BIOLOGICAL AND MOLECULAR BASIS OF IMPLANT TECHNOLOGY

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Disclosures: Palmaz Scientific , Co

Vascular materials biocompatibility testing

Endothelial cell migration: Healing

Fibrinogen adsorption

Platelet adherence

Monocyte adherence

} Thrombo-inflammatory

Material	Mean Thrombo-inflammatory score	EC migration	Overall score
Stainless Steel	3.33	4	7.33
Corethane	3.00	3	6.00
Elgiloy	3.00	3	6.00
Tantalum	3.00	3	6.00
Nitinol	3.00	3	6.00
Titanium	2.67	3	5.67
L605	2.33	3	5.33
Pellethane	3.00	2	5.00
Nickel	3.00	2	5.00
Molybdenum	1.67	3	4.67
Silathane	3.33	1	4.33
PolyHEMA	4.00	0	4.00
PTFE	4.00	0	4.00
Silicon Carbide	2.00	2	4.00
Gold	2.00	2	4.00
Polyester	2.00	2	4.00
Chromium	1.67	2	3.67
PDMS	3.67	0	3.67
Cobalt	2.00	1	3.00
Iron	2.00	1	3.00
Diamond-like Carbon	1.33	1	2.33
Manganese	1.00	0	1.00
Turbostratic Carbon	1.00	0	1.00

Comparison of new and old vascular materials:

