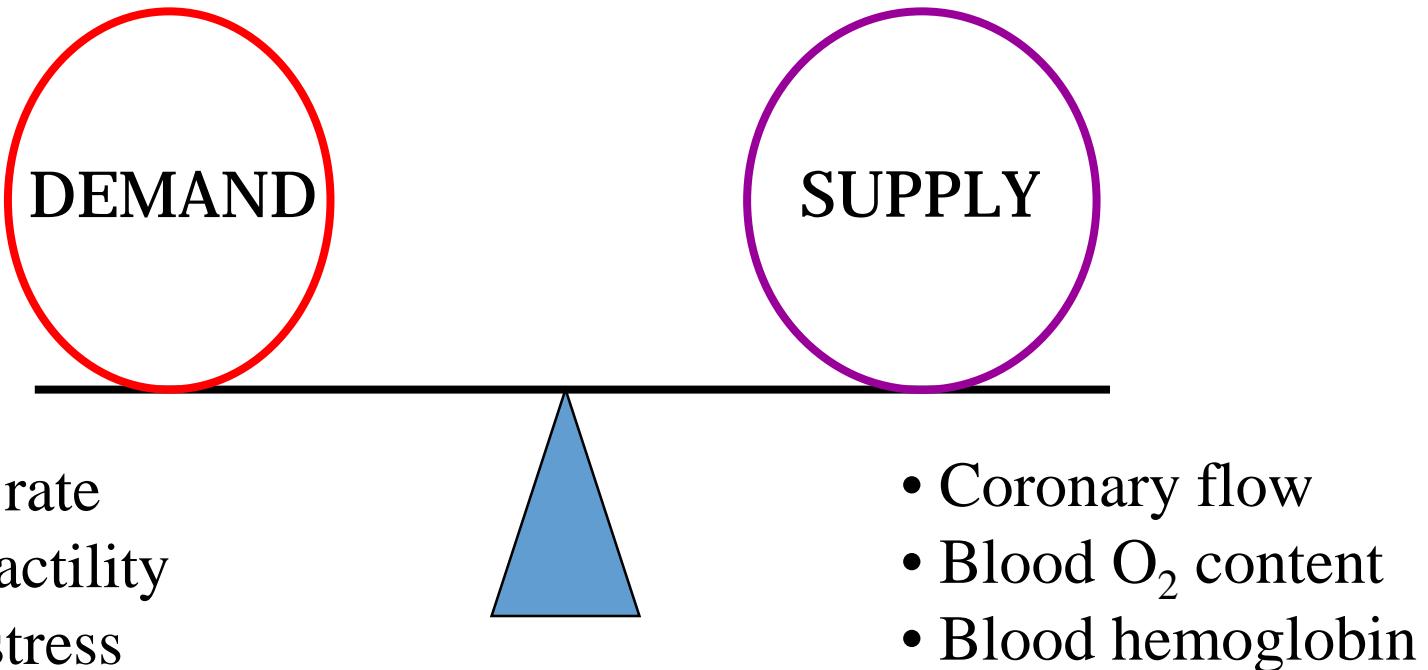


ISCHEMIC HEART DISEASE

Pathophysiology and Pathogenesis

Ebo de Muinck, M.D., Ph.D.
Professor of Vascular Medicine
Linköping University
Sweden

