

In the name of GOD



**Pseudo Poly(Amino Acids) Composed of Amino Acids
Linked by Nonamide Bonds such as Esters, Imino
Carbonates, and Carbonates**

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Introduction

This class of polymers is formulated by:

- modifying amino acid(s) with chain extender(s) incorporated into their backbone by peptide
- nonpeptide bonds

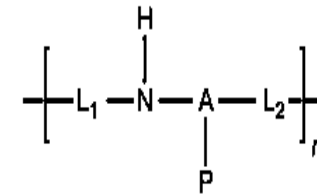
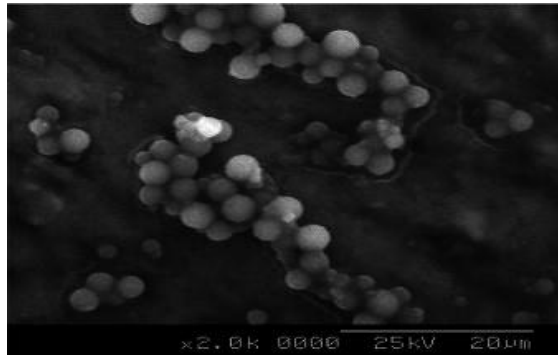
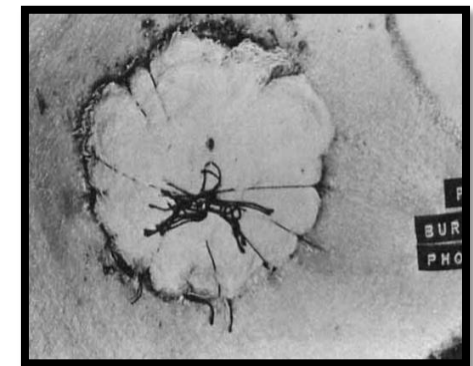
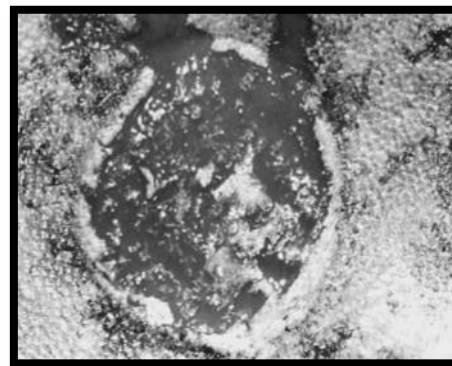
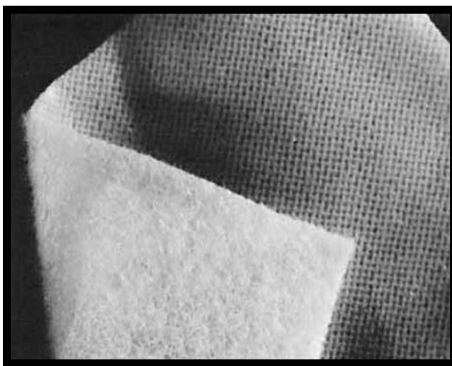


FIGURE 12.1 General scheme of “pseudo” poly(amino acids) where H-N-A is the amino acid, L₁ and L₂ are linking groups, and P is the protecting group.



poly(amino acids) for sutures and skin grafts

Doi:10.1002/jbm.820030203

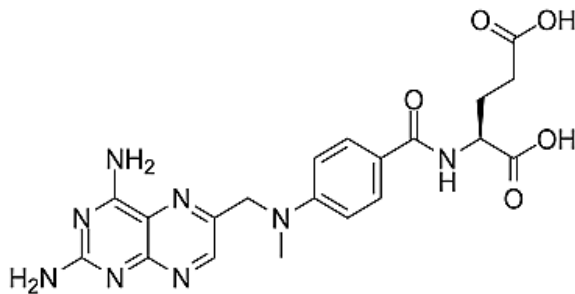
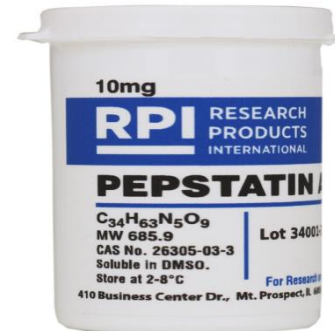
side chains of poly(amino acids)

functionalized

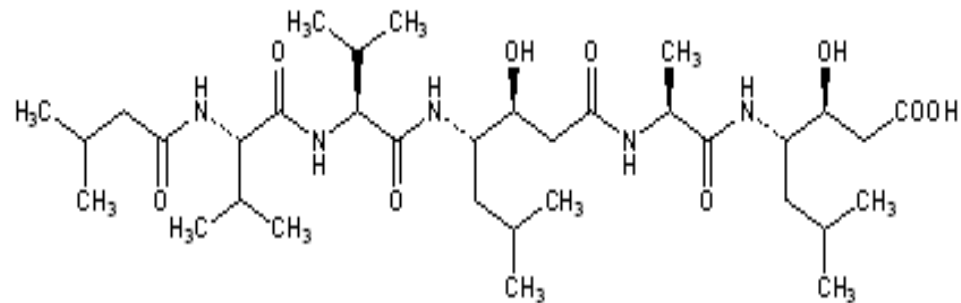
controlling the physicochemical properties