- New materials equivalent to traditional ones

- No material with outstanding properties at present

Implantable vascular prosthetics

Choices of materials by convenience

Surgical prosthetic polymers

Metals for intravascular stents

Drugs for delivery systems

Designing for a targeted effect

Potent

Specific

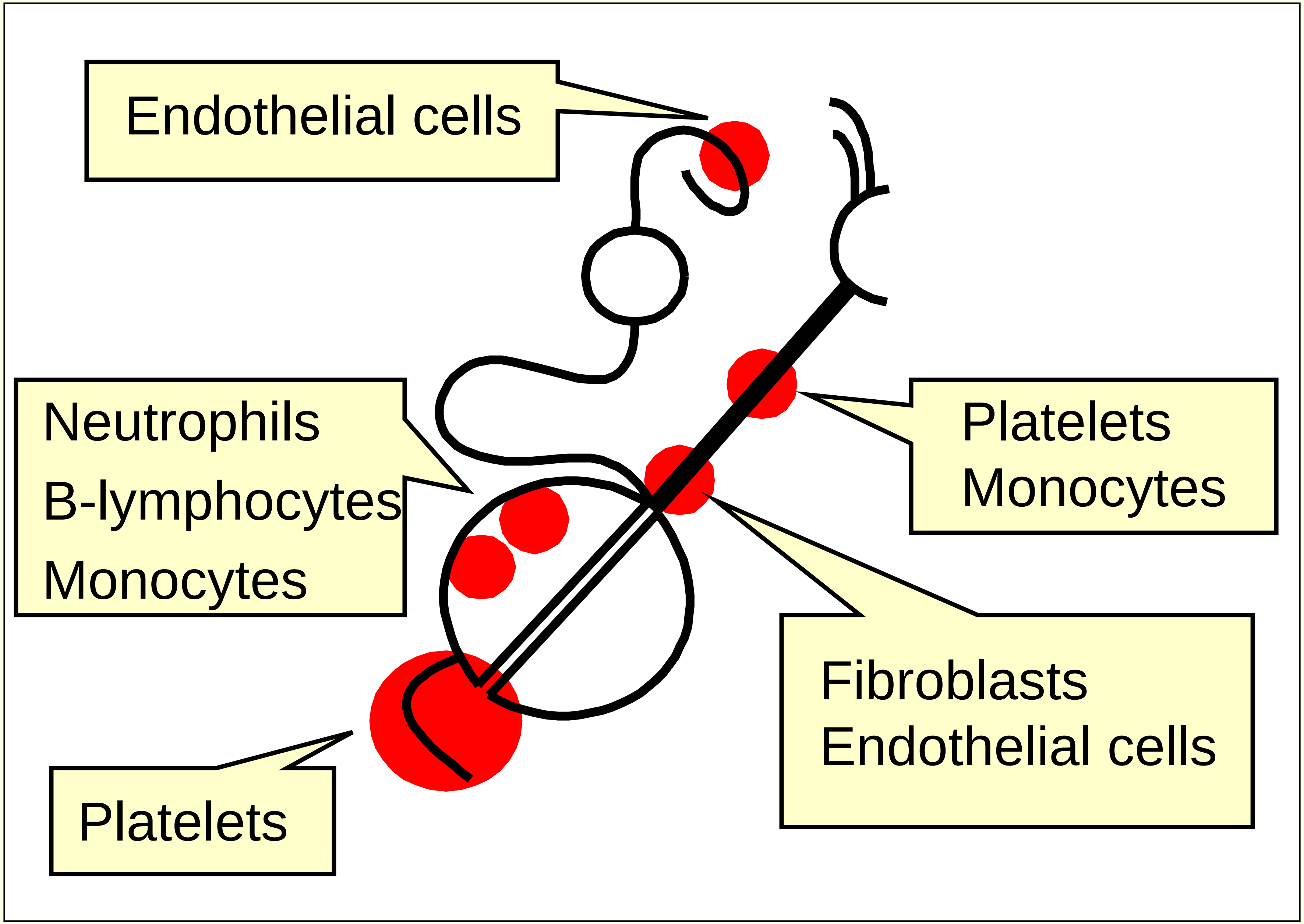
Selective

Difficult and expensive

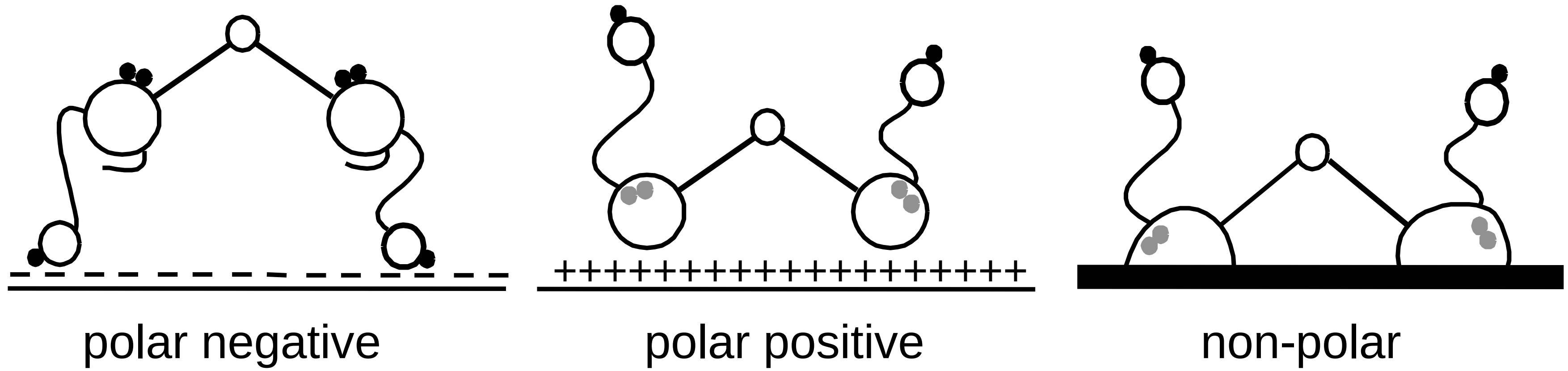
Designing a nanomolecular smart surface

Starts by understanding the target malecule