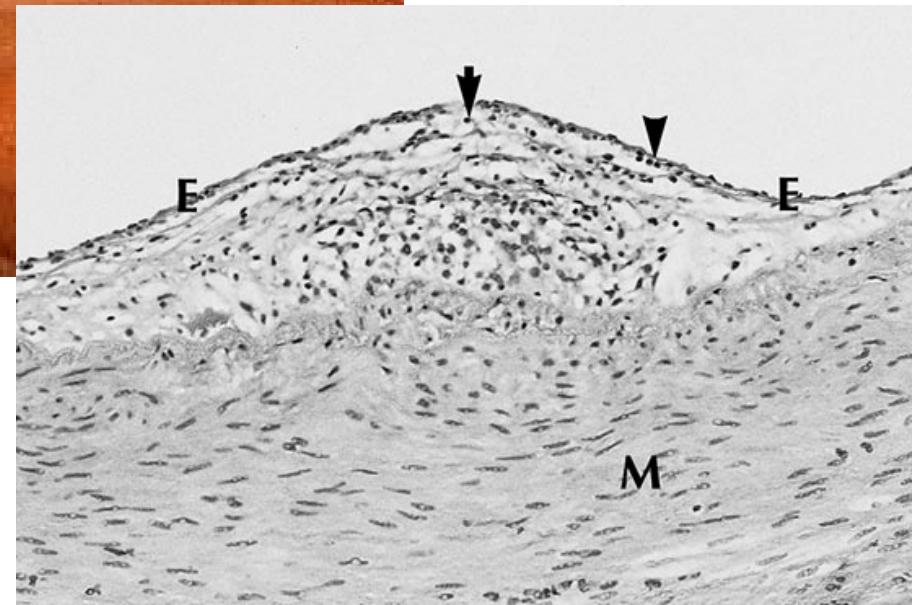
PATHOPHYSIOLOGY

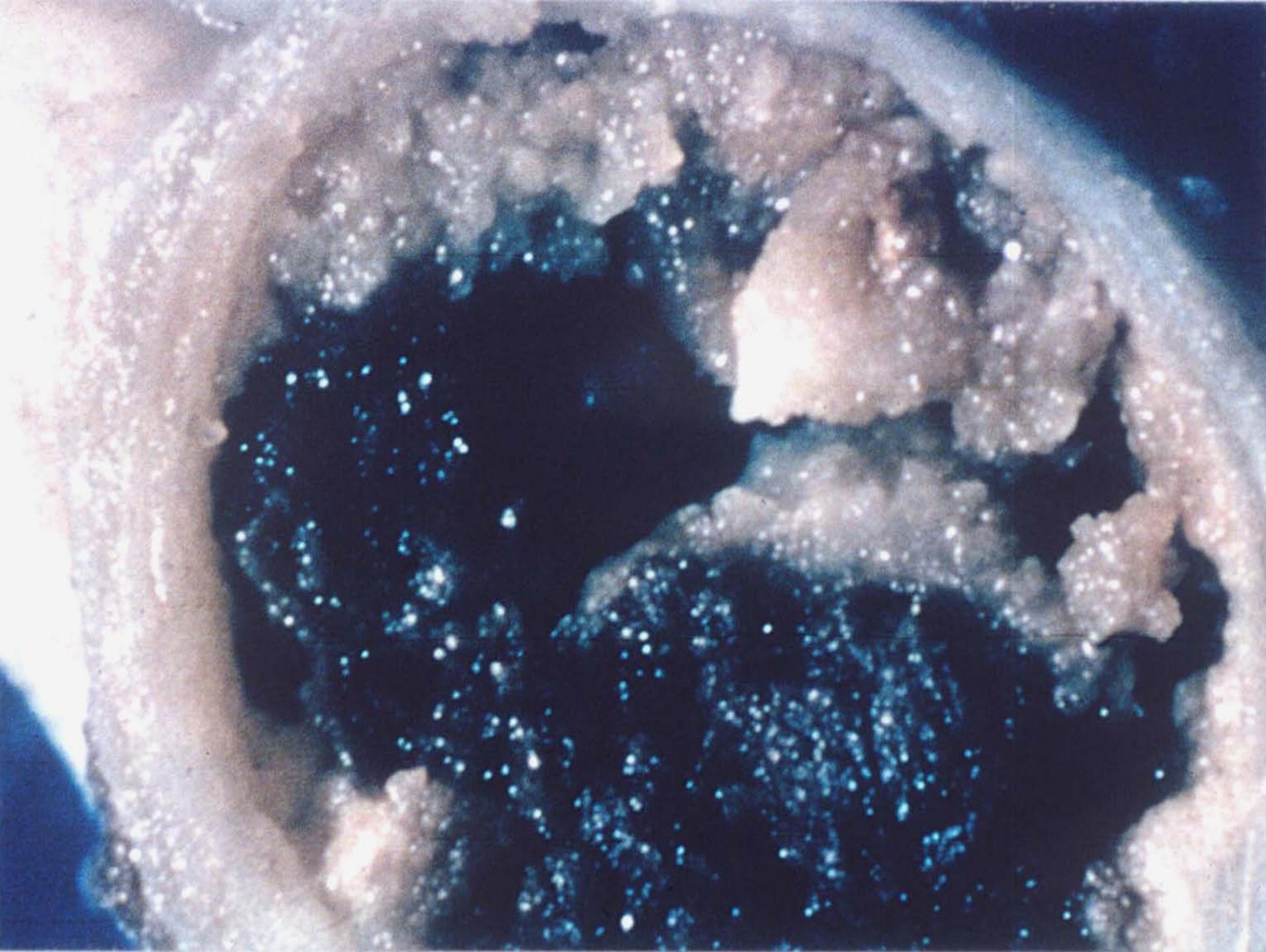