to conjugate targeting moieties and drugs on delivery devices

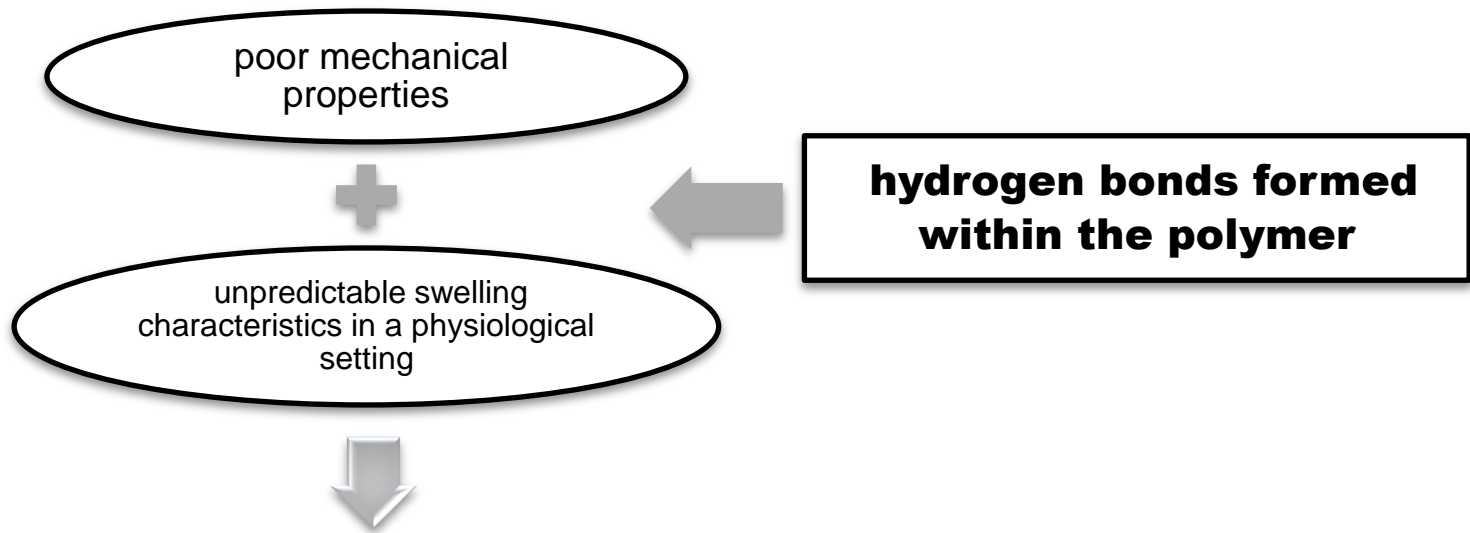
promoting cell adhesion and growth on scaffolds



methotrexate



pepstatin



sequences of amino acids can be modified using alternating peptide and nonpeptide bonds. such as esters, urethanes, and carbonates, results in the generation of **“pseudo” poly(amino acids)**

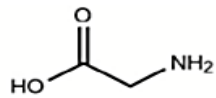


ReZolve®2

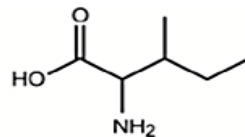


AIGISRx

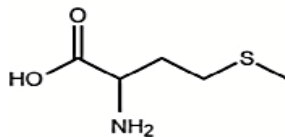
SYNTHESIS OF "PSEUDO" POLY(AMINO ACID)



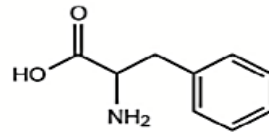
Glycine (G)



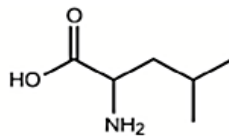
Isoleucine (I)



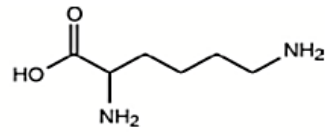
Methionine (M)



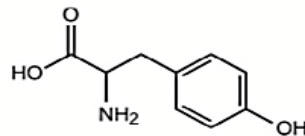
Phenylalanine (F)



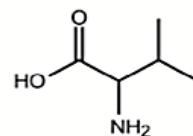
Leucine (L)



Lysine (K)

