INJURY OF ENDOTHELIAL CELLS IN CULTURE INDUCED BY LOW DENSITY LIPOPROTEINS.

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The effect of low density lipoproteins on human endothelial cells in primary culture was investigated. The effect was evaluated by use of a 51-Cr-release assay and phase contrast microscopy. When the cells were exposed to low density lipoproteins (LDL, d=1.019-1.063 g/ml) suspended in RPMI 1640 the endothelial cells underwent extensive morphological changes and detached from the bottom of the culture vessel. Addition of lipoprotein-poor serum (d>1.21 g/ml) prevented the injurious effect of the LDL fraction at low concentrations, and to a lesser extent at the LDL concentration was raised. Unfractionated serum from hyperlipoproteinemic patients (type IIa) did not appear to injure endothelial cells. Addition of the LDL fraction, however, had a more pronounced effect on the cells when added to hyperlipoproteinemic serum than to normal human serum. Thus, LDL as obtained by ultracentrifugation may have an injurious effect on cultured human endothelial cells. Secondly, hyperlipoproteinemic serum appears to contain factors which augment the effect of the added LDL fraction.

EFFECT OF PROSTAGLANDINS E2, B2, B3, AND ARACHIDONIC ACID ON THROMBUS FORMATION IN VIVO.


Arachidonic acid (AA) and prostaglandin (PG) E2 have been shown to be precursors of both pro-aggregatory and anti-aggregatory agents in vitro. If PGs are produced in thrombotic and inflammatory situations, it is important to know their effects on thrombus formation in vivo. Initial thrombus formation was induced in the aortoiliac (60-70 μm) of the hamster cheek pouch by combining micro-electrical damage with perivascular application of AEP (10-6M).

PGF2α or vehicle was applied perivascularly, followed 50 sec and 1 min later by electrical micro-electrical damage and application of AEP (10-5M). The vessel was then raised and thrombus formation was quantitated by timing the adherence of thrombus for the following 10 min. Each animal served as its own control and results were expressed as % difference (mean ± s.e.) from control. PGF2α or AEP produced a dose-related (10-7-1250 ng) inhibition (10 ± 2% to 50 ± 10%) of thrombus formation.

Both PGF2α (Lewis, Westwick & Williams, Br.J.Pharmacol., 1977, in press) and AA induce a short-lasting vasodilatation, at the site of vessel irritation. PGF2α, in a low dose (125 ng) potentiated (49 ± 20%) while high doses (1250 ng) produced a weak inhibition (15 ± 10%) of thrombus formation. PGF2α had little activity up to a concentration of 1250 ng.

These results demonstrate that AA and PGF2α can be converted to anti-thrombotic agents in vivo when applied perivascularly. Since PGF2α and AA were not anti-thrombotic, it is possible that the observed effect was due to generation of prostacyclin.

DEGRADATION OF SULPHATED GLYCOSAMINOGLYCANS AT THE SURFACE OF CULTURED HUMAN ENDOTHELIAL CELLS BY A PLATELET HEPARINASE.


The non-thrombogenic property of the endothelial cell surface is a prerequisite for maintenance of blood circulation. The nature of this property is poorly understood. Recent advances in culturing techniques of endothelial cells in vitro may facilitate studies of the surface biochemistry. Human endothelial cells (EC) isolated from umbilical veins were shown to synthesize and secrete sulphated glycosaminoglycans (GAGs). The recent finding of a platelet enzyme capable of degrading heparin sulphate (HS) raised the question: Can platelet lysate or a purified heparinase detach and degrade endothelial HS? EC cultured in the presence of 35S-sulphate, produce 35S-labelled GAG which was isolated from the incubation medium from a cell associated tryptic labile pool and from a cellular pool not liberated by trypsin. After 24 hours of incorporation about 40% of 35S-GAG was found in the medium fraction, 5% in the trypsin fraction and negligible amounts in the cell fraction. In the trypsin pool ("surface fraction") heparin sulphate comprised about 85%, while the remaining 15% consisted of chondroitin sulphate and/or derman sulphate. Incubation of 35S-labelled EC with platelet lysate or a partially purified preparation of the enzyme from the same source caused a marked release of cell-surface associated HS to the incubation medium as oligosaccharides. These effects could be ascribed to heparinase activity and may alter the properties of the EC surface and influence the interaction between these cells on one hand and blood cells or plasma components, e.g., coagulation factors on the other.