



ASSOLOMBARDA
Confindustria Milano Monza e Brianza



Microincapsulazione

Dipartimento di Scienze del Farmaco – Università di Pavia

Speaker

Prof. Bice Conti

12 ottobre 2016

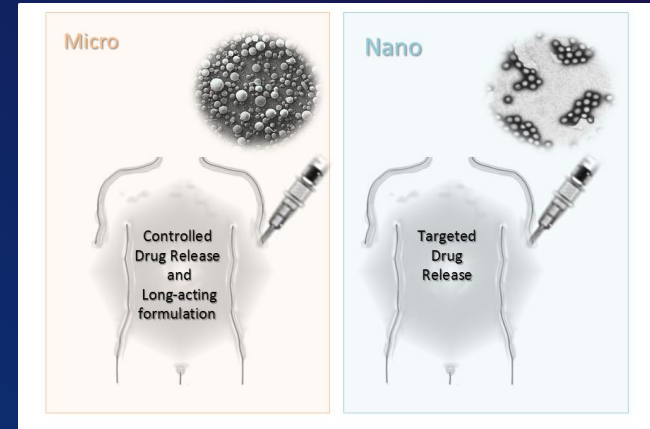
Proff. Bice Conti, Ida Genta, Rossella Dorati, Tiziana Modena.

Laboratorio di Tecnologia e legislazione Farmaceutica (PT&L)- Dipartimento di Scienze del Farmaco, Università di Pavia

Linee di ricerca

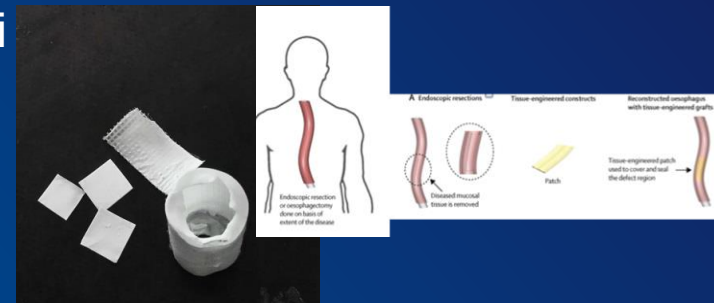
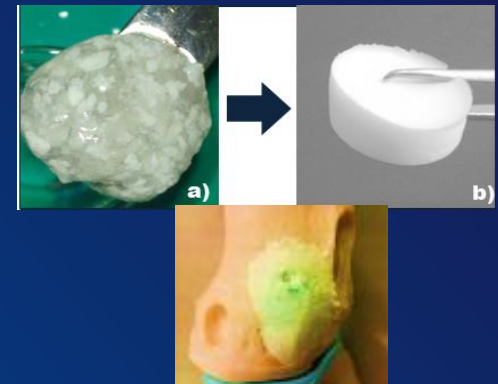
DRUG DELIVERY SYSTEMS

- Sistemi terapeutici polimerici micro e nanoparticellari
- Veicolazione di molecole farmacologicamente attive.



RIGENERAZIONE TISSUTALE

- Scaffold 3 D polimerici composti modellabili, per la rigenerazione ossea.
- Scaffold 3 D-Drug delivery systems polimerici composti modellabili, per la rigenerazione ossea.
- Scaffold 3 D polimerici composti iniettabili gelificanti in situ, per la rigenerazione ossea.
- Scaffold polimerici per la rigenerazione esofagea.
- Microscaffold cellularizzati.