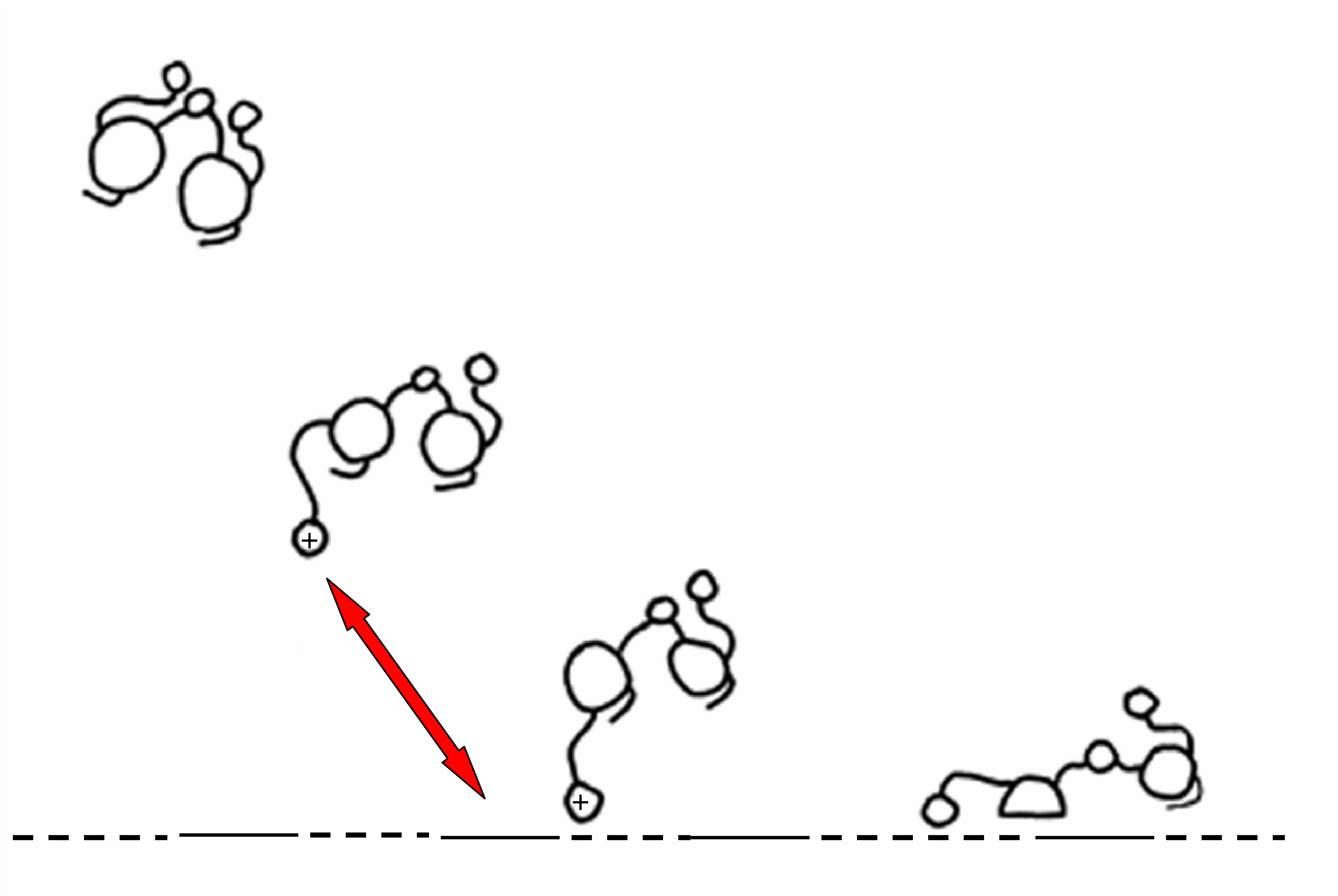
Fibrinogen ligand sites



Fibrinogen molecular conformation and ligand exposure



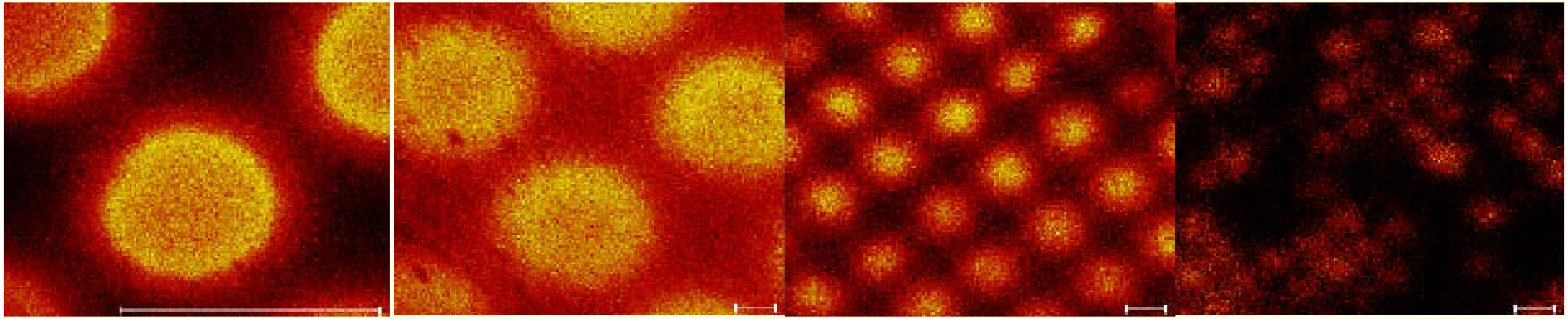
Nano-engineering basis for promoting capture of adhesive protein



