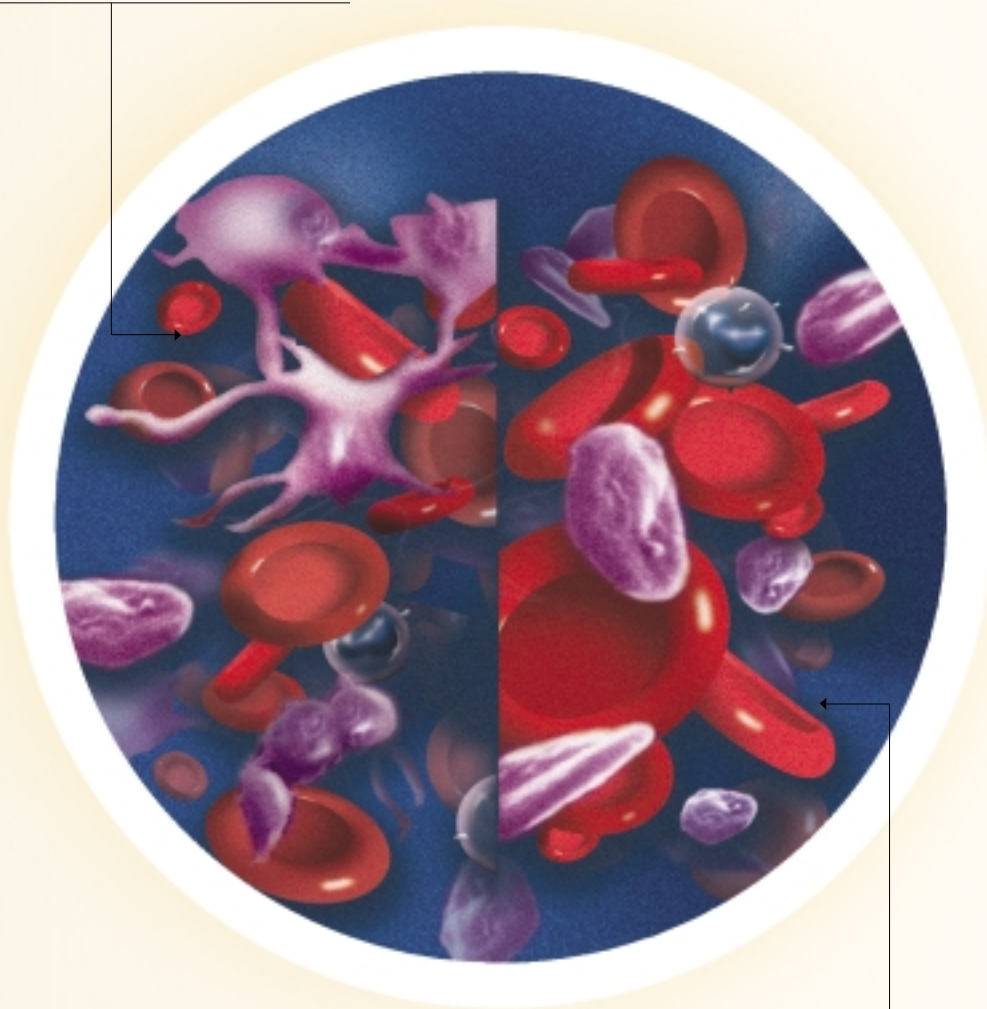


What do you call a surface
modifying additive that reduces
platelet adhesion during bypass surgery?



We call it **SMART_XT[®]**.
Very **SMART_XT[®]**.

(surface modifying additive technology)

COBE

Cardiovascular[®]

The Problem

The activation of blood during cardiopulmonary bypass surgery can lead to significant post-operative complications such as blood loss, thrombosis and organ dysfunction.