Emulsione con
evaporazione del
solvente

Coacervazione

Fluidi supercritici

Estrusione

Tecniche di
microincapsulazione

Termica

Gelificazione

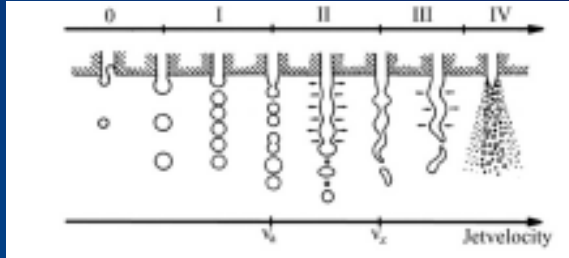
Ionotropica

Polimerizzazione in
situ

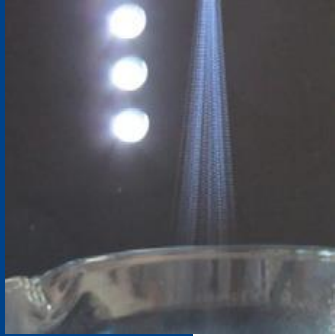
Spray drying

Policondensazione
interfacciale

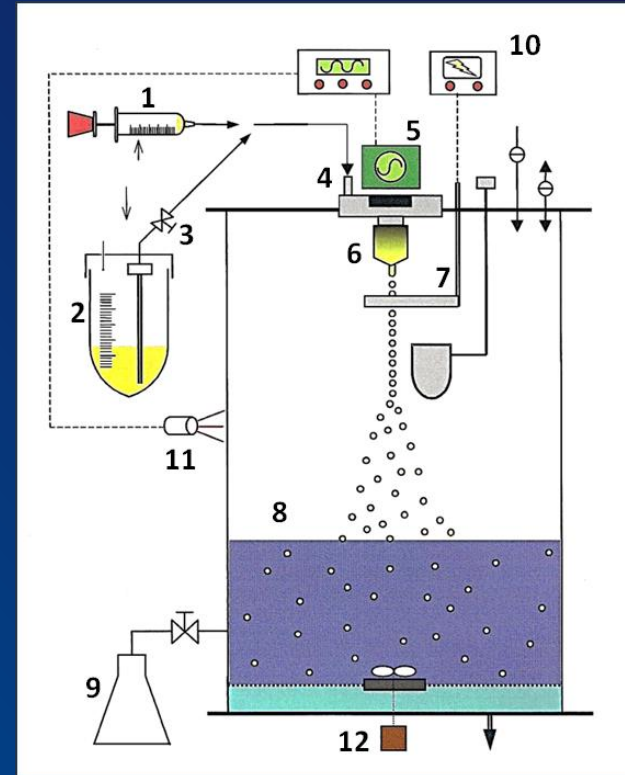
Microincapsulazione con tecnica vibrazionale ad alta efficienza



Correlazione tra la velocità del getto del liquido e la formazione delle gocce (da: *Heinzen et al. 2004*)



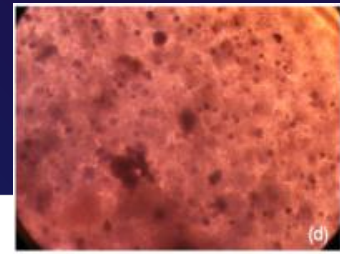
Microincapsulatore BUCHI B395 Pro



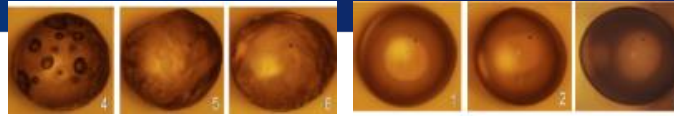
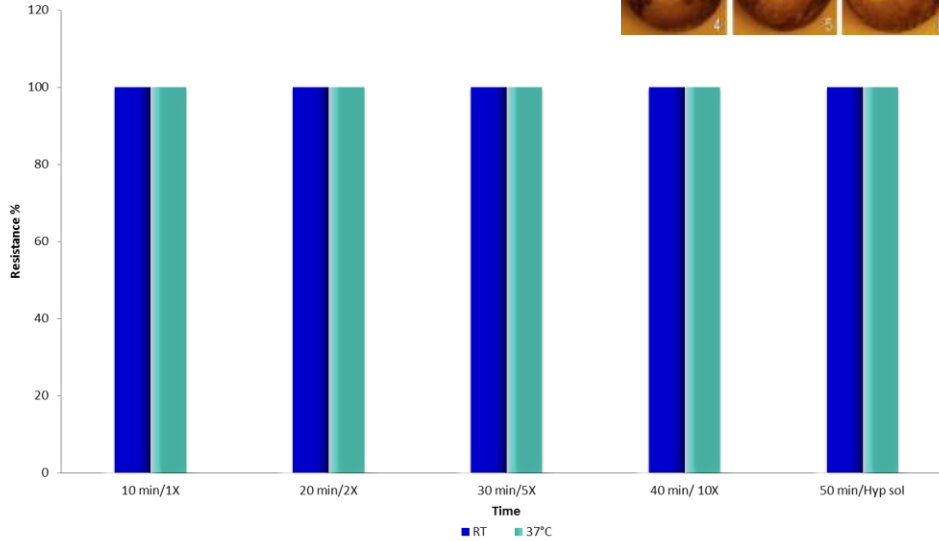
Schema microincapsulatore 1. pompa-siringa; 2. bottiglia a pressione; 3 sistema di controllo pressione aria; 4 camera di iniezione; 5 sistema a vibrazione; 6 ugello; 7 elettrodo; 8 recipiente di reazione; 9 collettore; 10 generatore di frequenza; 11 stroboscopio; 12 agitatore magnetico (da: *BUCHI, manuale operativo*)

