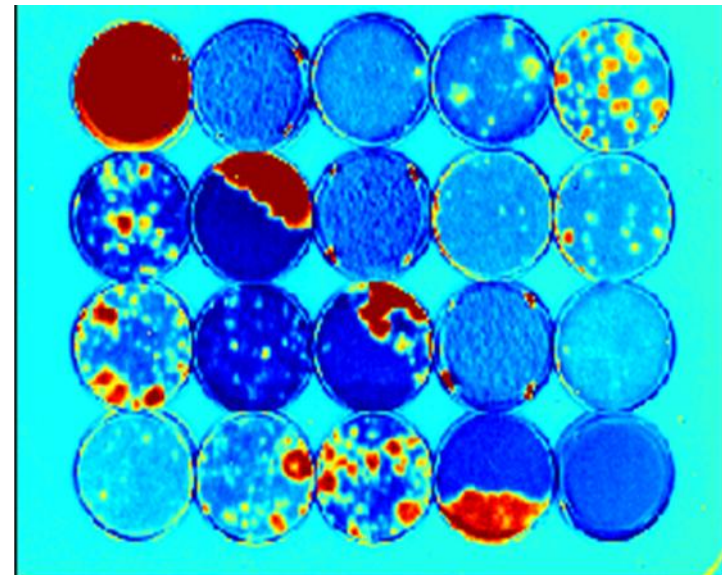


Presentation outline



- **Introduction to the Biotech/Pharma field**
- **Process Analytical Technology initiative**
- **Biologicals and their complexity**
- **Summary:**
 - **Starting point**
 - **Future trends**
 - **Priorities for the call**

Current state



Four pillars of PAT

- **Tools for Design, Data Acquisition and Analysis**
MULTIVARIATE
- **Process Analyzers**
ON-LINE/IN-LINE or AT-LINE
- **Process Control Tools**
RISK-BASED APPROACH & (NEAR-)TIME RELEASE
- **Continuous Improvement & Knowledge Management Tools**

Process validation guidance



Collection and evaluation of data, from the process design stage through commercial production, which establishes scientific evidence that a process is capable of consistently delivering quality products

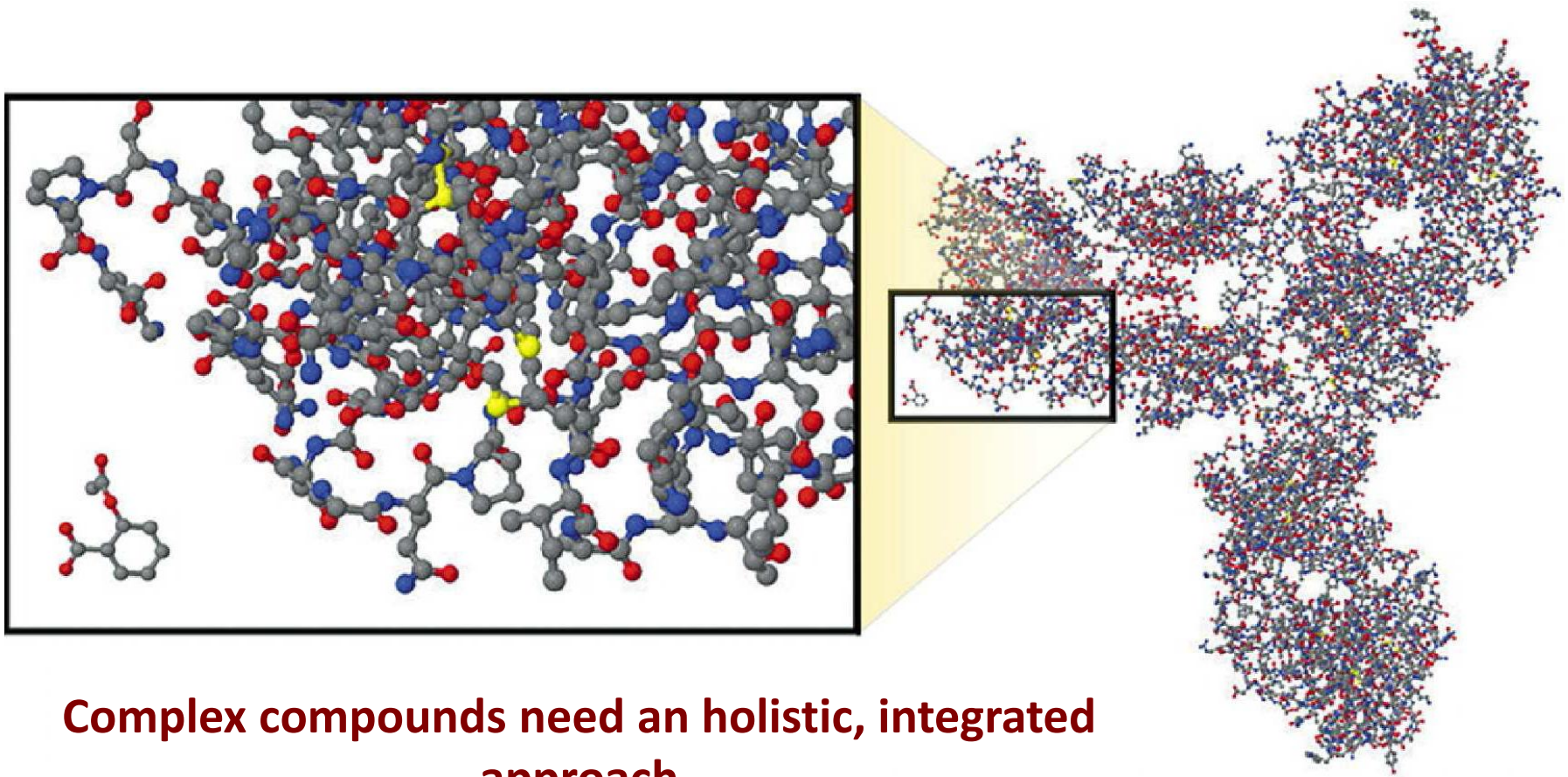
Process Understanding

Managing variation

Managing variation

- **Understand the source of variations**
- **Detect the presence and degree of variation**
- **Understand the impact of variation on the process and ultimately on product**
- **Control the variation**

Biologicals – new challenges



Pharmaceutical production process

Upstream

Raw material analysis
Media preparation
Cell line optimisation
Preculture preparation

C
U
L
T
U
R
E

Downstream

Harvest
Purification
Formulation
Fill finish

Pharmaceutical production process



Knowledge?