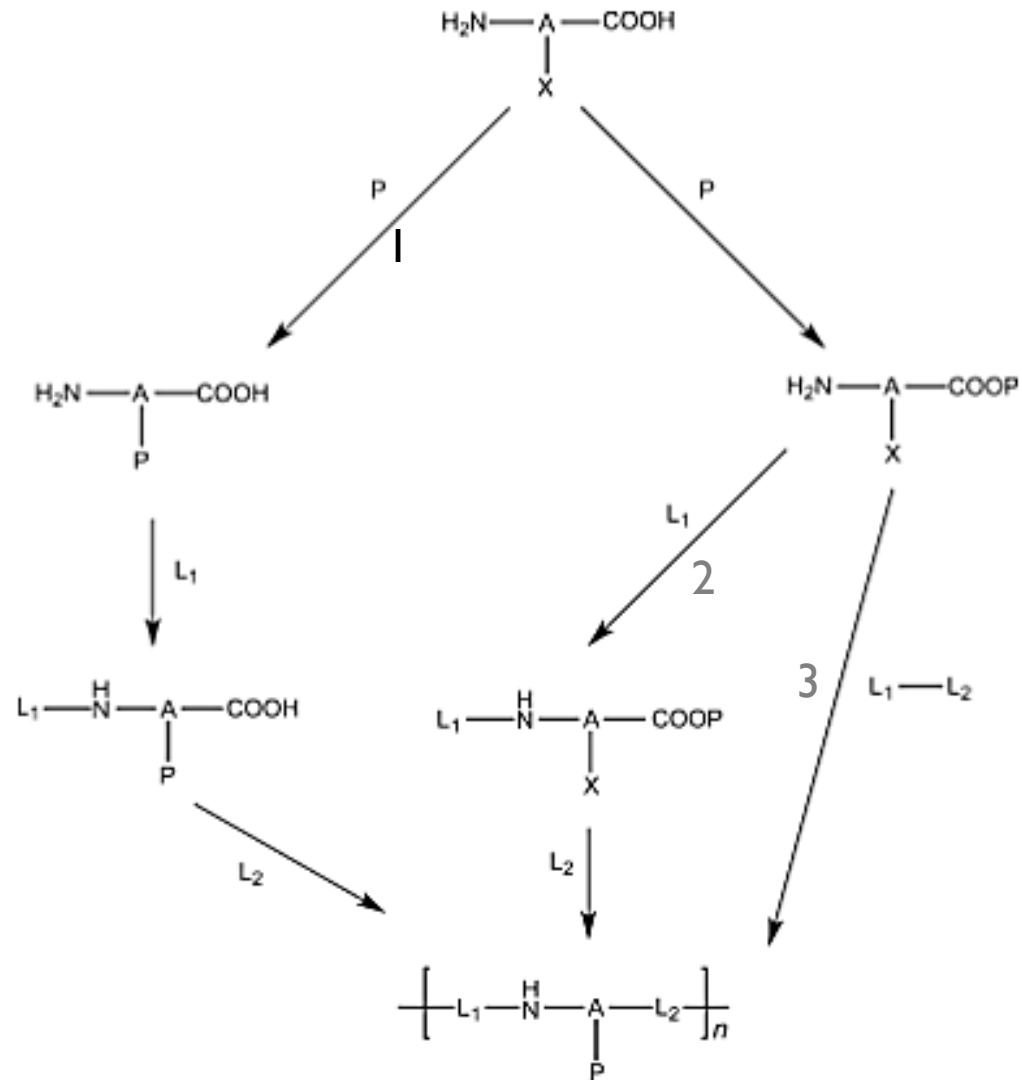


Tyrosine (Y)



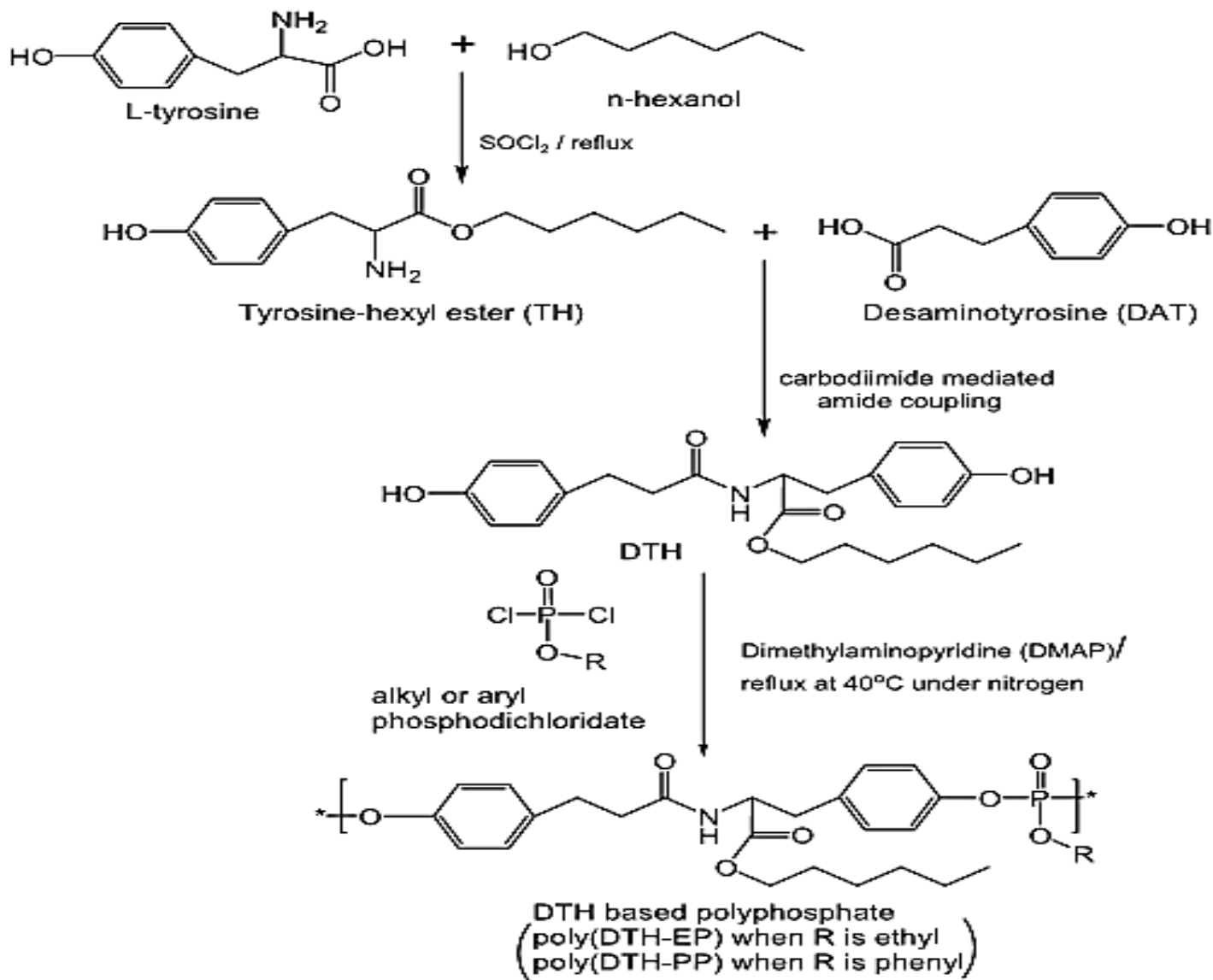
Valine (V)