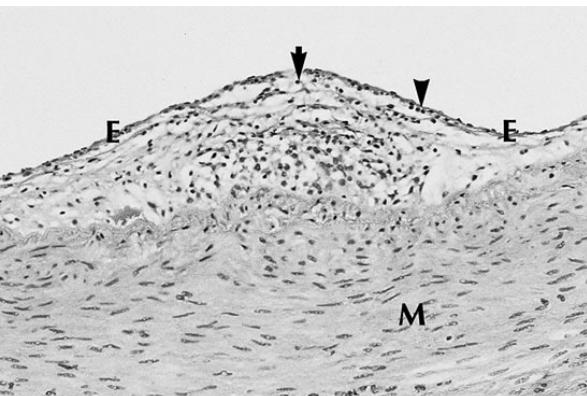
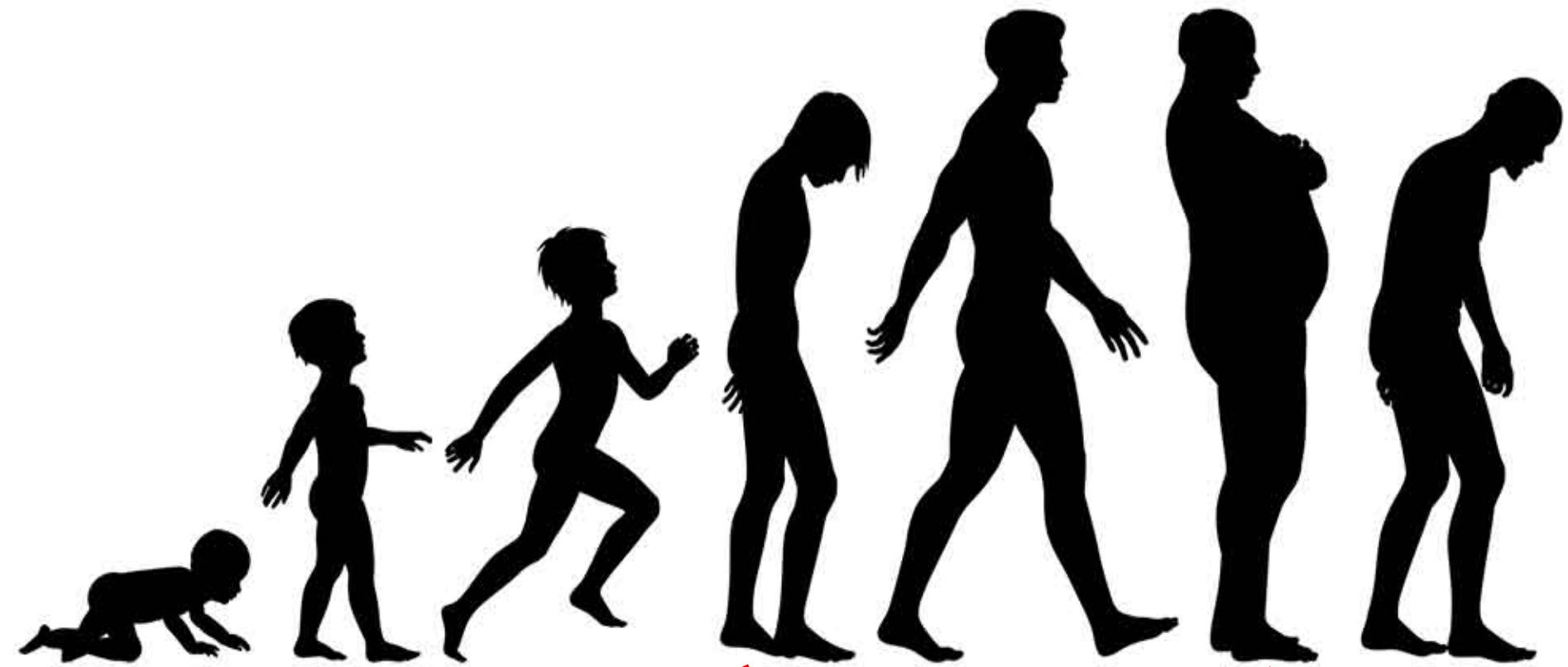
PATHOGENESIS