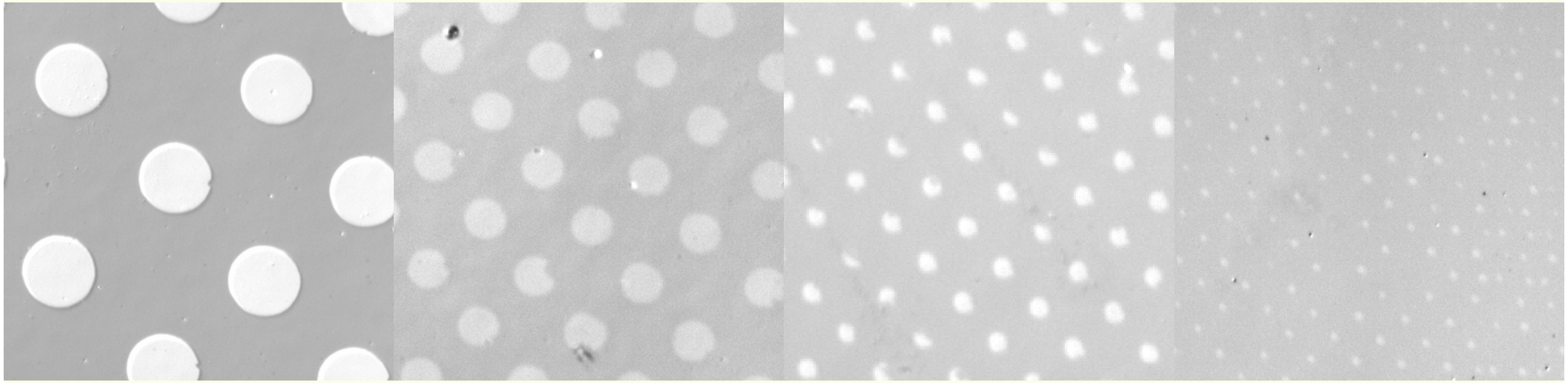
Engineered surfaces

Stainless steel dots on hydrated silicon

50X50um | 25X25 μm | 15X15 μm | 5X5 μm



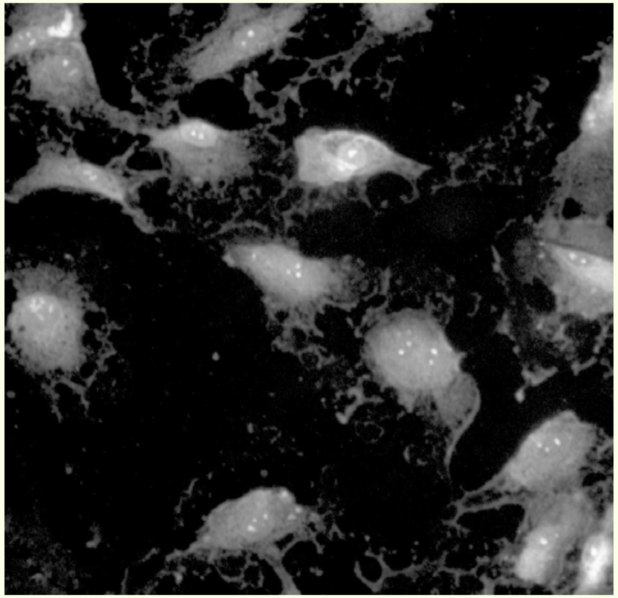
Chromium scan



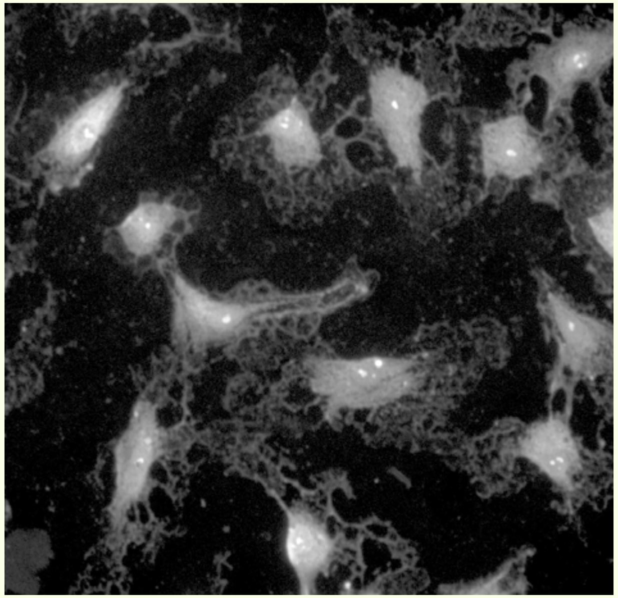