Common amino acids used for synthesis of "pseudo" poly(amino acids)

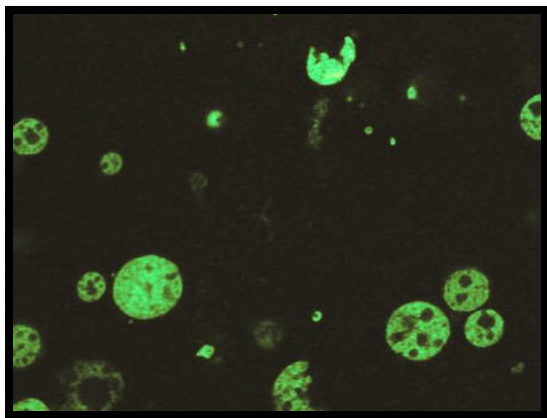


General reaction scheme for "pseudo" poly(amino acids) where P is a protecting group; $L1$ is either diisocyanate, polyol, or diamine; $L2$ is either dicarboxylic acid or diisocyanate; and $L1-L2$ is a prepolymer

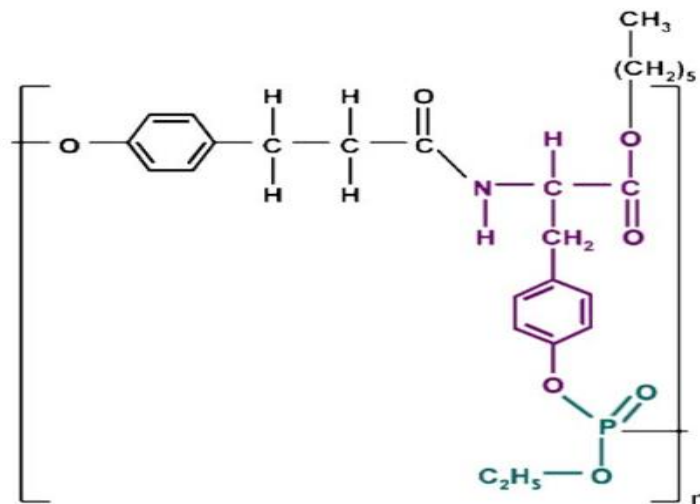
ESTER-BASED "PSEUDO" POLY(AMINO ACIDS)



Chemical structures of L-tyrosine based starting compounds, diphenolic monomer and corresponding polyphosphate polymer.



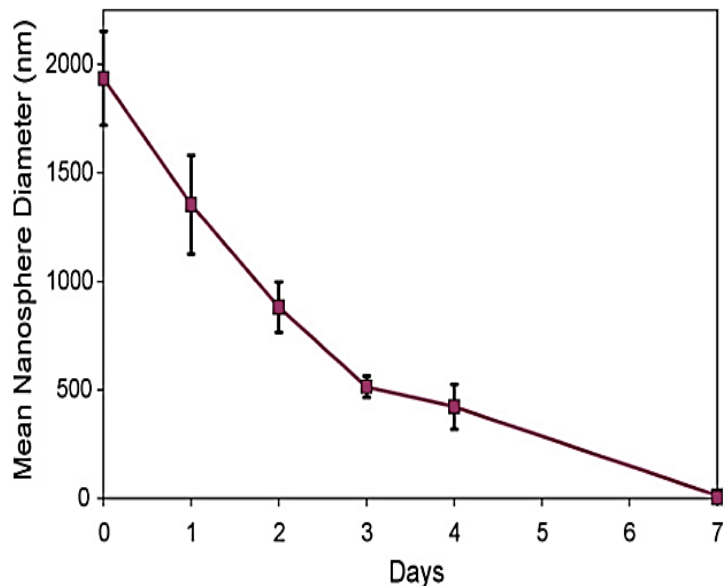
Confocal image of LTP microspheres. The fabrication method of water-in-oil-in-water emulsion shows internal structure that could be used to load aqueous-based drugs