Case Study 1

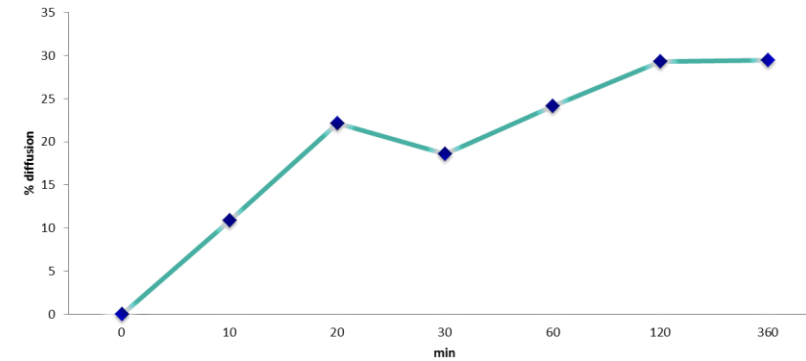
Polymeric beads for cell transplantation



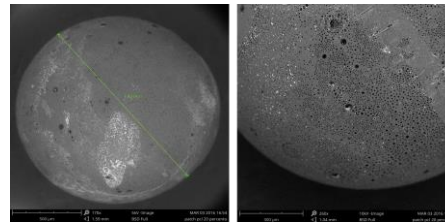
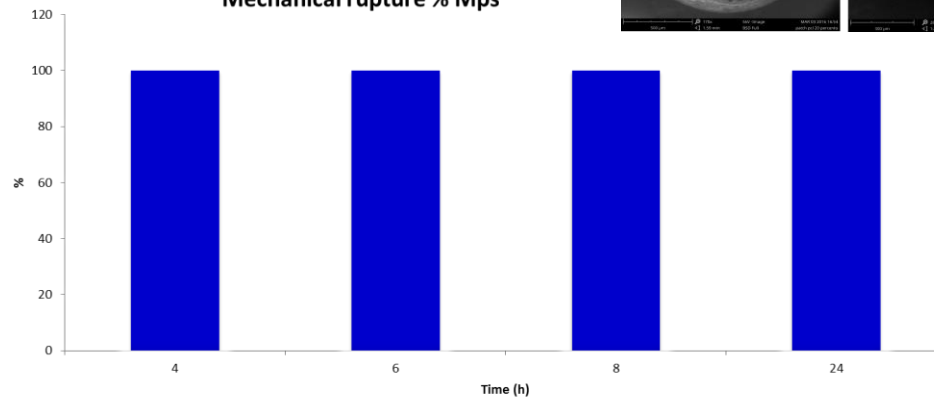
Osmotic Resistance % Mps