Epi-illumination microscopy

Cell area is inversely related to dot area

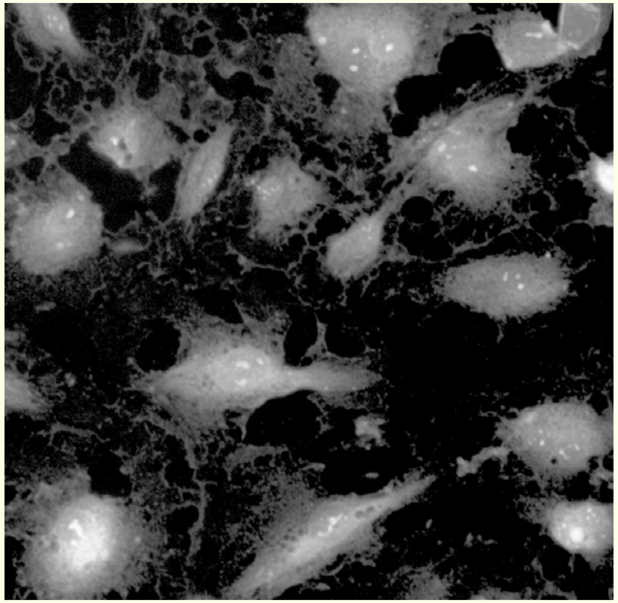
50X50um



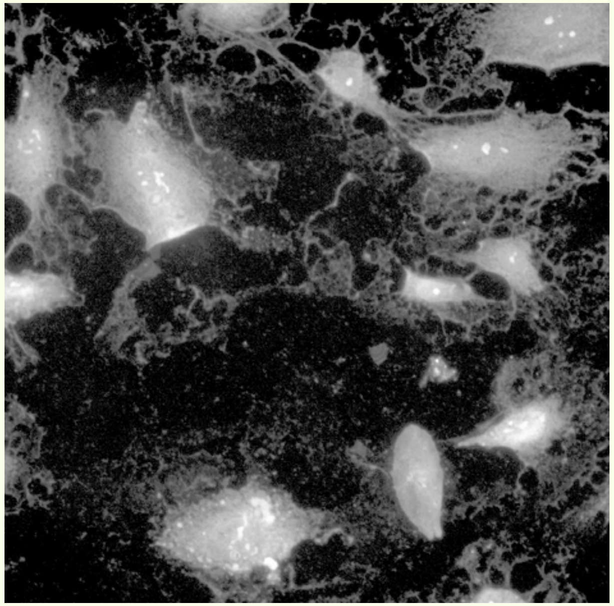
25X25 μm



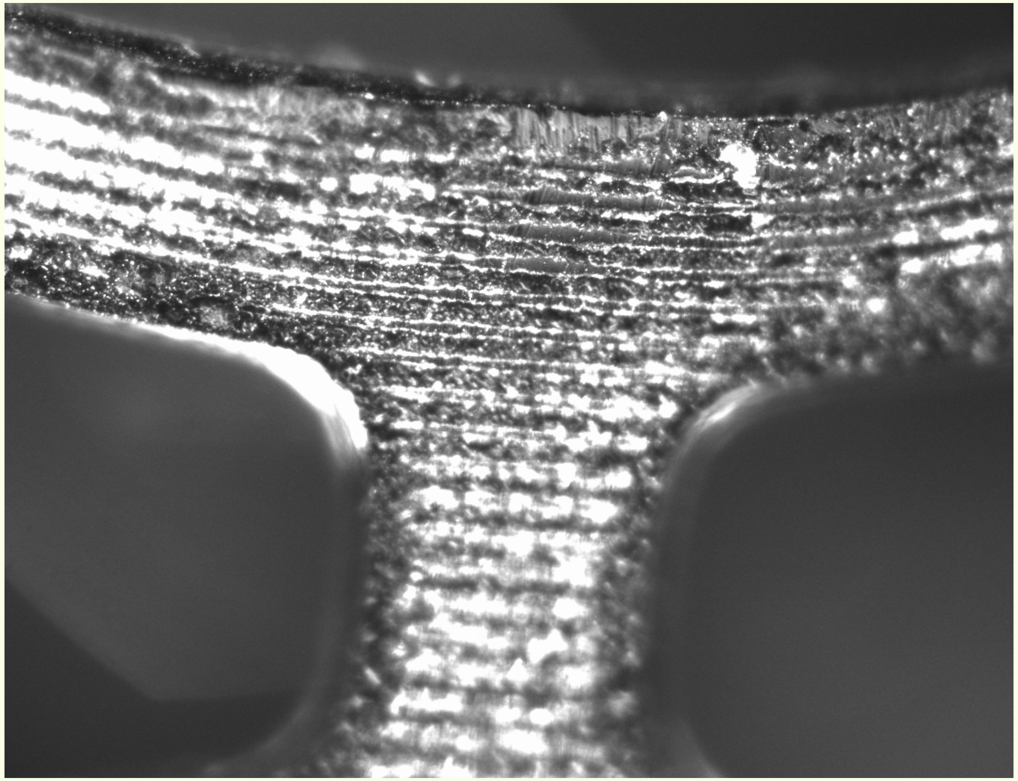