Chemical structure of LTP

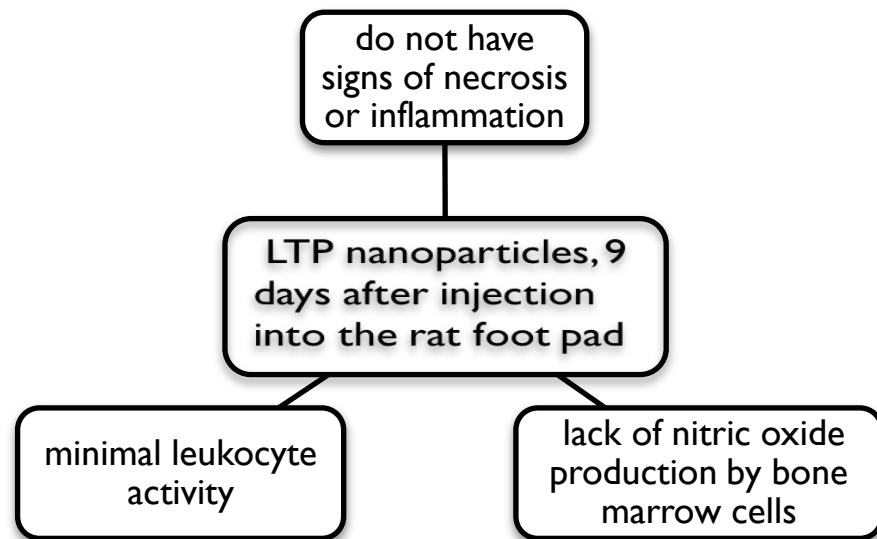
Doi:10.1007/s00396-009-2082-4

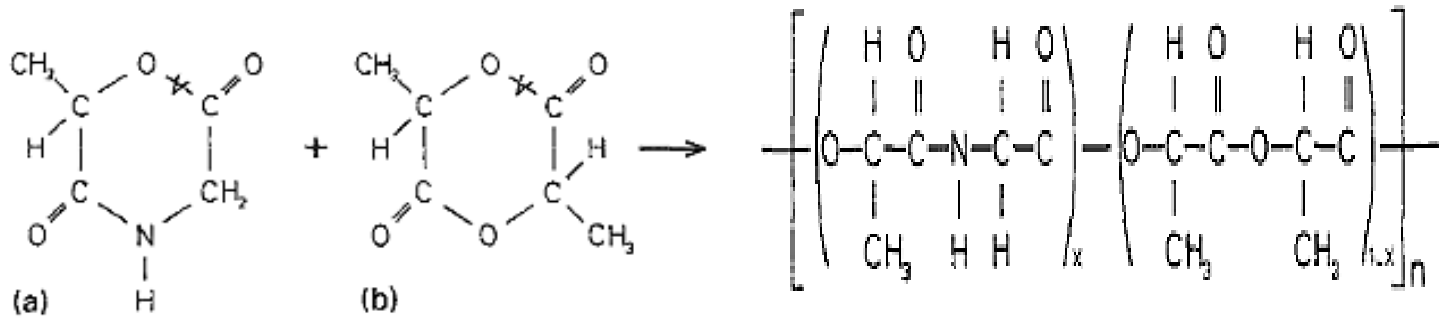
LTP's short degradation period of 7 days



Degradation of LTP nanosphere mean diameter

Doi:10.1016/j.ijpharm.2008.10.019

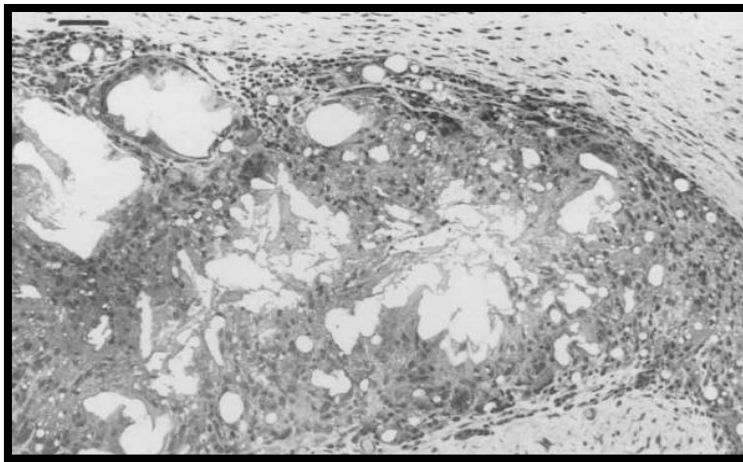




Poly(glycine-co-lactide)

a = cyclo(glycine-lactic acid)

