COST 865 Spring Workshop
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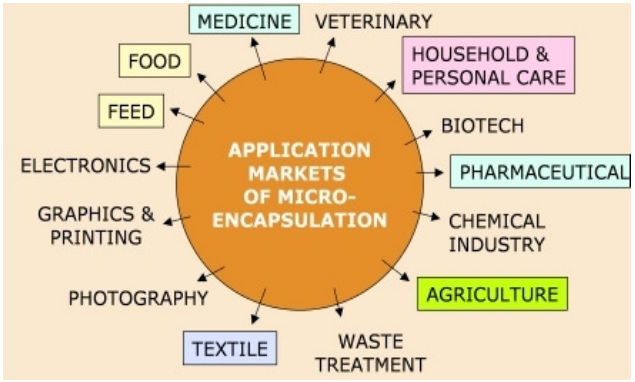
Multiscale requirements for bioencapsulation in medicine and biotechnology

Workgroup II, COST 865, presented by
Marion Ansorge-Schumacher (TU Berlin),

Bioencapsulation in medicine and biotechnology



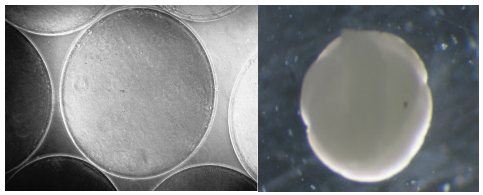
Biotechnology: Increase of cell density and productivity in cell fermentation, avoidance of washout of biological catalysts.

Medicine: Drug protection & deliverance; bio-artificial organs.

Drawbacks to application of bioencapsulation

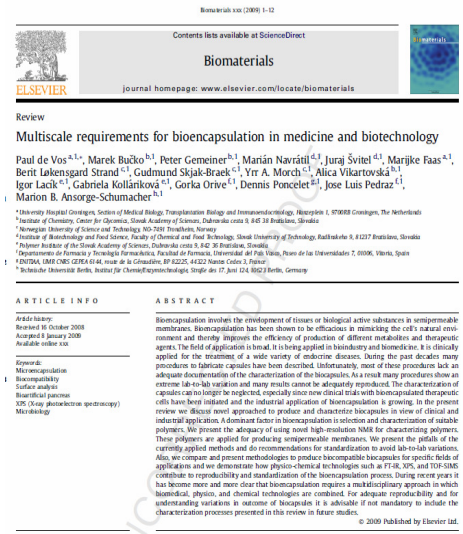
Why not more generally applied ?

- Considered low reproducibility
- Lab-to-Lab variations



Pitfall until 2008: Lack of documentation of production process and capsule properties

Review on methods for characterisation of capsules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Review

Multiscale requirements for bioencapsulation in medicine and biotechnology

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ARTICLE INFO

ABSTRACT

Workgroup II, COST 865

Polymers for bioencapsulation

Selection of adequate polymer

- Support functional survival of cell (intracapsular compatibility)
- Compatible with exterior (recipient, fermentation)
- Mechanical and physical-chemical adequacy in specific application

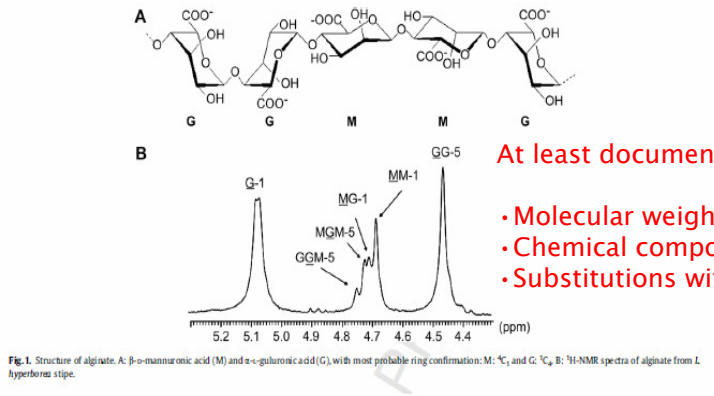


Fig. 1. Structure of alginate. A: β-D-mannuronic acid (M) and α-L-guluronic acid (G), with most probable ring confirmation: M: $^4C_1$ and G: $^1C_4$. B: ^{1}H-NMR spectra of alginate from *L. hyperborea* stipe.