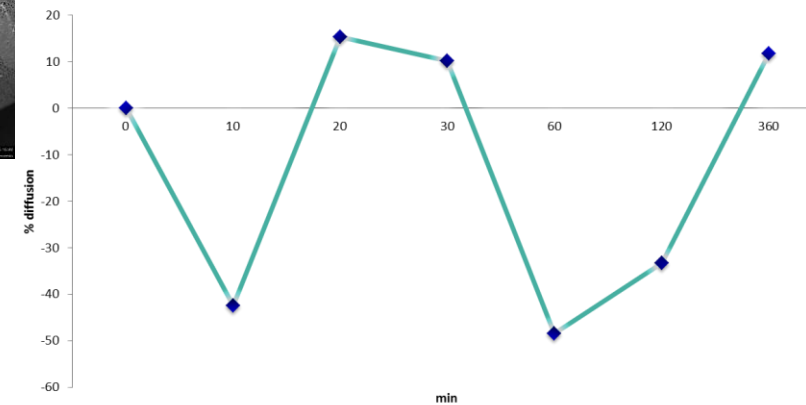
a) Diffusion % Pullulan Mw 5900



Mechanical rupture % Mps



b) Diffusion % Pullulan Mw 11000



Case Study 1

Polymeric beads for cell transplantation

Application: Encapsulation of cells into polymeric beads

Presently PT&L are using the BUCHI Encapsulator B-395 Pro to develop and optimize a standard and innovative protocol to load cells into polymeric beads.

Scale-up of this production process under GMP conditions is possible.

Equipment: Encapsulator B-395 Pro

BUCHI Encapsulator B-395 Pro is the instrument of choice on the market for sterile encapsulation of cells into polymeric beads and capsules. The instrument allows users to encapsulate cells under gentle and stress free conditions, thus maintaining very high cell viability.

Moreover, the formulations can be developed under fully sterile conditions by reproducible procedures.

Most important parameters affecting microcapsules characteristics are easily set and adjusted on the Encapsulator.

Case study 2 NUTRIDENT FP7 PROJECT

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Adhesive microbeads for the targeting delivery of anticaries agents of vegetable origin

Bice Conti ^{a,*}, Barbara Colzani ^a, Adele Papetti ^a, Dora Mascherpa ^a, Rossella Dorati ^a, Ida Genta ^a, Carla Pruzzo ^b, Caterina Signoretto ^c, Edjia Zaura ^d, Peter Lingström ^e, Itzak Ofek ^f, Mike Wilson ^g, David A. Spratt ^g, Gabriella Gazzani ^a

^a Department of Drug Sciences, School of Pharmacy, University of Pavia, Via Taramelli 12, 27100 Pavia, Italy

^b DISTAV, University of Genoa, Corso Europa 26, 16132 Genoa, Italy

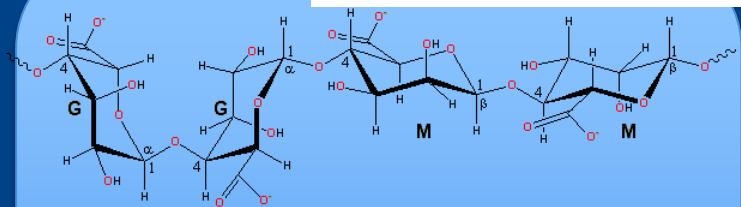
^c Dipartimento di Patologia e Diagnostica-Sezione di Microbiologia, Università di Verona, Strada Le Grazie 8, 37134 Verona, Italy

^d Department of Cariology, Academic Centre for Dentistry Amsterdam (ACTA), University of Amsterdam and Free University Amsterdam, Gustav Mahlerlaan 3004, 1081 LA Amsterdam, The Netherlands

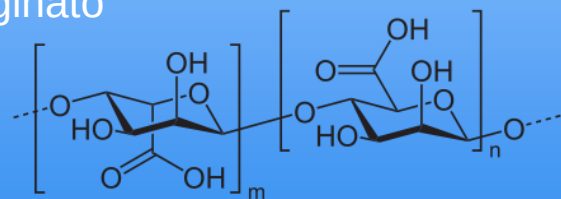
^e Department of Cariology, Institute of Odontology, The Sahlgrenska Academy, University of Gothenburg, Box 450, SE-405 30 Gothenburg, Sweden

^f Department of Clinical Microbiology and Immunology, Sackler Faculty of Medicine, Tel Aviv University, 9778 Tel Aviv, Israel