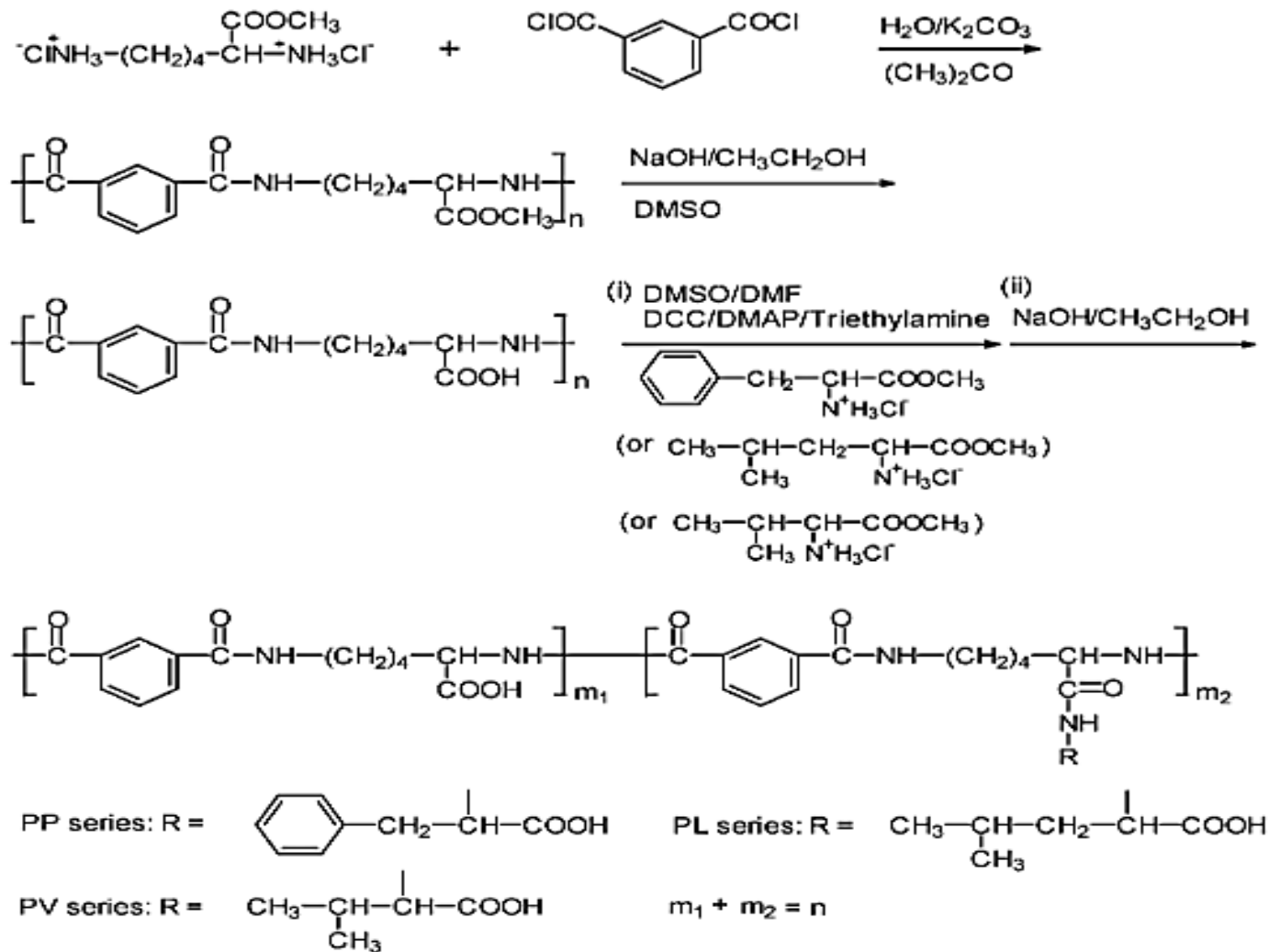
b = dilactide monomer



less severe inflammatory reaction upon histological examination of the surrounding tissue

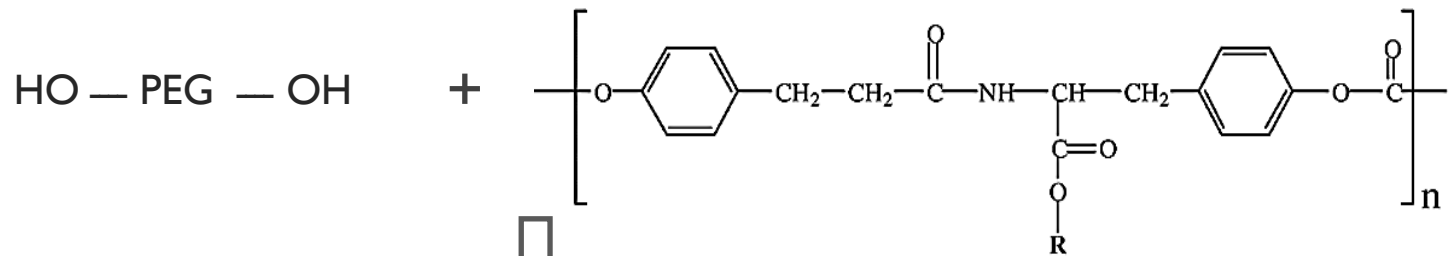
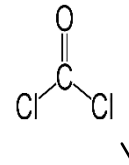
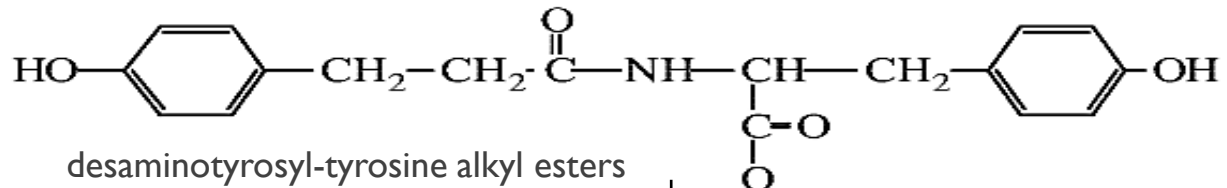
Doi:10.1002/jbm.820231105

AMIDE-BASED "PSEUDO" POLY(AMINO ACIDS)

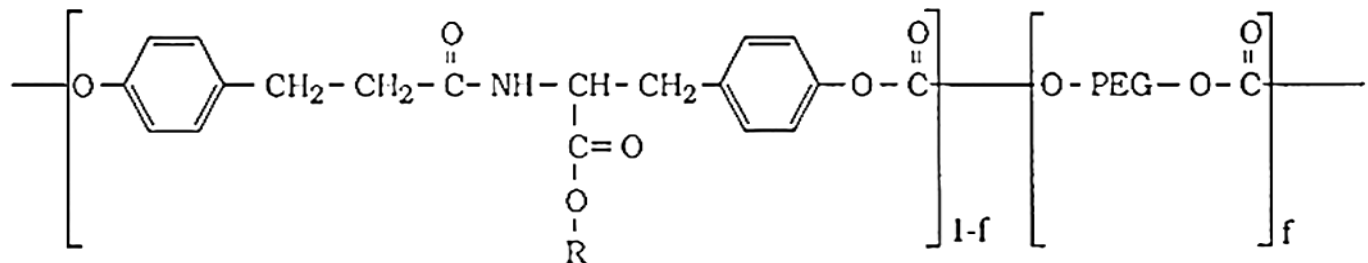
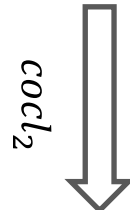


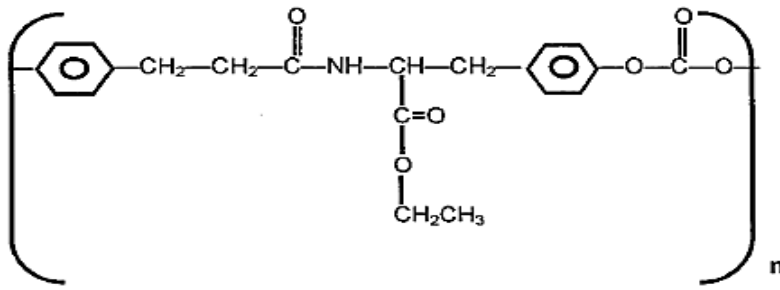
Synthesis of poly(L-lysine isophthalamide)s grafted with Lvaline (PV series), L-leucine (PL series) and L-phenylalanine (PP series).