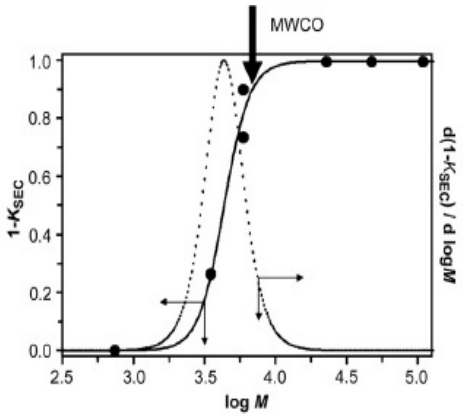
At least documentation of:

- Molecular weight average
- Chemical composition
- Substitutions with modifications

Permeability properties

Permeability properties

- Determines exchange, production, efficacy of system
- Determines survival of cells



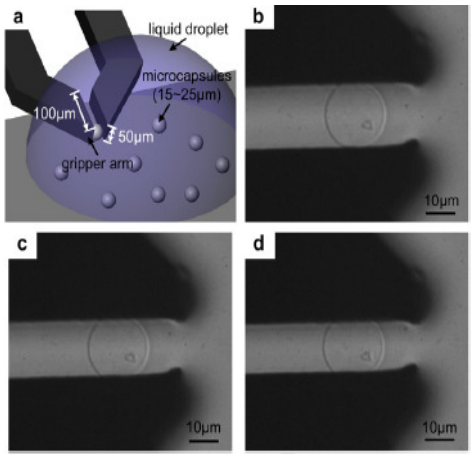
At least documentation of:

- Solutes applied (application dependent)

➔ Size exclusion chromotography most reproducible

Mechanical resistance

Determination of durability



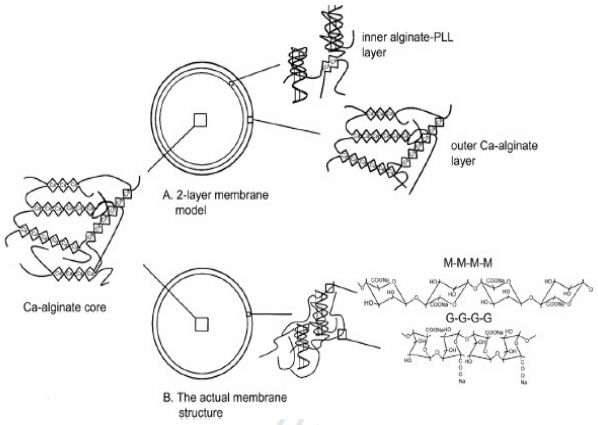
At least documentation of:

- Force required to acquire a fixed compression or implosion

Surface properties

Surface properties

- Determines functional performance in specific application
- Provides insight in actual structure of capsule



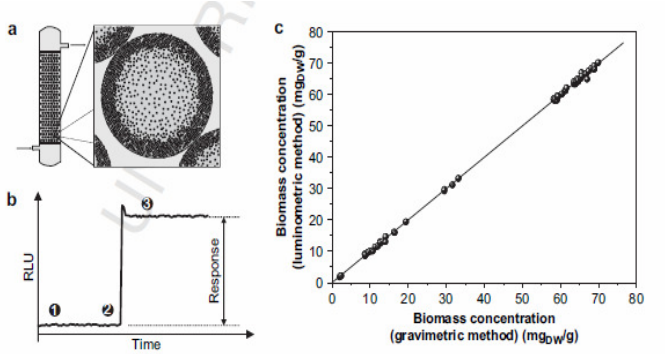
Recommendation:

- XPS, FTIR, or Tof-Sims before and after application

Biocompatibility

Biocompatibility

- Intracapsular, functional survival of cells
- Extracapsular, maintenance of functional properties in application



Recommendation: Bioluminescence, viability monitoring; monitoring functional properties of membrane before after and during application

Conclusions

Every application requires a **specific adaptation** of the procedure, consequently every application requires an **unique capsule type**

General technologies to document capsule properties have been identified and **improve reproducibility**

Many novel **structural insights** have been gained by documentation and comparison