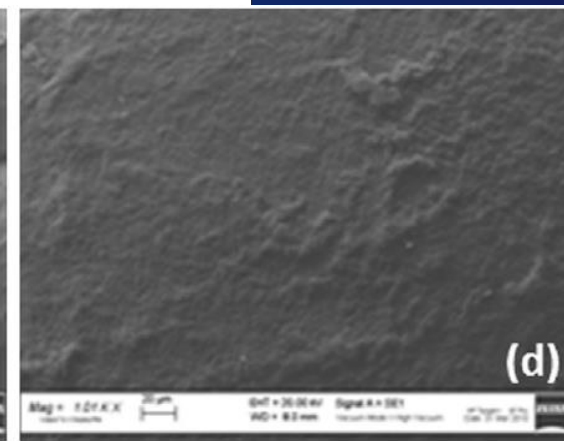
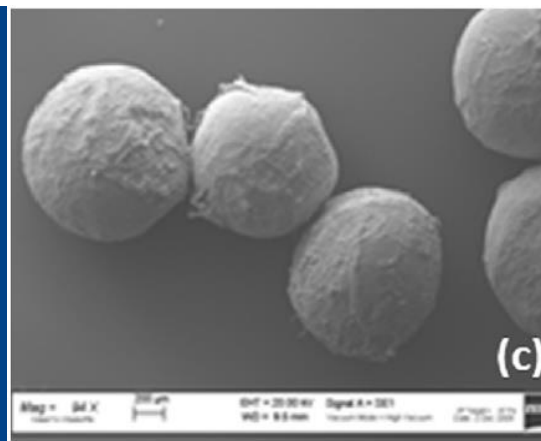
^g Department of Microbial Diseases, UCL Eastman Dental Institute, 256 Gray's Inn Road, London WC1X 8LD, UK



Alginate

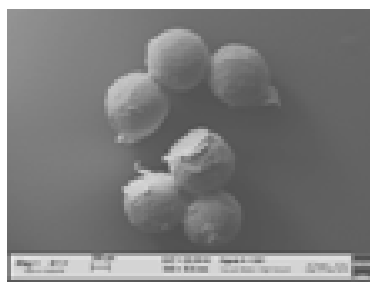


Chitosano

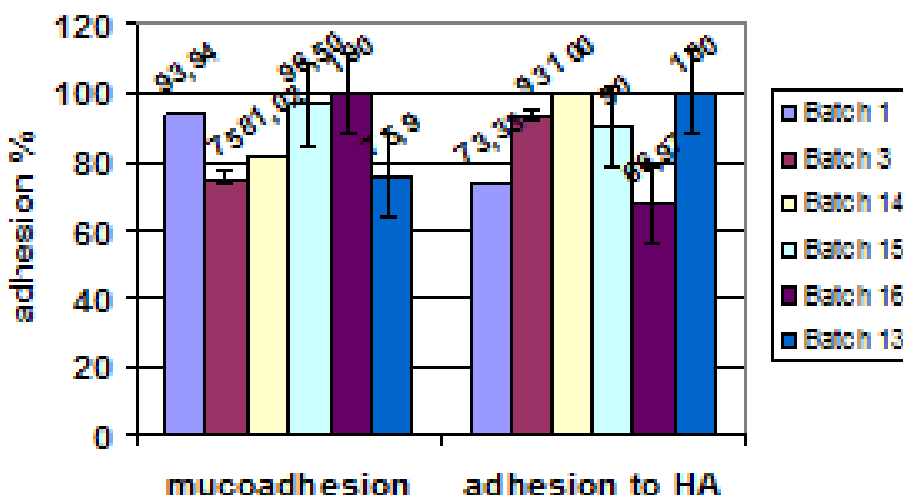


Chitosan coated alginate microbeads, size 300 – 500 micron

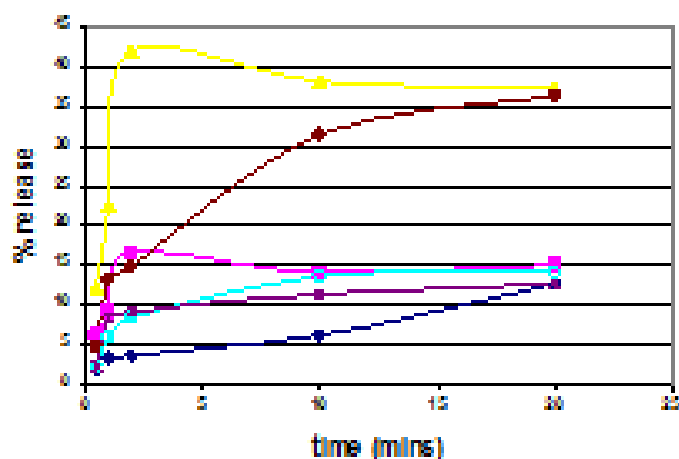
Adhesive microbeads for the targeting delivery of anticaries agents of vegetable origins