CARBONATE-BASED "PSEUDO" POLY(AMINO ACIDS)



Chemical structures of tyrosine-derived polycarbonates





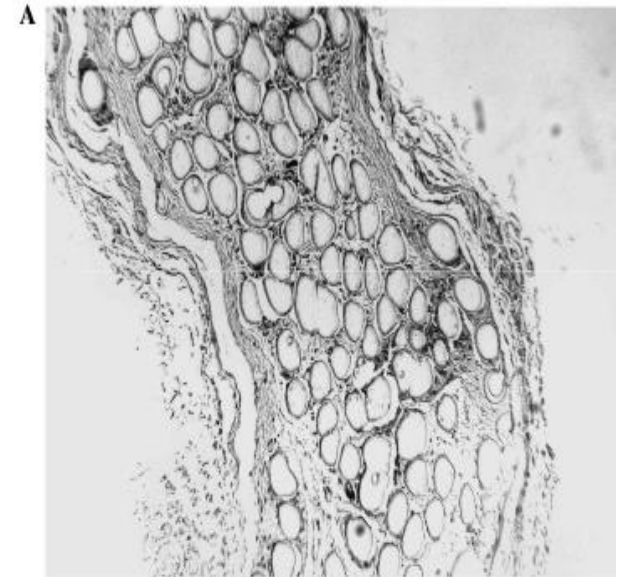
Structure of poly(DTE carbonate)

- Poly(DTE carbonates) display better overall biocompatibility with improved physicochemical
- cellular compatibility properties when compared to PLLA
- no inflammatory responses within the new bone formation



folded PDTE carbonate membrane before implantation

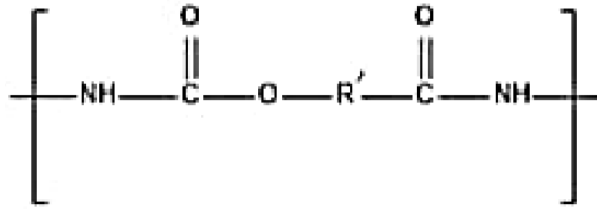
Doi:10.1098/rsif.2006.0119



A)poly(DTE Carbonate) at 4 Weeks
B)poly(DTE carbonate) at 8 weeks

Doi:10.1089/107632704322791682

URETHANE-BASED “PSEUDO” POLY(AMINO ACIDS)



Poly urethane

Polyurethanes:

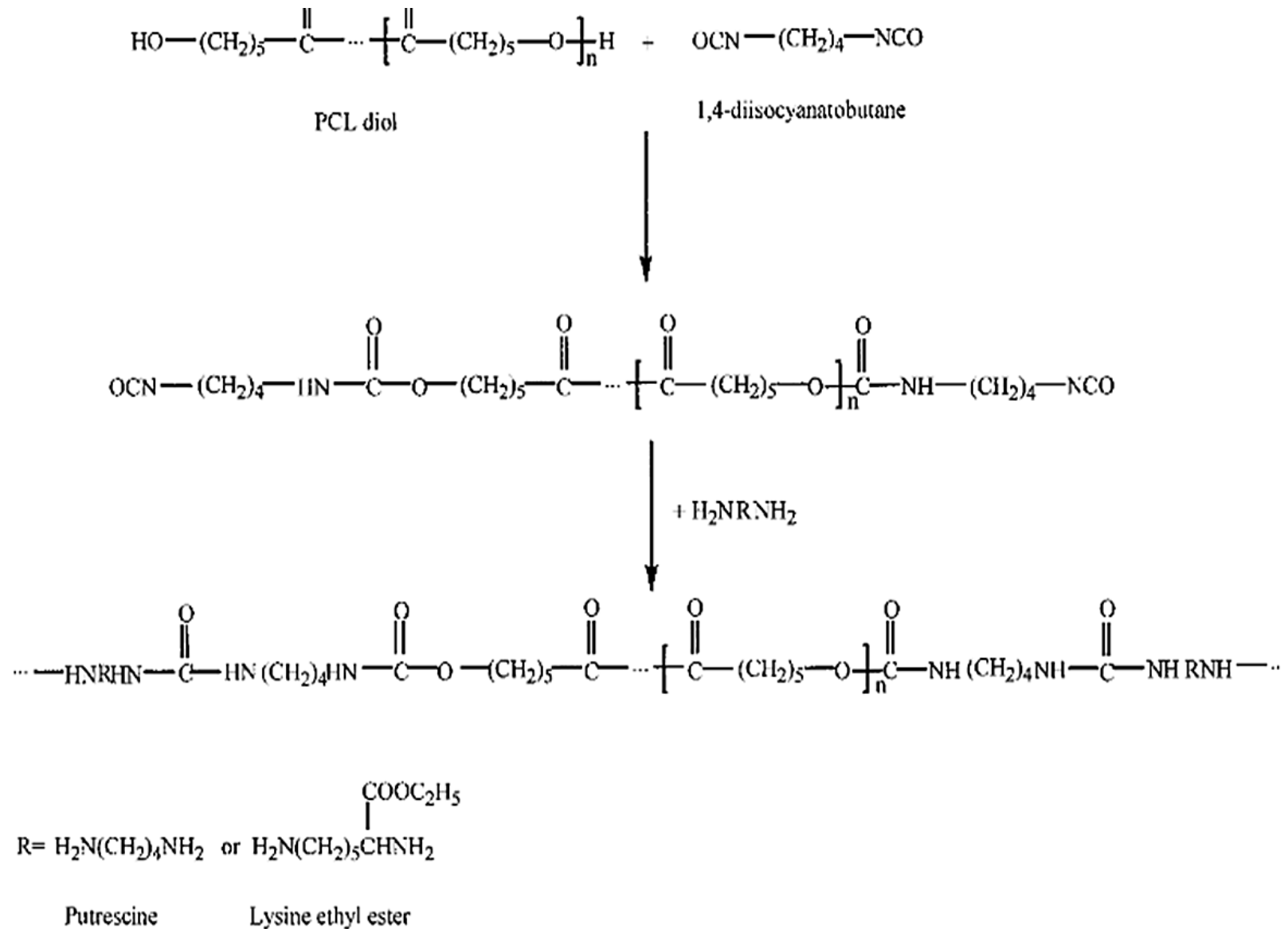
- high tensile strength
- excellent resistances to fatigue, wear and tear
- exceptional elasticity