- **A collection of data is not information**
- **A collection of information is not knowledge**
- **A collection of knowledge is not wisdom**

Challenges

- **Monitoring is not enough, process understanding is required**
- **Learn from failure**
- **Need to speed up process development time and technology transfer:**
 - **Ex. WHO, June 2011: for 2015 process development of influenza vaccines need to be brought down from 12 months to 3 months**

Comprehensive approach

Genomics

Transcriptomics

Proteomics

Metabolomics

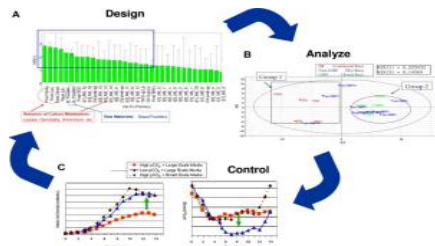
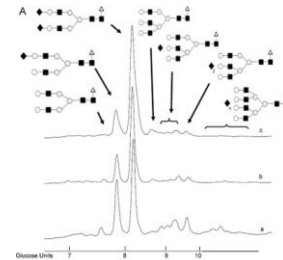
Fluxonomics

Historical production data

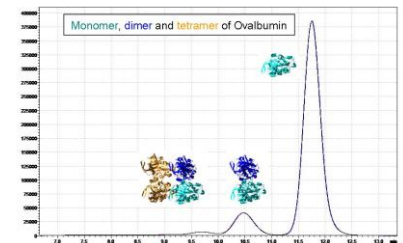
Clinical trials

Historical R&D data

	1	2	3	4	5	6	7	8	9	10	11	12
Q ₁ Medium	0 mg/ml	0 mg/ml	0 mg/ml	0.5 mg/ml	0.5 mg/ml	0.5 mg/ml	1.0 mg/ml	1.0 mg/ml	1.0 mg/ml	1.5 mg/ml	1.5 mg/ml	1.5 mg/ml
Q ₂ Medium	2.0 mg/ml	2.0 mg/ml	2.0 mg/ml	2.5 mg/ml	2.5 mg/ml	2.5 mg/ml	3.0 mg/ml	3.0 mg/ml	3.0 mg/ml	3.5 mg/ml	3.5 mg/ml	3.5 mg/ml
Medium and sugar DP	0 mg/ml	0 mg/ml	0 mg/ml	0.5 mg/ml	0.5 mg/ml	0.5 mg/ml	1.0 mg/ml	1.0 mg/ml	1.0 mg/ml	1.5 mg/ml	1.5 mg/ml	1.5 mg/ml
Q ₁ Medium and sugar DP	2.0 mg/ml	2.0 mg/ml	2.0 mg/ml	2.5 mg/ml	2.5 mg/ml	2.5 mg/ml	3.0 mg/ml	3.0 mg/ml	3.0 mg/ml	3.5 mg/ml	3.5 mg/ml	3.5 mg/ml
Q ₂ Medium and sugar DP	0 mg/ml	0 mg/ml	0 mg/ml	0.5 mg/ml	0.5 mg/ml	0.5 mg/ml	1.0 mg/ml	1.0 mg/ml	1.0 mg/ml	1.5 mg/ml	1.5 mg/ml	1.5 mg/ml
Q ₁ Medium and sugar DP	2.0 mg/ml	2.0 mg/ml	2.0 mg/ml	2.5 mg/ml	2.5 mg/ml	2.5 mg/ml	3.0 mg/ml	3.0 mg/ml	3.0 mg/ml	3.5 mg/ml	3.5 mg/ml	3.5 mg/ml
Q ₂ Medium and sugar DP	0 mg/ml	0 mg/ml	0 mg/ml	0.5 mg/ml	0.5 mg/ml	0.5 mg/ml	1.0 mg/ml	1.0 mg/ml	1.0 mg/ml	1.5 mg/ml	1.5 mg/ml	1.5 mg/ml
Q ₁ Medium and sugar DP	2.0 mg/ml	2.0 mg/ml	2.0 mg/ml	2.5 mg/ml	2.5 mg/ml	2.5 mg/ml	3.0 mg/ml	3.0 mg/ml	3.0 mg/ml	3.5 mg/ml	3.5 mg/ml	3.5 mg/ml
Q ₂ Medium and sugar DP	0 mg/ml	0 mg/ml	0 mg/ml	0.5 mg/ml	0.5 mg/ml	0.5 mg/ml	1.0 mg/ml	1.0 mg/ml	1.0 mg/ml	1.5 mg/ml	1.5 mg/ml	1.5 mg/ml



**Chemometrics/
multivariate
data mining**



Summary

- **Starting point:**
 - In today's pharma field there is a lack of process understanding that can only be bridged by a interdisciplinary approach
- **Future trends:**
 - **Urgent need for a versatile platform combining data acquisition & storage, multivariate analysis & expert knowledge based control system for high-through-put drug development and production**

Go raibh maith agat



Merci beaucoup!