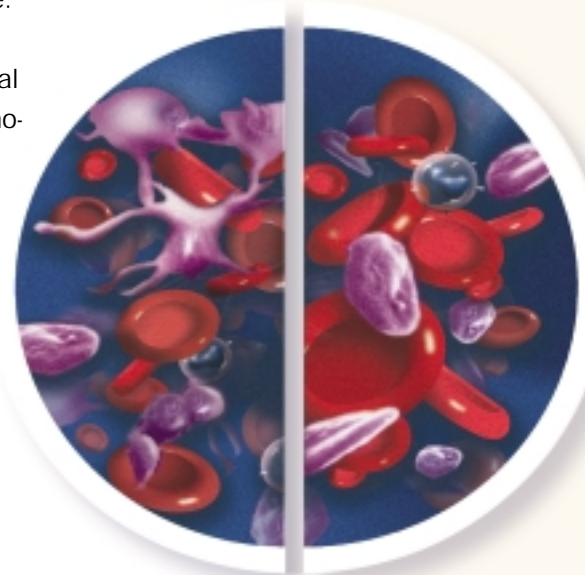
How blood is activated during bypass

When blood contacts foreign surfaces within the cardiopulmonary bypass circuit a variety of adverse responses are initiated. For example, proteins are activated and platelets adhere to the foreign surface. These responses can result in compromised blood being returned to the patient leading to post-operative morbidity.

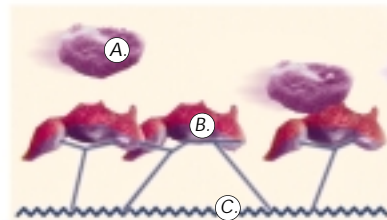
Others have tried to minimize blood activation

Previous attempts to solve this problem include hydrophobic surfaces such as silicone, or hydrophilic coatings such as heparin. However protein deposition occurs onto either surface.

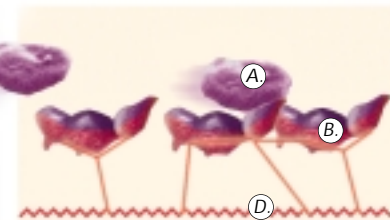
Fibrinogen has preferential sites that bind to hydrophobic or hydrophilic surfaces. Attachment of fibrinogen onto either surface results in conformational change to the protein structure allowing the expression of sites responsible for platelet activation and adhesion to circulating platelets.



- A. platelet
- B. fibrinogen
- C. hydrophobic surface
- D. hydrophilic surface



*The hydrophobic response**
Hydrophobic surfaces bind specific sites on fibrinogen.



*The hydrophilic response**
Hydrophilic surfaces bind alternate sites.

The SMART[®] way to do bypass

COBE Cardiovascular utilizes a proprietary biomaterial technology generically known as a surface modifying additive (SMA). This modified surface is composed of alternating hydrophilic and hydrophobic microdomains that form a stable, non-leaching, improved blood-material interface. The microdomain structure binds

hydrophobic and hydrophilic sites on fibrinogen, theoretically resulting in a unique protein mosaic that minimizes protein expression.

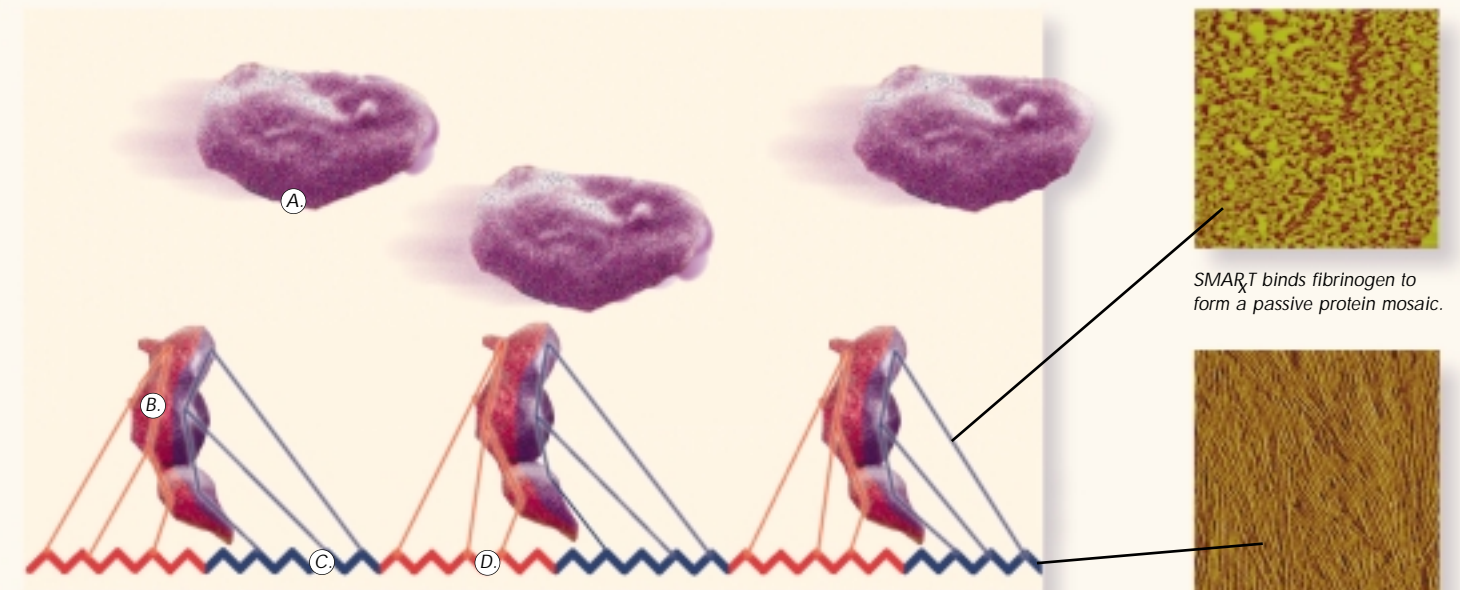
When applied to blood contacting devices within the bypass circuit, SMART[®] reduces platelet adhesion.