15X15 μm

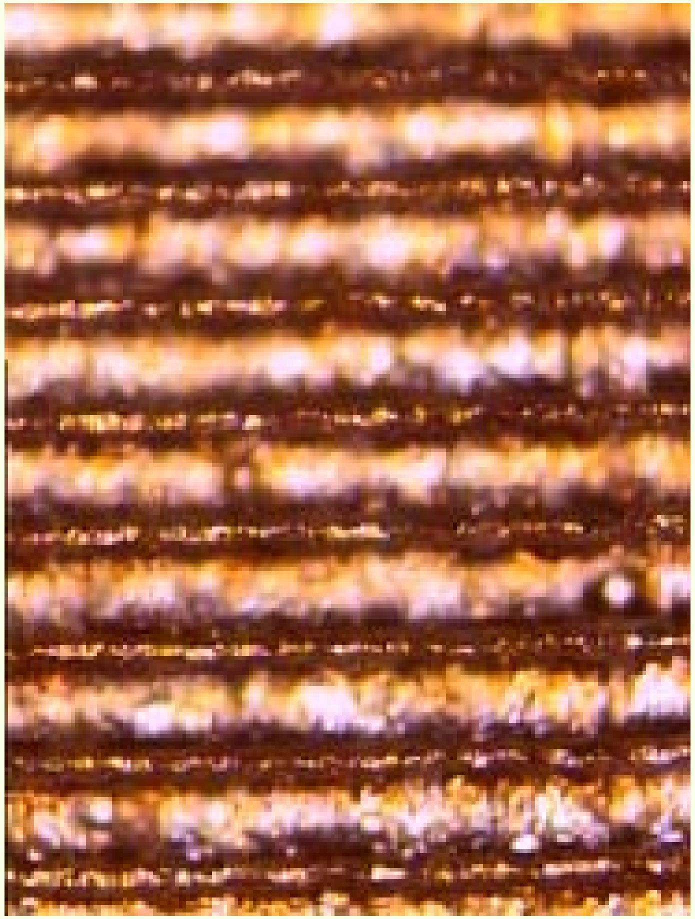


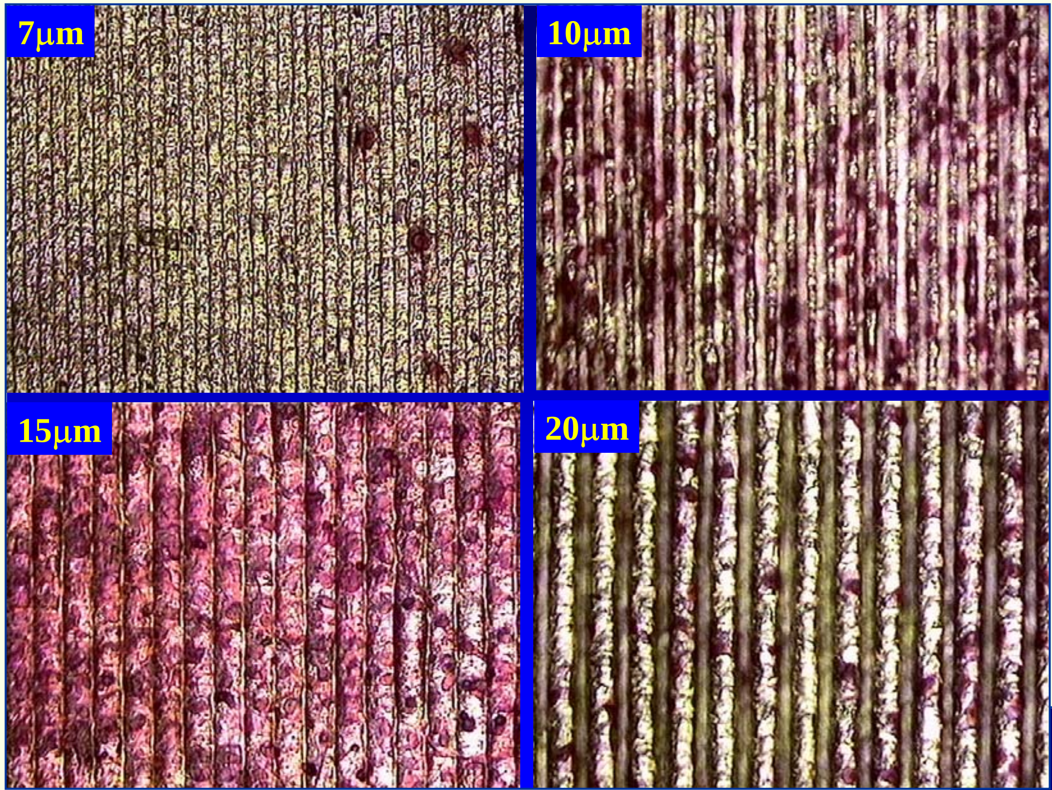
5X5 μm



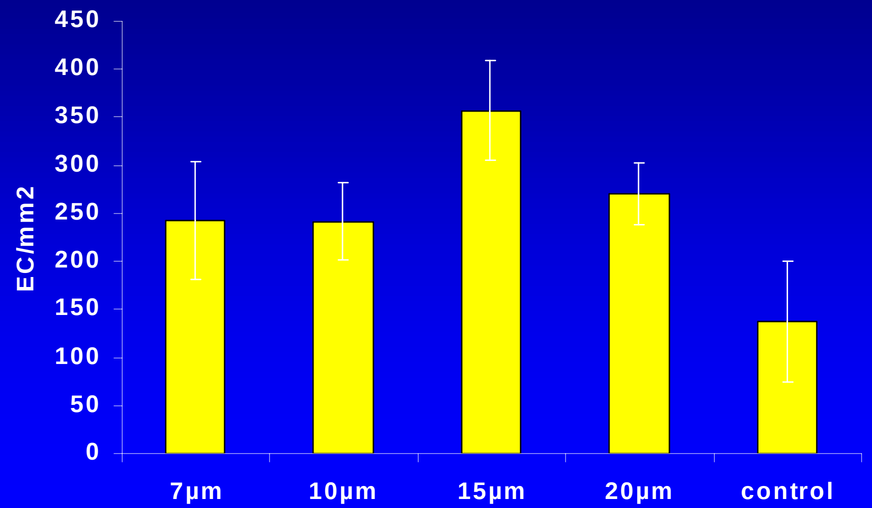
Microtexturing of blood contact surfaces for accelerated endothelialization