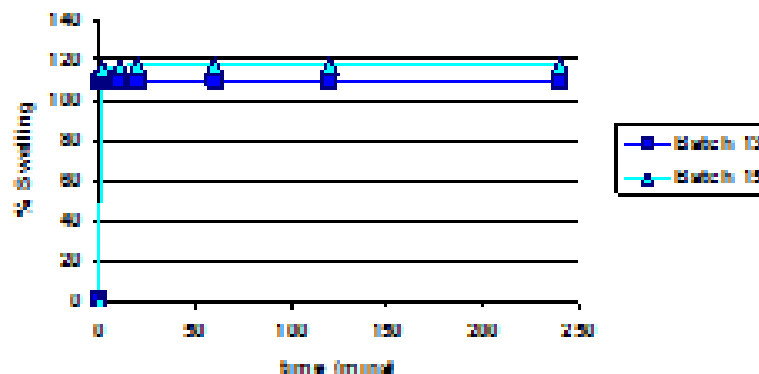
Scanning electron micrograph



In vitro mucoadhesion and adhesion to HA tests



In vitro release of the herbal extract from the microparticles



In vitro swelling behaviour

The microparticles can be formulated as:

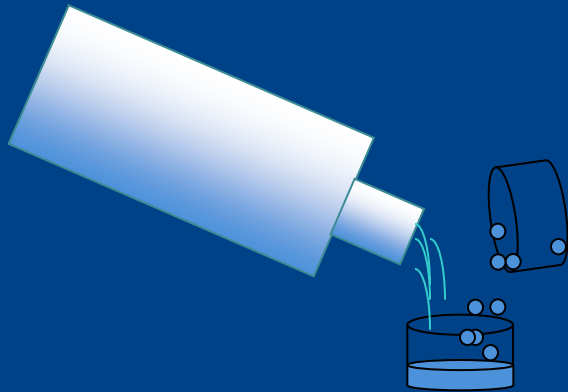
Controlled release mucoadhesive mouthwash



Liquid base



Microparticles (powder)



Resuspension, before use, of the microparticles (powder) into the liquid base.

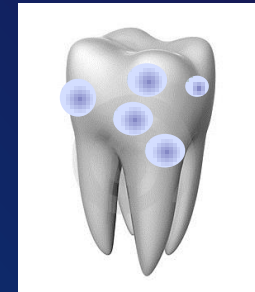


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Mucoadhesive microparticle loaded chewing gum



Saliva

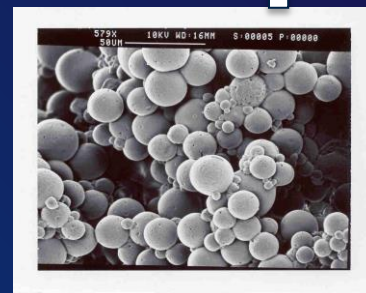


Percentages of microcapsules released undamaged in the chewing times tested

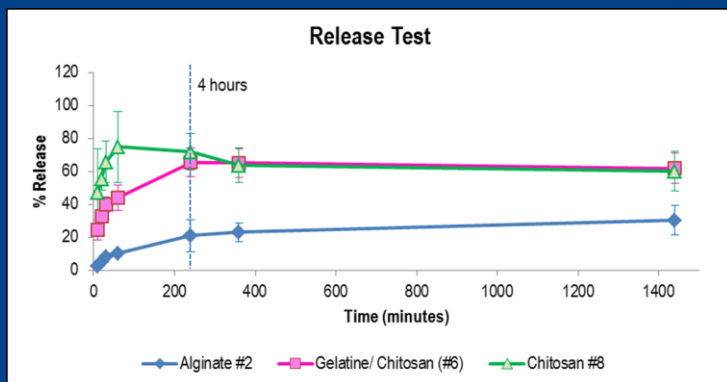
Sample	5 min	10 min	20 min
A	77.48 %	92.05 %	98.01 %
B	58.06 %	92.26 %	98.71 %
C	66.02 %	93.07 %	96.79 %