Benefits of SMART[®]

Published results of clinical studies indicate that SMART[®] may offer the following potential benefits:

- preserved platelet count and function
- decreased fibrinolytic activity
- reduced protein and cellular activation
- reduced blood loss and transfusion requirements
- reduced thrombin generation
- improved hemodynamic stability

A list of supporting references can be found on the following page.



The hydrophobic/hydrophilic response*

SMART[®] alternates hydrophobic and hydrophilic segments to bind fibrinogen's active sites (strong or weak).

SMART[®] binds fibrinogen to form a passive protein mosaic.

SMART[®] technology alternates hydrophobic and hydrophilic segments.

COBE Cardiovascular uses **SMART** technology in cardiopulmonary bypass circuits.



Scientific papers supporting the benefits of SMART. . .

Gu YJ, Boonstra PW, Rijnsburger AA, Haan J, van Oeveren W, Cardiopulmonary Bypass Circuit Treated with Surface-Modifying Additives: A Clinical Evaluation of Blood Compatibility, *Ann Thorac Surg*, 1998; 65:1342-7.

Spijker HT, Hann J, Graaff R, Boonstra PW, van Oeveren W, Surface Modifying Additives Reduce Thrombogenicity: An In Vitro and Clinical Evaluation, *Cells and Materials*, 1997; 7(3): 201-8.

Defraigne JO, Pincemail J, Dekoster G, et al., SMA Circuits Reduce Platelet Consumption and Platelet Factor Release During Cardiac Surgery, *Ann Thorac Surg*, 2000; 70: 2075-81.

Rubens FD, Ruel G, Lavallee G, Watson M, Robblee J, Wozny D, Nathan H, Circuits with Surface Modifying Additive Alter the Haemodynamic Response to Cardiopulmonary Bypass, *Eur J Card Thorac Surg*, 1999; 15: 353-8.

Rubens FD, Labow RS, Lavallee GR, Watson MJ, Robblee JA, Voorhees ME, Nathan HJ, Hematologic Evaluation of Cardiopulmonary Bypass Circuits Prepared with a Novel Block Copolymer, *Ann Thorac Surg*, 1999; 67: 689-98.

**Artist rendering of blood activation through cardiopulmonary bypass circuits does not imply absolute accuracy of platelet adhesion or lack thereof. Diagrams are intended to illustrate the bonding sites of fibrinogen within various surfaces as noted. In addition to reviewing the brochure material, readers are advised to consult the published scientific papers listed above.*

Caution: Federal law (USA) restricts this device to sale by or on the order of a physician. Please read the Instructions For Use carefully prior to clinical applications.

COBE
Cardiovascular®

COBE Cardiovascular, Inc.
14401 W. 65th Way
Arvada, CO 80004-3599
Tel: 800-221-7943
Fax: 303-467-6525
www.cobecv.com

©2001 COBE Cardiovascular
7/01 306300118 Rev.A

printed in USA