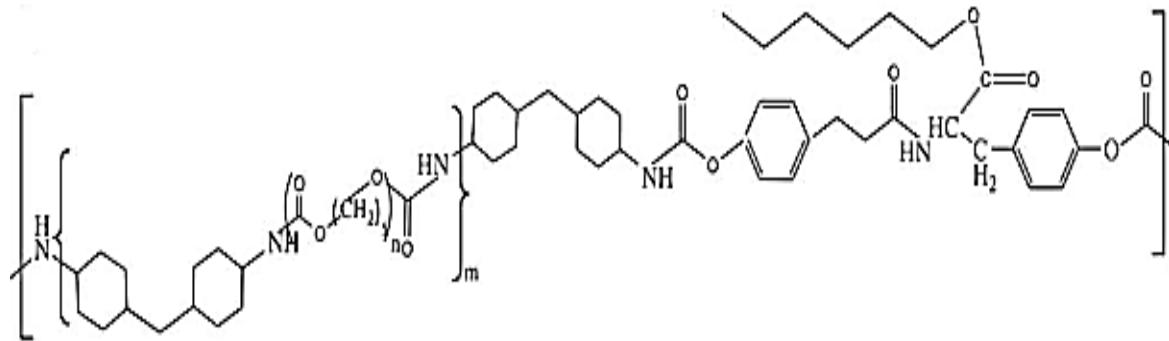


exposure to harsh biological conditions postimplantation has resulted in toxic, carcinogenic, and/or immunogenic by-products

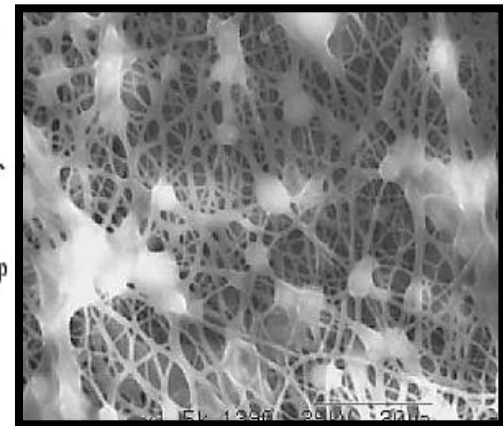
“Pseudo” Poly(amino acids) Formulated with Urethanes

Amino Acid (A)	Linker (L1)	Linker (L2)	Protecting Group (P)
Lysine (c)	PCL-diol (s)	1,4-Diisocyanato butane (h)	Ethanol
Tyrosine(c)	Desamino tyrosine (c)	PCL-diol (s) or PEG-diol (s) and hexamethylene diisocyanate	Hexanol
Lysine diisocyanate (h)	PCL-diol (s) or PEG (s)	Phenylalanine diester (c), 1,4cyclohexanedimethanol (c)	Methanole(lysine)

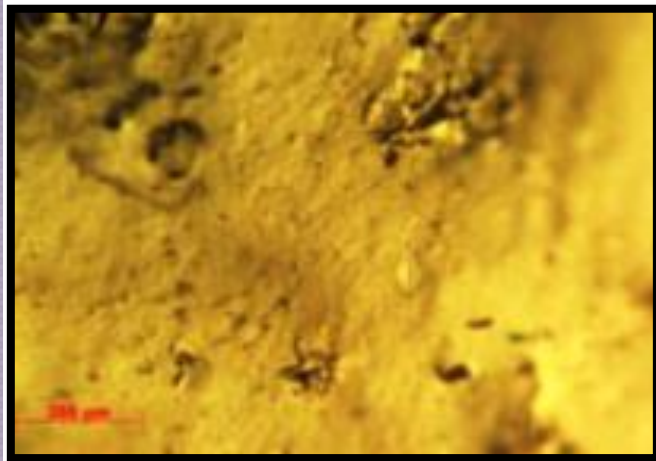




Chemical structures of L-tyrosine based polyurethanes : PCL-DTH



doi: 10.1016/j.polymer.2009.02.048



Polarized optical micrographs of PEG-based polyurethane and LTP blends

Doi:10.1002/app.30509

These polymers exhibit a wide range of mechanical properties, such as tensile strengths ranging from 2 to 18 MPa and elongations ranging from 214% to 1513%, and have mechanical characteristics needed for tissue engineering of human arteries and skin

Immunofluorescence staining of human dermal fibroblast attachment to electrospun LTU