- CORONARY ARTERY DISEASE
 - ***ATHEROSCLEROSIS***
 - Coronary dissection
 - Congenital coronary abnormality
 - Coronary vasculitis
 - Coronary embolization
 - Traumatic or iatrogenic lesion

ATHEROSCLEROSIS







Detection
Prevention



ATHEROSCLEROSIS

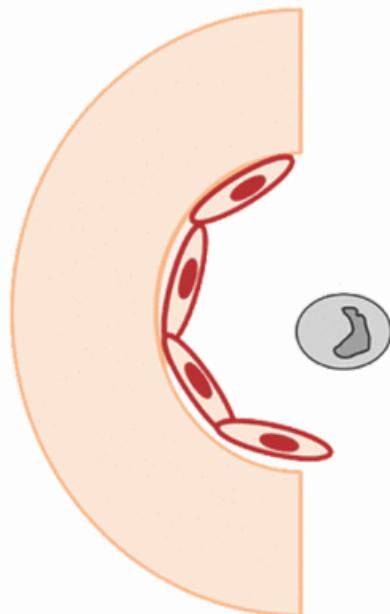
Initiating Events

Endothelial Dysfunction

Response to Retention

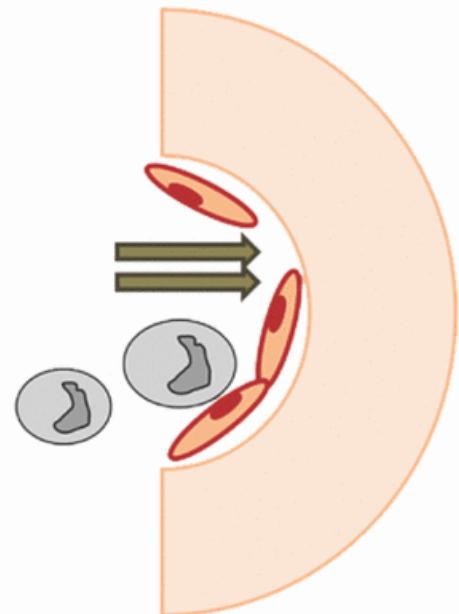
ATHEROSCLEROSIS

Normal endothelium



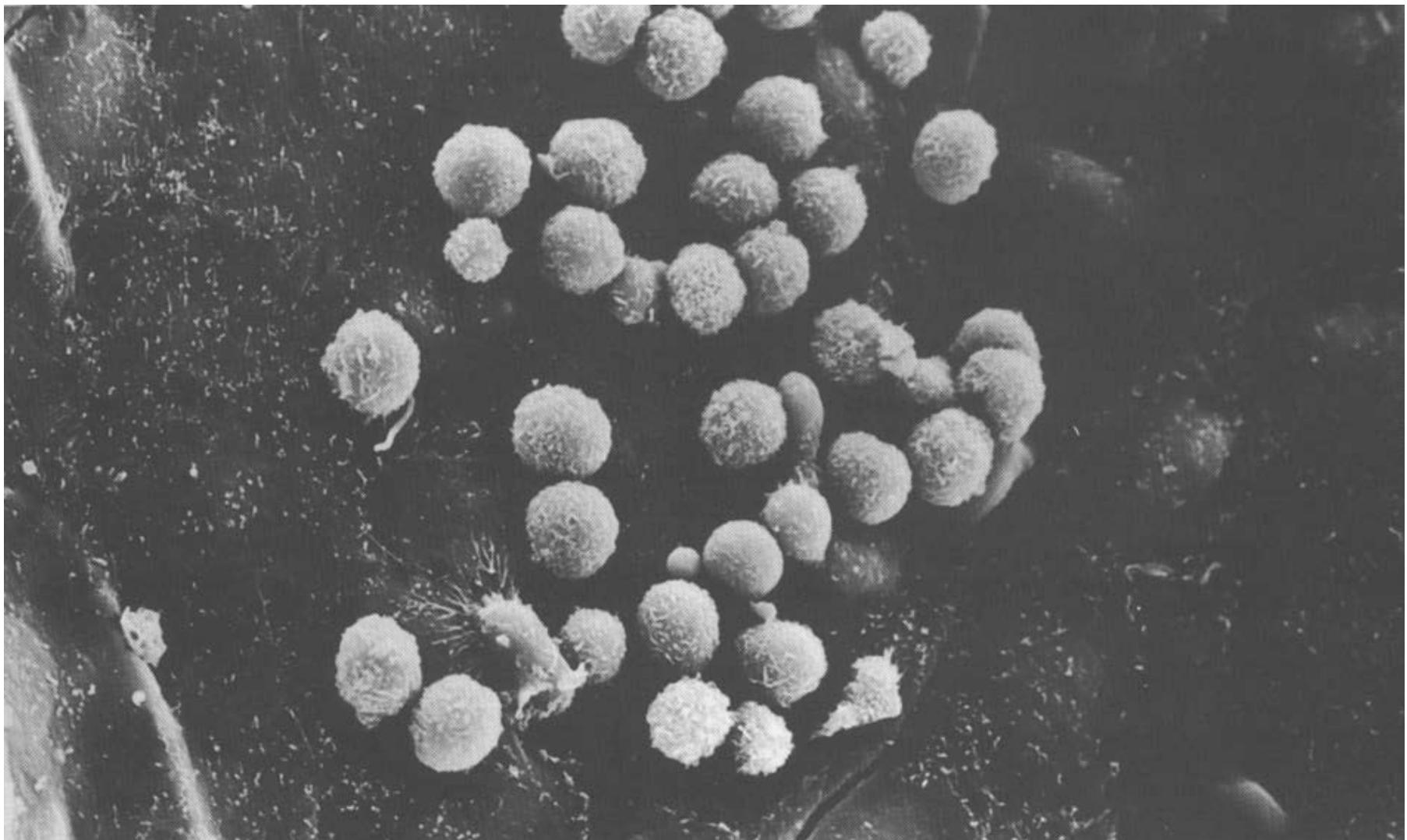
Dysfunctional endothelium

- ↑ endothelial permeability
- ↓ bioavailability of NO
- ↑ cytokines
- ↑ leucocyte adhesion

