Fig tree sap: antithrombogenicity on nylon surfaces

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Abstract. An effort is made to study the anti-thrombogenic property of the latex of fig tree by immobilizing its components on nylon surface. It is also evaluated, how such surfaces may effect the blood compatibility by investigating variations in surface energy parameters, plasma recalcification time and platelet adhesion using calf's blood.

Keywords. Fig tree sap; antithrombogenicity; nylon; platelet adhesion; plasma recalcification time; surface energy.

1. Introduction

To achieve a truly antithrombogenic surface the attachment of a benign layer is essential so that it does not, initiate blood coagulation or damage blood components. It has been found that the hypocratic logic (Majno 1977) of clotting of blood by the juice of fig tree was immaterial. Instead it has been found that in presence of the latex of fig tree the coagulation gets delayed considerably. Here we have attempted to evaluate this hypocratic logic by immobilizing the components of the latex of fig tree (Graf 1978) *Ficus elastica* on nylon surface.

2. Experimental

Nylon (5 g %) was dissolved in M-Cresol (BDH, Poole England) and the films were cast on glass slides (2.5 × 7.5 cm). They were then dried in hot air oven at 100°C for 2 hr, dipped in 10 % nitric acid for 1 min and then rinsed thoroughly with distilled water and again kept for drying at room temperature. Nylon is a polyamide containing

groups. When it is treated with HNO_3 , some of the amide bonds break and free amino (NH_2) and acid groups ($-\text{COOH}-$) are generated which may link with the active component of the latex. Eight dry films were chosen and divided into two batches. The first batch containing 4 films were taken as bare surface and the second batch containing the remaining 4 films, were exposed to the latex for 15 min, washed with phosphate buffer (pH 7.4) and kept at room temperature over-night. After drying they were stored in a refrigerator and were later used for contact angle and platelet adhesion studies.

The contact angle for each batch of films were measured using a Goniometer

Table 1. Surface energy of nylon and latex modified nylon surfaces.

Liquids	Nylon (bare)				Nylon + latex*		
	γ_{LV} (ergs/cm ²)	Contact angle $\pm$ SD	γ_{SV} (ergs/cm ²)	γ_{SL} (ergs/cm ²)	Contact angle $\pm$ SD	γ_{SV} (ergs/cm ²)	γ_{SL} (ergs/cm ²)
H ₂ O	72.5	54 $\pm$ 4	50.62	8.0	56 $\pm$ 5	49.44	8.9
Ethylene glycol	48	34 $\pm$ 2	40.52	0.72	48 $\pm$ 4	34.51	2.39
Glycerol	63	51 $\pm$ 3	44.53	4.88	61 $\pm$ 3	38.87	8.33

Mean γ_{SV} = 45.22 $\pm$ 5.09 ergs/cm²Mean γ_{SV} = 40.94 $\pm$ 7.68 ergs/cm²*Latex of *Ficus elastica* (family Moraceae).

Table 2. Platelet adhesion and PRT on latex exposed nylon surface.

Surface	Mean platelets	
	$\pm$ S.D. (0.4 mm ² area)	PRT (sec) $\pm$ S.D.
Glass	—	93 $\pm$ 5.6
Bare (nylon HNO ₃ treated)	5 $\pm$ 0.82	121 $\pm$ 4.6
Nylon + sap	2 $\pm$ 0.71	177 $\pm$ 17.4

(Kernco Instruments Co. Inc. Texas) and spectroscopically pure solvents. From the contact angles the values γ_{SV} and γ_{SL} were obtained from the conversion tables (Neumann *et al* 1980) as shown in table 1.

Washed calf platelets were prepared and suspended in tyrode solution for the adhesion studies as described elsewhere (Lee and Kim 1979). Different fields were read randomly and averaged for all samples as shown in table 2.

Plasma recalcification time (PRT) was determined as described elsewhere (Sharma and Paul 1982). Citrated calf blood was collected and was tested for recalcification time under controlled pH (7.4) and temperature (37°C). Nylon coated tubes with and without exposure to latex as described above PRT was determined and results were averaged as shown in table 2.

3. Conclusion

Usually it is observed that increase in hydrophobicity of polymer surface encourages adverse interaction with blood components *via* protein denaturation. However in this case where PRT was delayed on nylon coated tubes which were exposed to the fig sap (latex), also decreased the number of platelets adhered indicating that though the sap decreased the surface energy *i.e.* increased the hydrophobicity of the nylon surface, possibly it makes it closer to the hydrophobicity/hydrophilicity ratio, best needed for blood compatibility requirements (Sharma 1981). Investigations are merely preliminary in nature as mentioned above which should await further biological tests for validity. Similar studies have been done with 1 g % buffered honey exposed to HNO₃ treated nylon surfaces also. The results are similar, although they are not as promising as with fig tree sap.

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