

**Tuesday, July 14, 1981**

## **Oral Presentations**

### **Artificial Surfaces – I**

**08:00–09:30 h**

### **Artificial Surfaces – II**

**09:45–11:00 h**

**Grand Ballroom East**

## **0303**

**08:15 h**

**AN IN VIVO MODEL TO ASSESS BIOMATERIAL THROMBORESISTANCE.**  
R. Rodvén, J. Robinson, P. Litwak, R.R. Mitchell. Institutes of Medical Sciences, San Francisco, California.

A minimally invasive model has been developed in which control and test No.5 French catheters are passed retrograde from the lingual to the carotid arteries. Goats are given autologous  $^{111}\text{In}$  platelets 48 hours before catheter placement, and, after placement, scanned externally and continuously for 3 hours. Net radionuclide retention occurs for the first 30 to 90 minutes after which  $^{111}\text{In}$  leaves the catheter. Simultaneously placed polyethylene (PE) catheters are non-interactive; the weight of thrombus recovered/cm and platelets/cm for 18 goats (36 catheters) is  $19.8 \text{ mg} \pm 9.8$  and  $8.87 \times 10^8 \pm 7.5$  respectively. Thrombus is evenly distributed along the axial length of the PE catheter, increasing effective catheter diameter by 44%. Correlation between recovered thrombus/cm catheter and net platelet retention/cm catheter is 0.924 for PE. Various catheters exposed to 0.2 mg/ml albumin or 4 mg/ml albumin retained albumin but accumulated equal amounts of thrombus and platelets as untreated PE catheters. Glutaraldehyde used on albuminated catheters also did not change thrombus and platelet retention. Less thrombus was recovered and less platelets retained by PVC, Biomer<sup>R</sup> and teflon than by PE catheters. This model provides an excellent method to evaluate different polymers fabricated as catheters, both to understand thrombus growth and dissolution, and to choose among catheters for clinical use.

## **0302**

**08:00 h**

**INTERACTIONS OF PLATELETS WITH PROTEINS OF PLASMA AND MATRICES.** Judith Lahav and Richard O. Hynes, Massachusetts Institute of Technology, Cambridge, MA 02139

We have been analyzing the interactions of human blood platelets with plasma proteins and with proteins of extracellular matrices (collagen, fibronectin etc.) using a variety of techniques. Using a modified enzyme-linked immunosorbent assay (ELISA), as few as  $5 \cdot 10^3$  bound platelets could be determined quantitatively and proteins bound from solutions could be detected. Using this method the interaction of the plasma proteins fibronectin, FVIII-VWF and fibrinogen with one another, with components of the basement membrane and with the blood platelet were studied. Antibody against carefully washed human platelets recognizes fibronectin, FVIII-VWF, and fibrinogen as well as platelet surfaces. However, specific antisera to these three proteins fail to bind to the surface of gel-filtered, unactivated platelets. When gel-filtered platelets adhere to plastic in the absence of plasma proteins, they spread. Such platelets do react with antibodies to fibronectin, FVIII-VWF, and fibrinogen. These results suggest that these three plasma proteins are found inside platelets but not on their surfaces prior to activation and that they become exposed upon spreading. Furthermore, these proteins are undetectable on the surfaces of unactivated platelets by surface iodination followed by immune precipitation. We have also studied the interactions of platelets with various collagen substrata by immunofluorescence microscopy which shows recruitment of plasma fibronectin by platelets. These findings confirm and extend recent suggestions concerning the associations of fibronectin, FVIII-VWF and fibrinogen with human platelets. Finally, we are using chemical crosslinking reagents to analyze the same protein-protein and protein-platelet interactions.

## **0304**

**08:30 h**

**CORRELATIONS BETWEEN PLATELET CONSUMPTION AND THE SURFACE CHEMISTRY OF NEUTRAL POLYMERS IN BABOONS.** S. R. Hanson, B. D. Ratner, A. S. Hoffman, and L. A. Harker, Departments of Medicine (Hematology), Chemical Engineering and the Center for Bioengineering, University of Washington, Seattle, Washington, USA.

The rate of destruction of autologous  $^{51}\text{Cr}$ -labeled blood platelets has been measured in baboons having femoral arteriovenous shunts composed of various test materials. Platelet survival was normal in baboons with chronic Teflon-Silastic shunts alone demonstrating that the surgical variables had no detectable effect. Platelet survival data obtained when other materials were studied were analyzed by computer modeling to estimate both the rate of shunt-associated platelet destruction and the rate of platelet removal by ordinary senescent mechanisms. Rates of shunt associated platelet destruction, normalized with respect to shunt surface area (plats/cm<sup>2</sup>-day), were used to assess material thrombogenicity. Polymers studied included poly(ethyl methacrylate) (EMA), poly(hydroxyethyl methacrylate) (HEMA) and two intermediate copolymers (HEMA/EMA: 1/1, 1/3) radiation grafted onto two substrates (silastic and polyethylene). On both substrates rates of platelet consumption (range:  $5\text{--}20 \times 10^6$  plats/cm<sup>2</sup>-day) correlated with: 1) HEMA/EMA monomer ratios; 2) graft polymer water absorption measurements; and 3) surface ratios of carbon to oxygen atoms and of various functional groups as determined from electron spectroscopy for chemical analysis (ESCA). With ten commercial polyurethane materials rates of platelet consumption (range:  $2\text{--}23 \times 10^6$  plats/cm<sup>2</sup>-day) correlated inversely with the percentage of surface carbon atoms forming hydrocarbon bonds, and directly with the surface content of ether-type linkages (which will be related to polyether "soft" segments) as determined from ESCA.

These observations in primates indicate that the thrombogenicity of prosthetic materials is strongly influenced by their surface physicochemical properties.