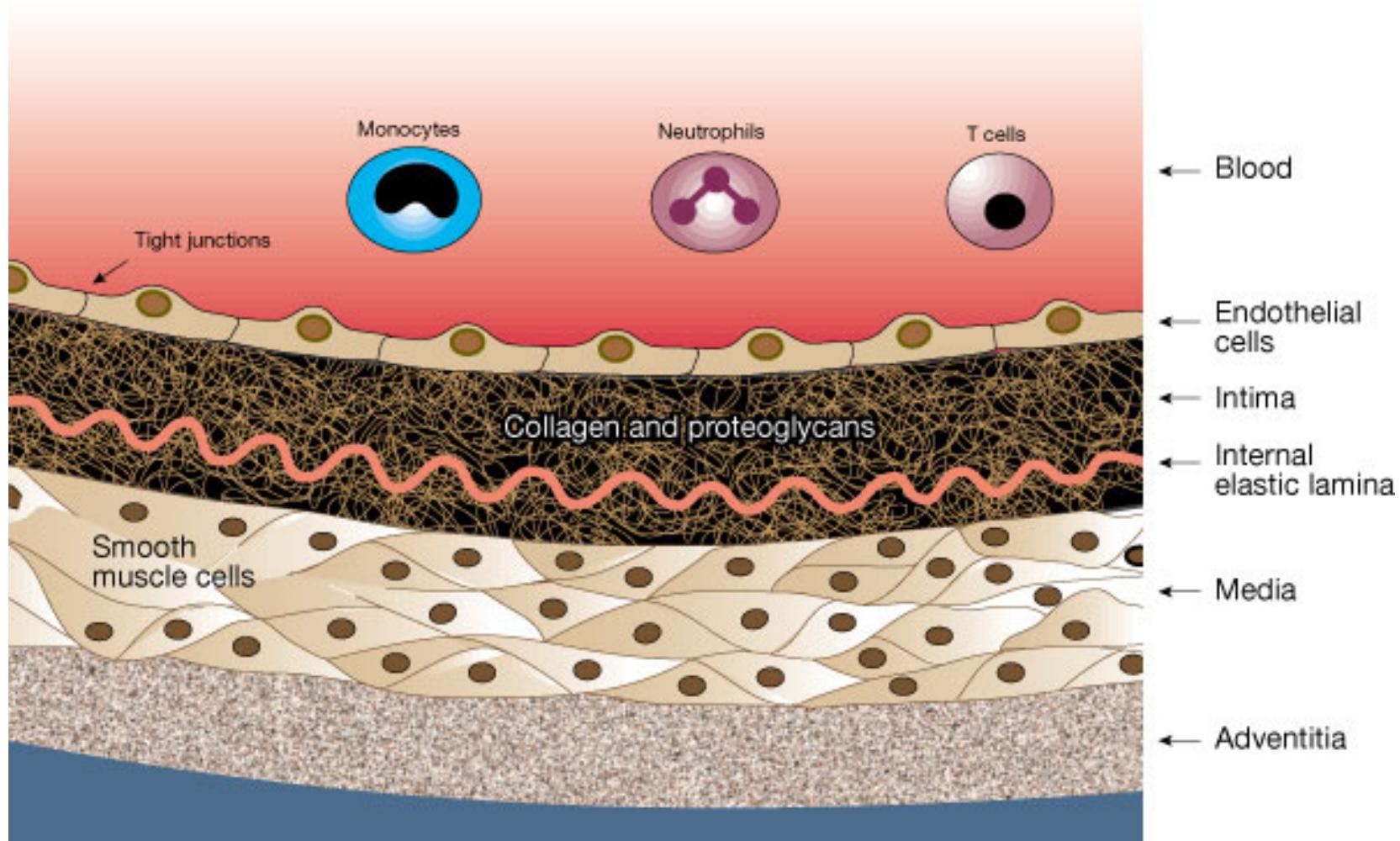


- ↑ bioavailability of NO
- ↓ MMP-9
- ↓ NF- κ B
- ↓ vW factor

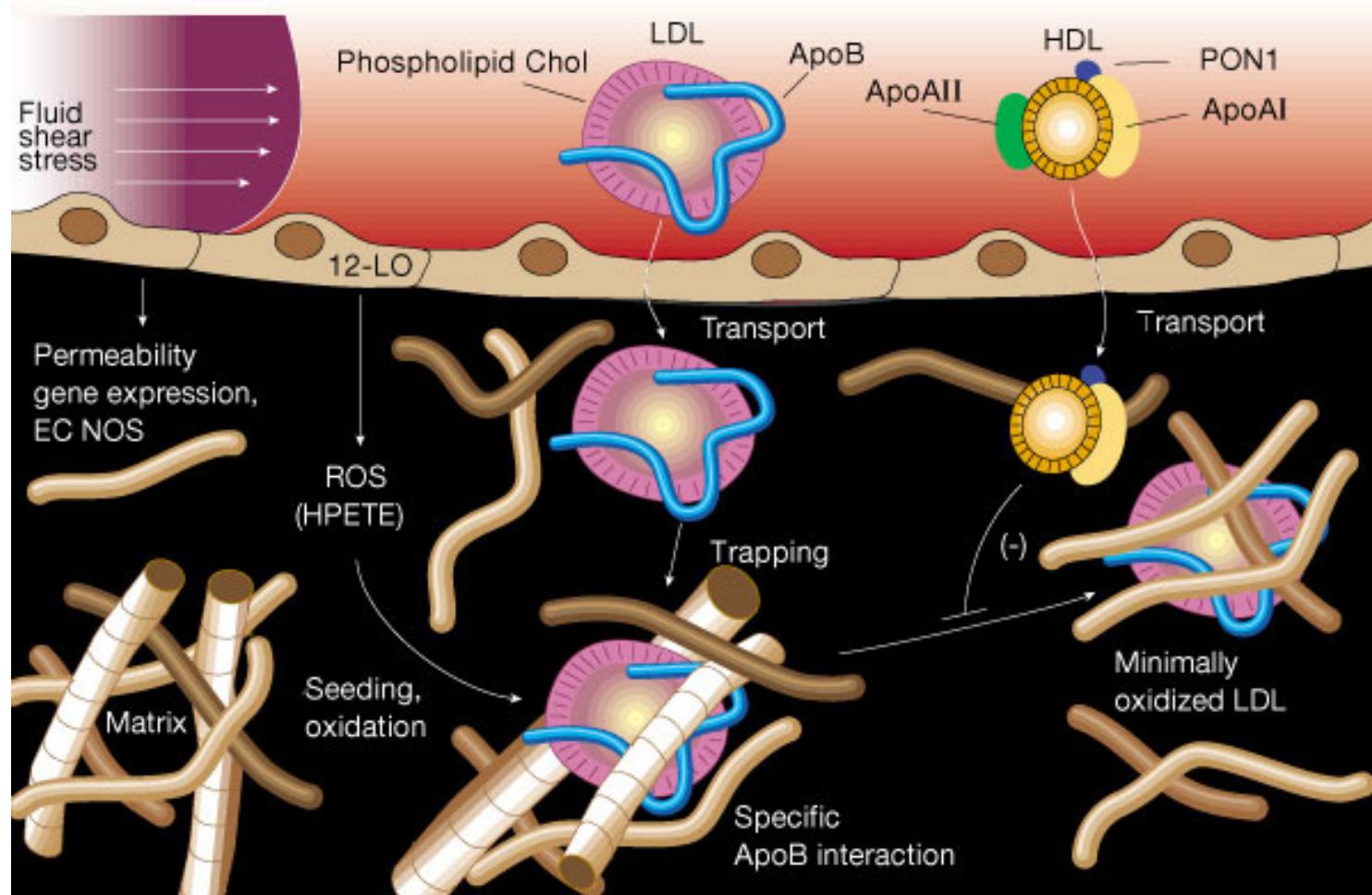
ATHEROSCLEROSIS



ATHEROSCLEROSIS



