THROMBOSIS: A FUNCTION OF SURFACE CHARGE AND/OR CHEMISTRY OF COLLAGEN. P.Sawyer, B.Stanczewski, R.Stillman, D.Kirschenbaum*, S.Sivakoff and T.Lucas. Electrochem and Biophys Labs, *Dept. Biochem, SUNY, DMC, Brooklyn, New York, USA

Examination of porcine prosthesis and bovine heterografts using histologic, SEM and physical examination revealed that ; (1) they have a measurable half life in terms of function; (2) the results are predictable; (3) the structure of the observed thrombus is unusual.

A number of collagen and human umbilical cord prostheses were prepared by bonding a variety of aliphatic acids to the helical polypeptide collagen side chains to produce a repeating surface chemistry. The control (fresh or ficin digested collagen) was compared to (i) glutaraldehyde tanned (GT)(-) charged, (ii) GT plus (+) charged and (iii) GT neutral surface. These resulting tubular grafts were implanted in dog carotid and femoral arteries.

The results indicate the most important factor in long term patency and function is a covalently bonded, GT (-) surface.

Histologic examination reveals that manipulation of the surface charge of collagen results in bizarre thrombus formation with aggregation of a single cell type or protein element.

The (-) charged grafts were free from thrombus. Control collagen grafts contained classical fibrinogen and cellular thrombus. The (+) charged grafts had a pseudo-thrombus i.e. increased fibrinogen fragments (& B) monomers plus trapped cell deposition. The neutral grafts had a less dense, branched fibrinogen deposit with some cellular elements.

In summary, the structural, chemical and surface charge configuration of collagen can be manipulated to produce a biological cardiovascular prosthesis with improved performance.

COAGULATION STUDIES ON SYNTHETIC BENZYL GLUTAMATE-LEUCINE COPOLYMERS. P.J. Parks, O.P. Malhotra, and D.F. Gibbons. VA Hospital and Case Western Reserve University, Cleveland, Ohio, U.S.A.

To obtain a polymer(s) which is passive to blood proteins so that it can be used as a prosthetic material, a series of uncharged amino-acid copolymers containing: a) 20% benzyl ester of glutamic acid and 80% leucine (GL-14); b) equal amounts of glutamic acid and leucine (GL-11); c) 80% glutamic acid and 20% leucine (GL-41); d) 100% benzyl glutamate (G-1); and e) 80% benzyl ester of glutamic acid and 20% phenylalanine (GP-41) were tested for initiation of clot formation. The effect of solvent was also taken into consideration because films of a particular polymer cast from dioxane, dichloroethane and benzene exhibited different morphology and different polar and total surface energies. We investigated the activation of the intrinsic and extrinsic pathways of blood coagulation including the adhesion of platelets and release of platelet Factor 3. In all these studies, glass and siliconized glassware were included to serve as negative and positive controls, respectively. For the extrinsic system, glass and GP-41 had the greatest effect in the activation of Factor VII and GL-14 and G-1 the least; siliconized glass, GL-11, and GL-41 were between these two extremes ($p < .001$). For the intrinsic pathway, when the solvents used for casting purposes were benzene or dichloroethane, glass and GL-11 had the greatest effect, GL-14 and siliconized glass the least, and G-1, GL-41 and GP-41 an intermediate effect ($p < .001$). However, when the solvent used for casting purposes was dioxane, GL-14 was even more passive than siliconized glass in the activation of the intrinsic system; G-1 was as effective as siliconized glass. Again, the effects of the polymer ($p < .001$) and of solvent ($p < .0025$) were significant. For adhesion of platelets, the polymer containing 100% benzyl glutamate was most compatible; the number of platelets attached to this surface was minimal.