CHEWING-GUMS AS PAEDIATRIC ORAL DOSAGE FORM TO IMPROVE THE LOCAL TREATMENT OF ORAL CANDIDIASIS

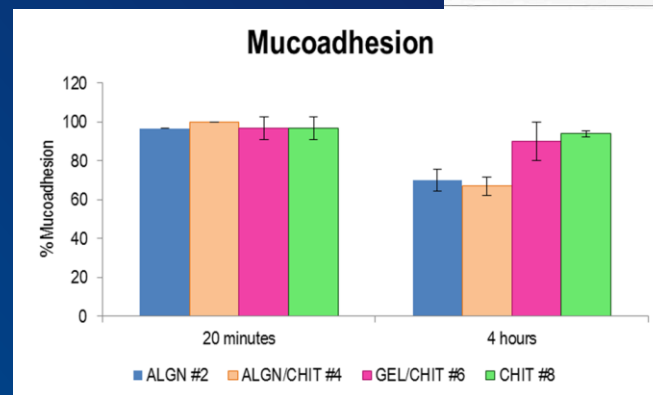
R. Dorati, B. Colzani, I. Genta, T. Modena, B. Conti



ALG concentration (%)	Nozzle Diameter (μm)	Vibration frequency (Hz)		
		1300	3000	6000
0.5	80	111.578 $\pm$ 23.78	114.60410 $\pm$ 5.45	125.020 $\pm$ 25.89
	120	161.804 $\pm$ 39.40	145.672 $\pm$ 7.45	253.019 $\pm$ 34.78
1	80	157.8 $\pm$ 17.50	162.665 $\pm$ 3.98	166.436 $\pm$ 29.65
	120	221.103 $\pm$ 16.98	217.216 $\pm$ 9.70	266.080 $\pm$ 43.21
1.5	80	283.131 $\pm$ 12.34	276.942 $\pm$ 6.0	277.440 $\pm$ 51.09
	120	406.353 $\pm$ 42.90	390.745 $\pm$ 6.89	543.743 $\pm$ 28.99

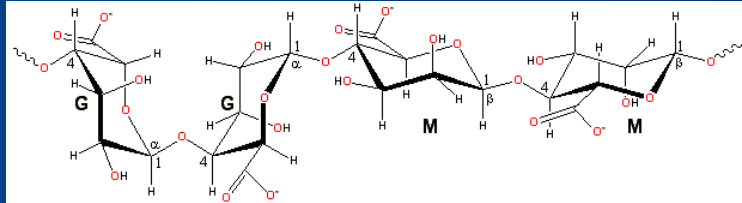


Results of *in vitro* MCN release profile from microparticles: Alginate (#2, blue line), Gelatine/Chitosan (#6, pink line) and Chitosan (#8, green line)

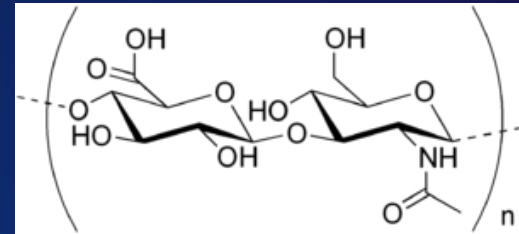


In vitro mucoadhesion test performed on Alginate MP (#2, blue), Alginate/ Chitosan MP (#4, orange), Gelatine/ Chitosan (#6, pink) and Chitosan (#8, green).