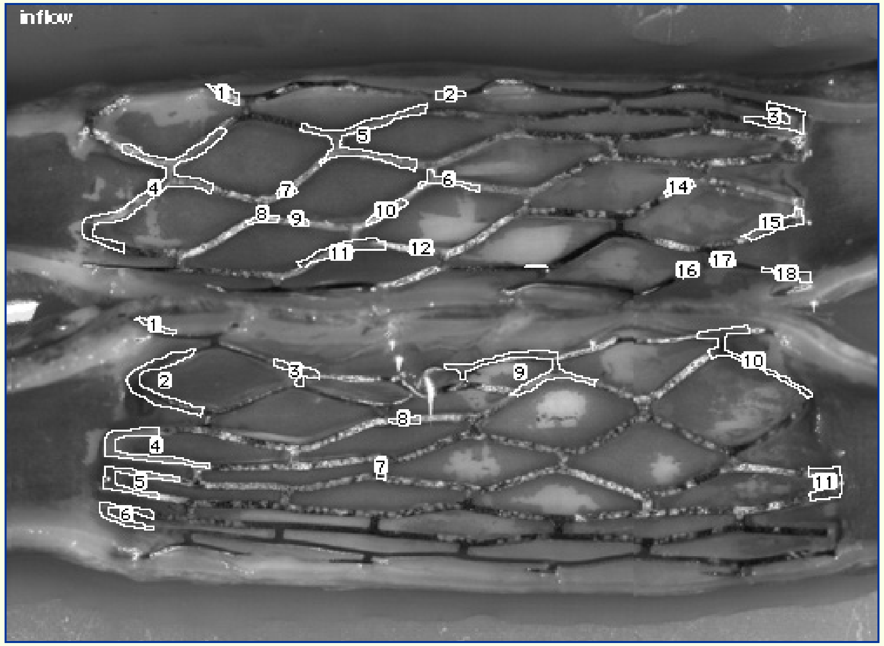


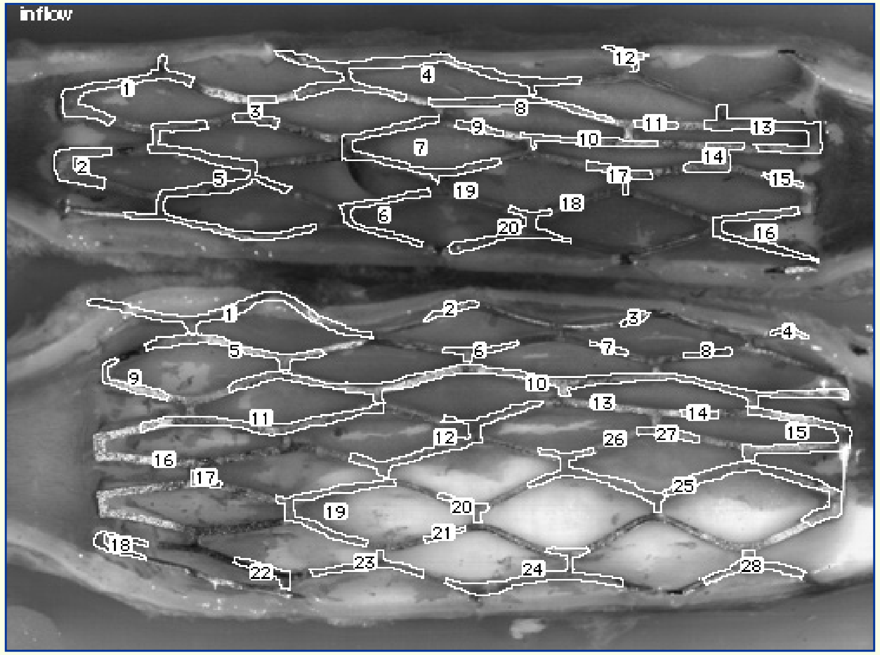


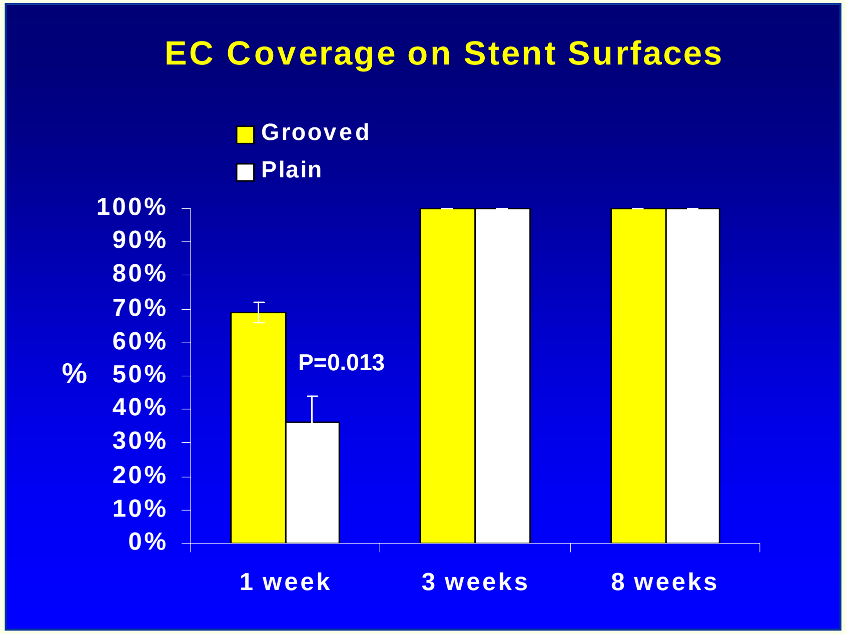
EC coverage under static conditions



Endothelialization speed on plain and grooved stents







Conclusions

Future innovations in vascular devices will be in surface science.

Nanotechnology will have a central role