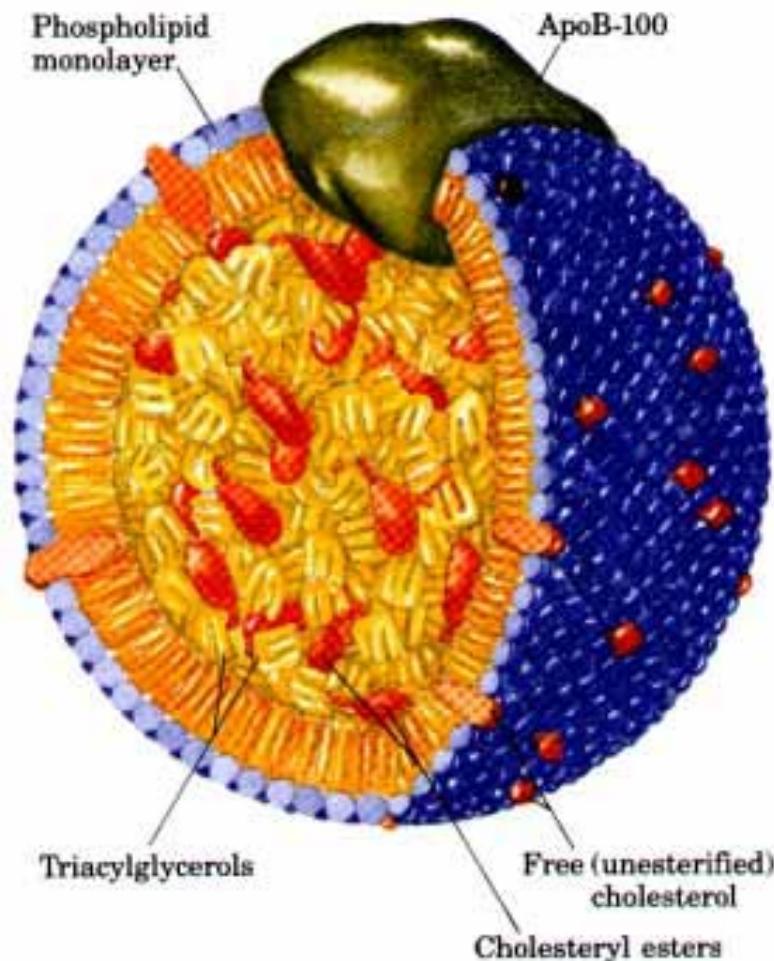
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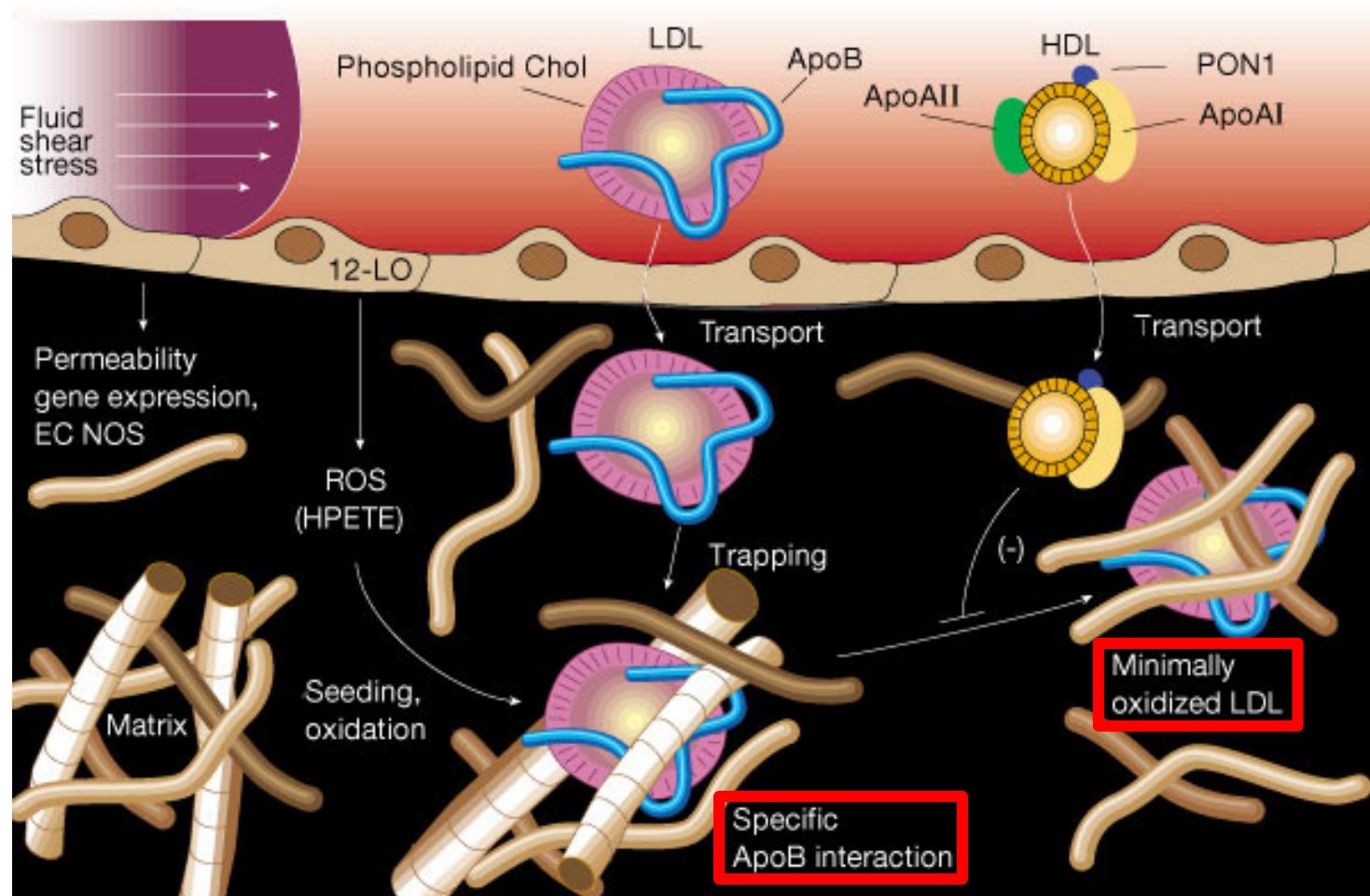
Minimal oxidation: oxidative waste of vascular cells