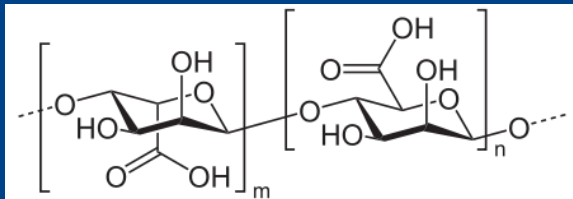
Polimeri naturali



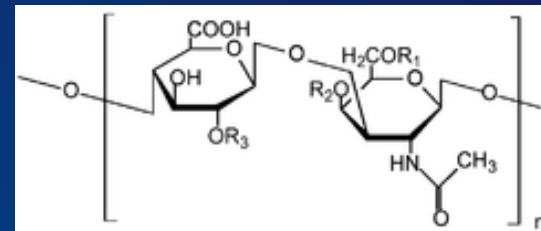
Alginate



Acido ialuronico

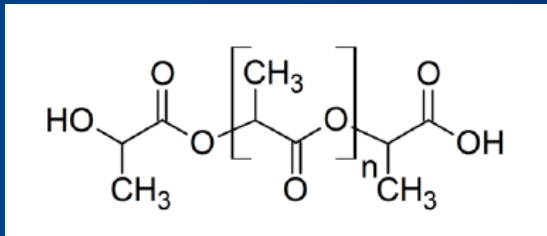


Chitosano

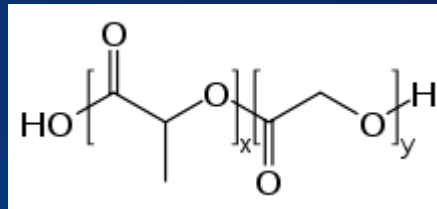


Condroitin solfato

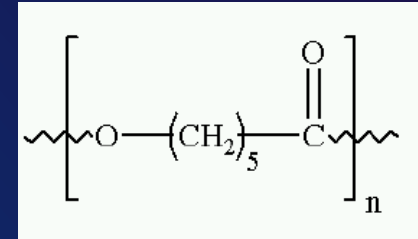
Polimeri sintetici



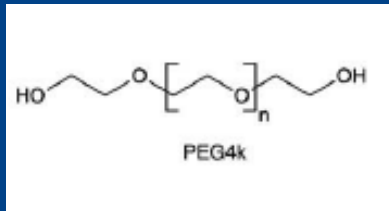
Polilattide



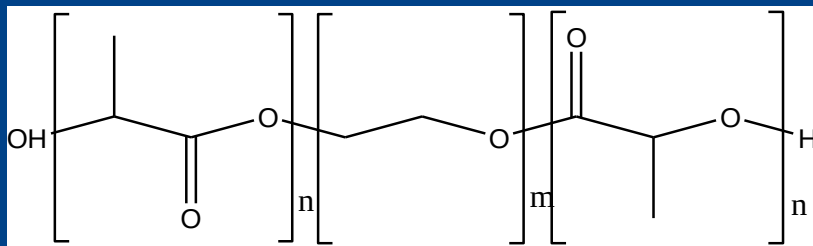
Polilattide-co-glicolide



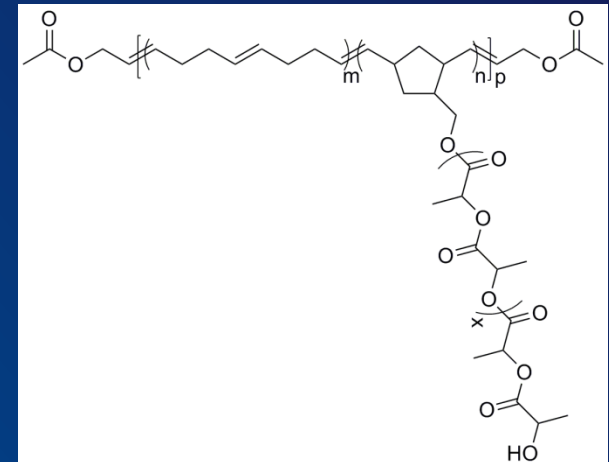
Poli-ε-caprolattone



Polietilenglicole



Polylactide-co-polyethylenglicol



Poly(1,5-cyclooctadiene-co-5-norbornene-2-methanol-graft-DLlactide).

GRAZIE PER L'ATTENZIONE

Proff. Bice Conti, Ida Genta, Rossella Dorati, Tiziana Modena.
Laboratorio di Tecnologia e legislazione Farmaceutica (PT&L)
Dipartimento di Scienze del Farmaco, Università di Pavia

bice.conti@unipv.it



Department of Drug Sciences

