TABLE 22.4
Polymers Studied for Bioadhesive Drug Delivery

Bioadhesive Polymers

PAA-based polymers
- PAA
- Polycarbophil (copolymer of PAA and divinyl glycol)
- Copolymer of olig(methyl methacrylate) and PAA
- Copolymer of PAA and PEG monoether monomethacrylate (PAA-CO-PEG)
- PAA/chitosan complex
- Pluronic-*g*-polyacrylic acid copolymers

PMMA-based polymers
- PMMA
- PMMA grafted starch

PMA-based polymers
- PMA
- Poly(methacrylic acid—grafted—ethylene glycol)

Thiomers
- Polycarbophil-cysteine
- Chitosan-thioglycolic acid
- PAA-cysteine

Spheromers
- Poly(fumaric acid: sebacic acid) (p[DA:SA])
- Fumaric anhydride oligomer
- L-DOPA-grafted butadiene maleic anhydride (L-DOPA-BMA)

Natural polymers
- Chitosan
- Hyaluronic acid/hyaluronan
- Lectin
- Pectin
- Tragacanth

Other polymers
- Polyanhydride and derivatives
- Sodium carboxymethyl cellulose (Na CMC)
- Polyvinyl alcohol (PVA)
- Polyvinylpyrrolidone (PVP)
- Hydroxypropyl cellulose (HPC)
- Poly(methyl vinyl ether-co-malic anhydride) (PMVEMA)
- Poly(methyl vinyl ether-co-maleic acid) (PMVEMAC)
- Polystyrene

How and why polymers adhere to mucosal surfaces is a topic of great research interest. The topic has been extensively reviewed by Peppas and Sahlin (1996), but it is generally believed that adhesion of polymers to the mucosal surface is the result of several processes related to wetting on the mucosal surface (Kaelbe and Moacanin 1977), electronic transfer between the polymer and glycoprotein network (Derjaguin et al. 1977), adsorption between polymer mucosal surface (hydrogen bonding and Van der Waals forces) (Kinloch 2001), and polymer diffusion (interpenetration) (Voyutskii 1963). Many new polymer derivatives with improved bioadhesion properties are being developed based on manipulating these processes.

Although bioadhesive drug delivery systems have been studied extensively in the past several decades, it is only recently that such systems have been used for delivering water-insoluble drugs. One such system, Spherazole™ CR (Spherics Pharmaceuticals, Inc., Mansfield, MA), has been used for controlled release of the BCS Class II water-insoluble drug itraconazole (Jacob 2005, 2006; Jacob et al. 2005).