Nature 2000;407:233

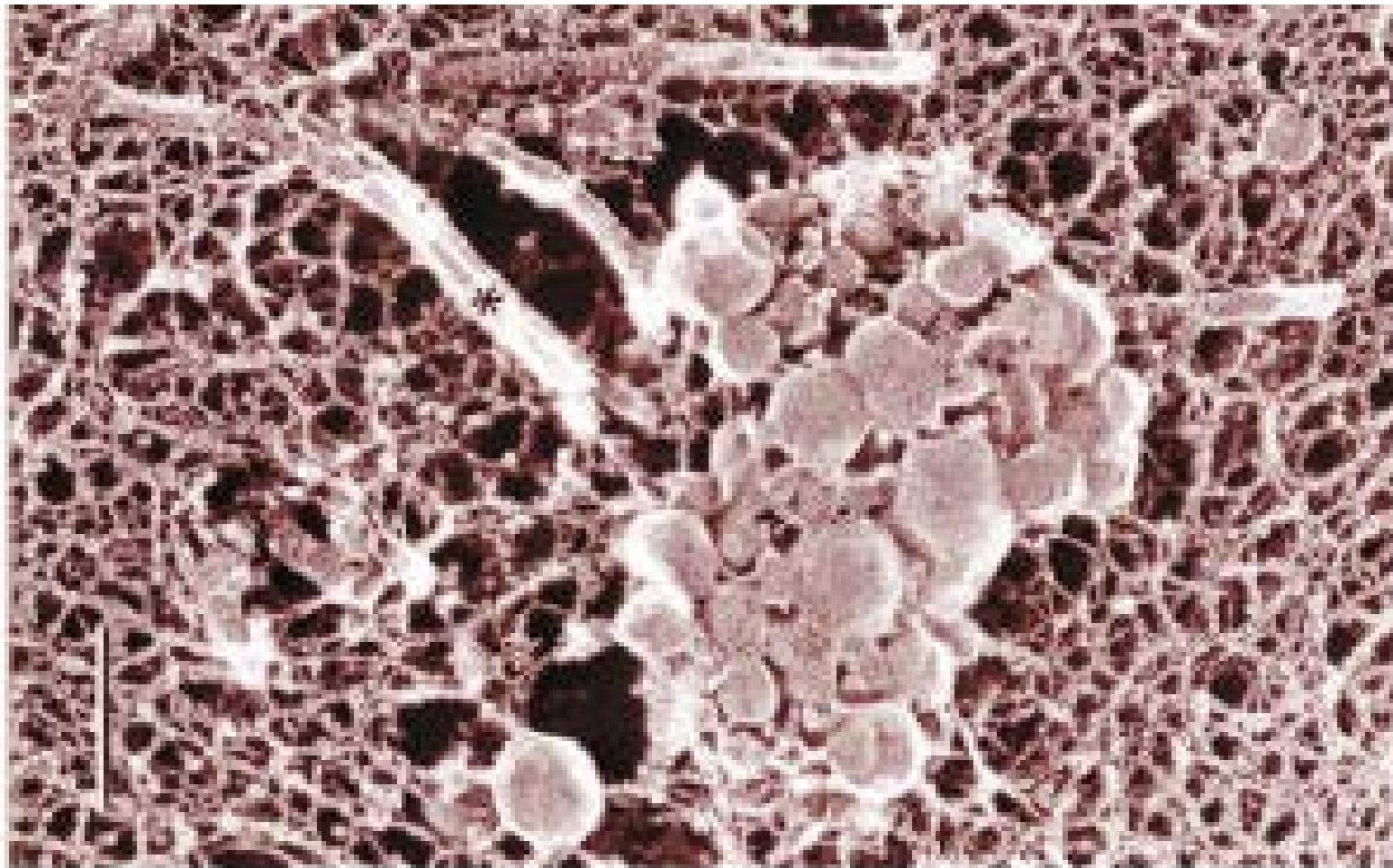
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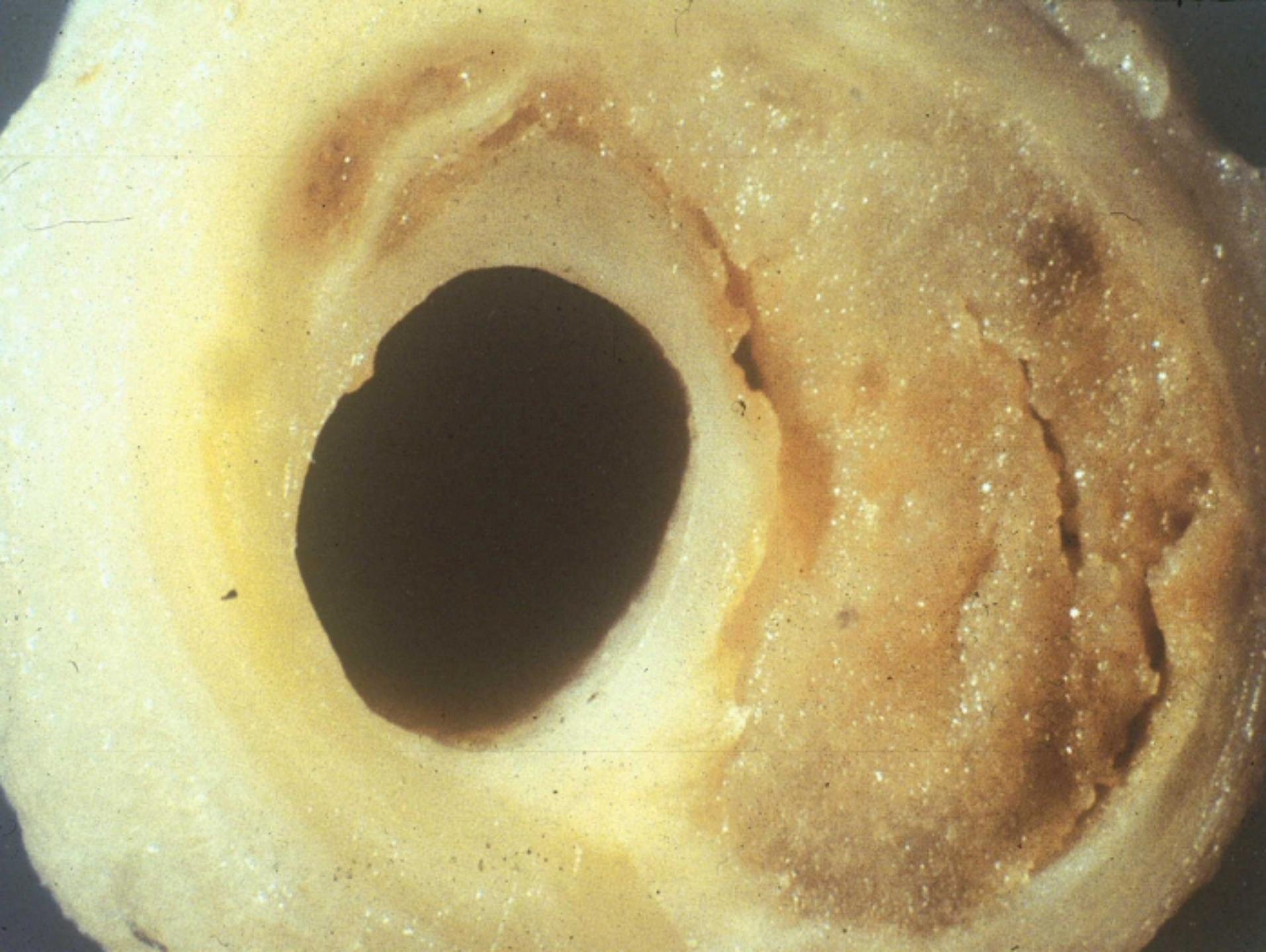


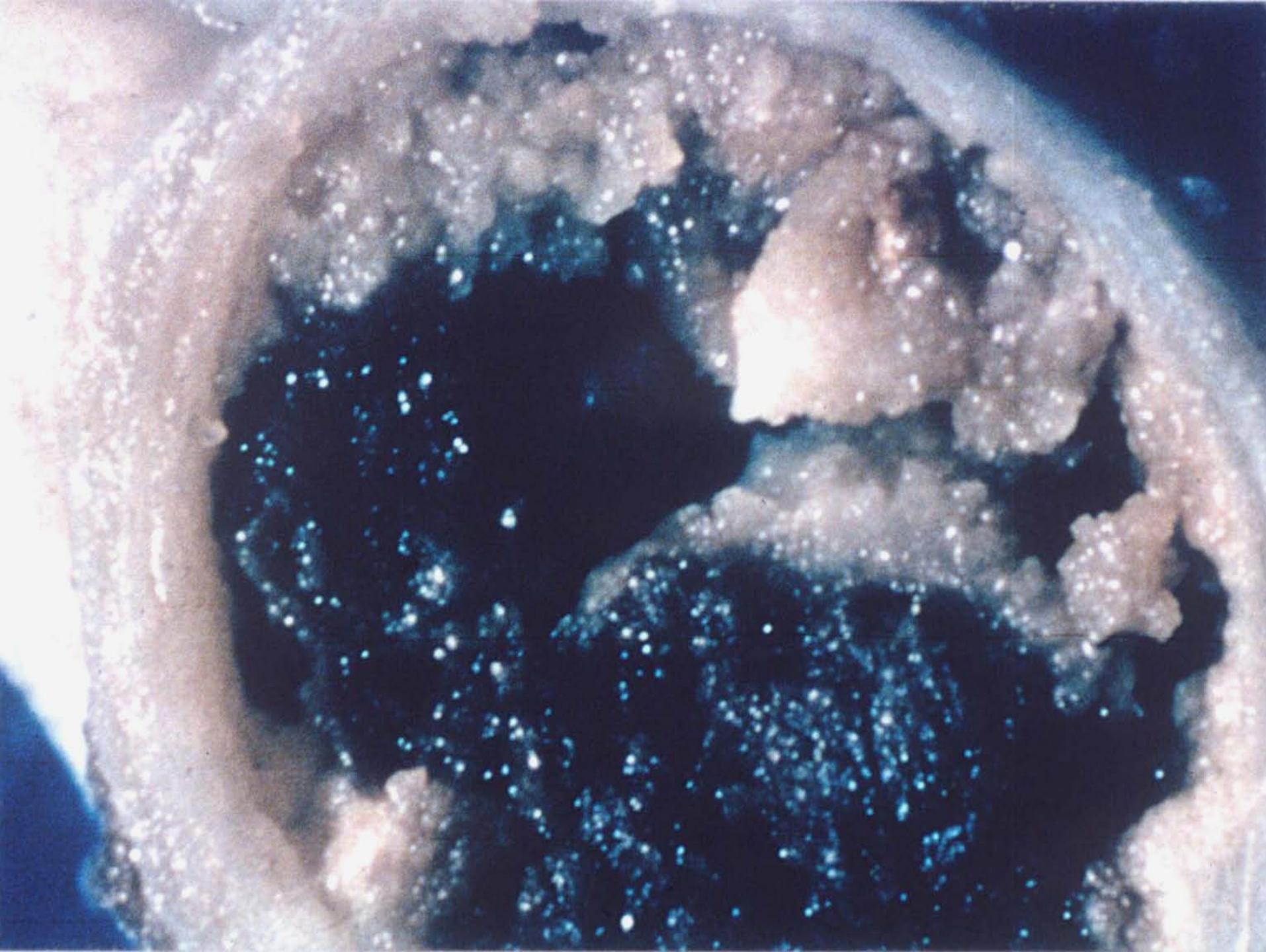
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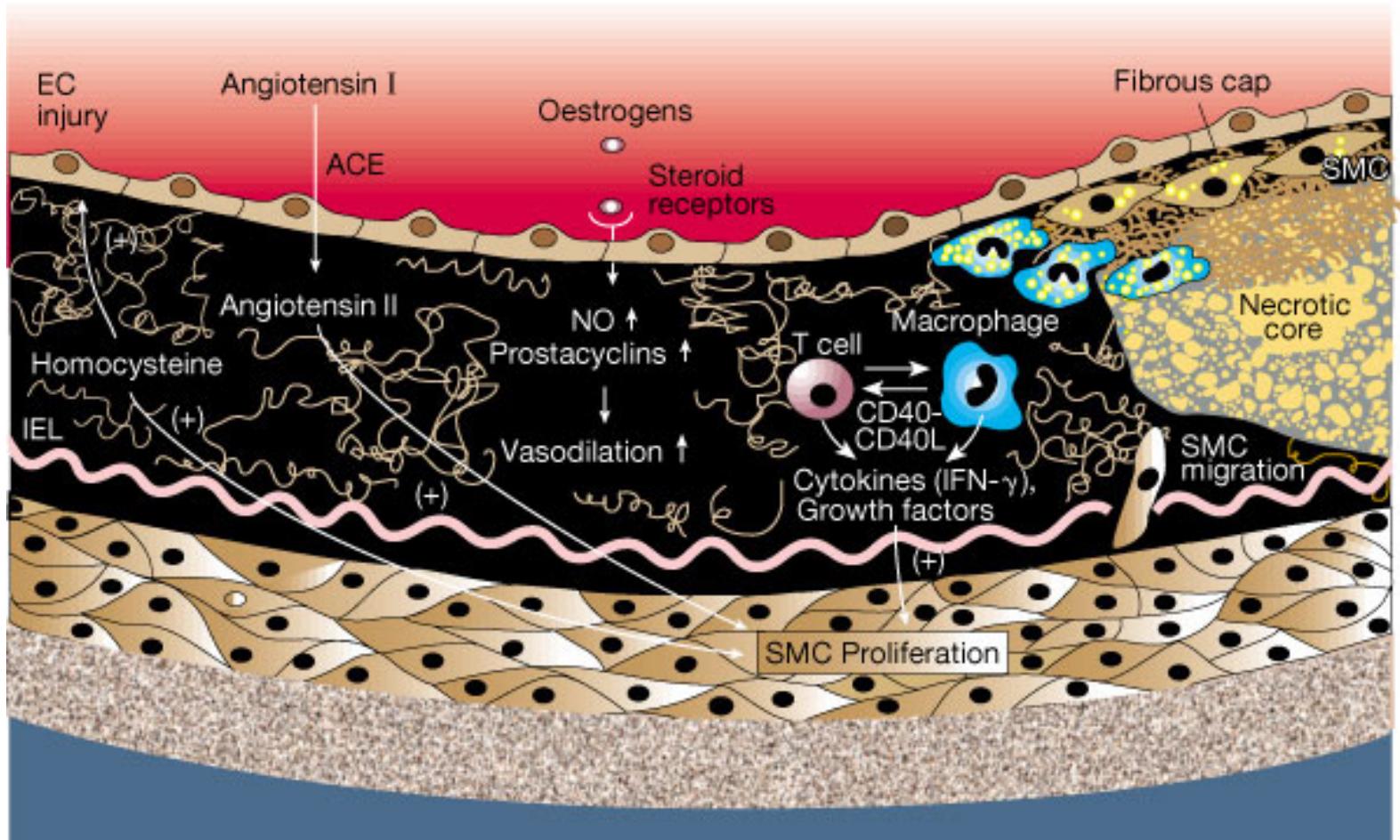
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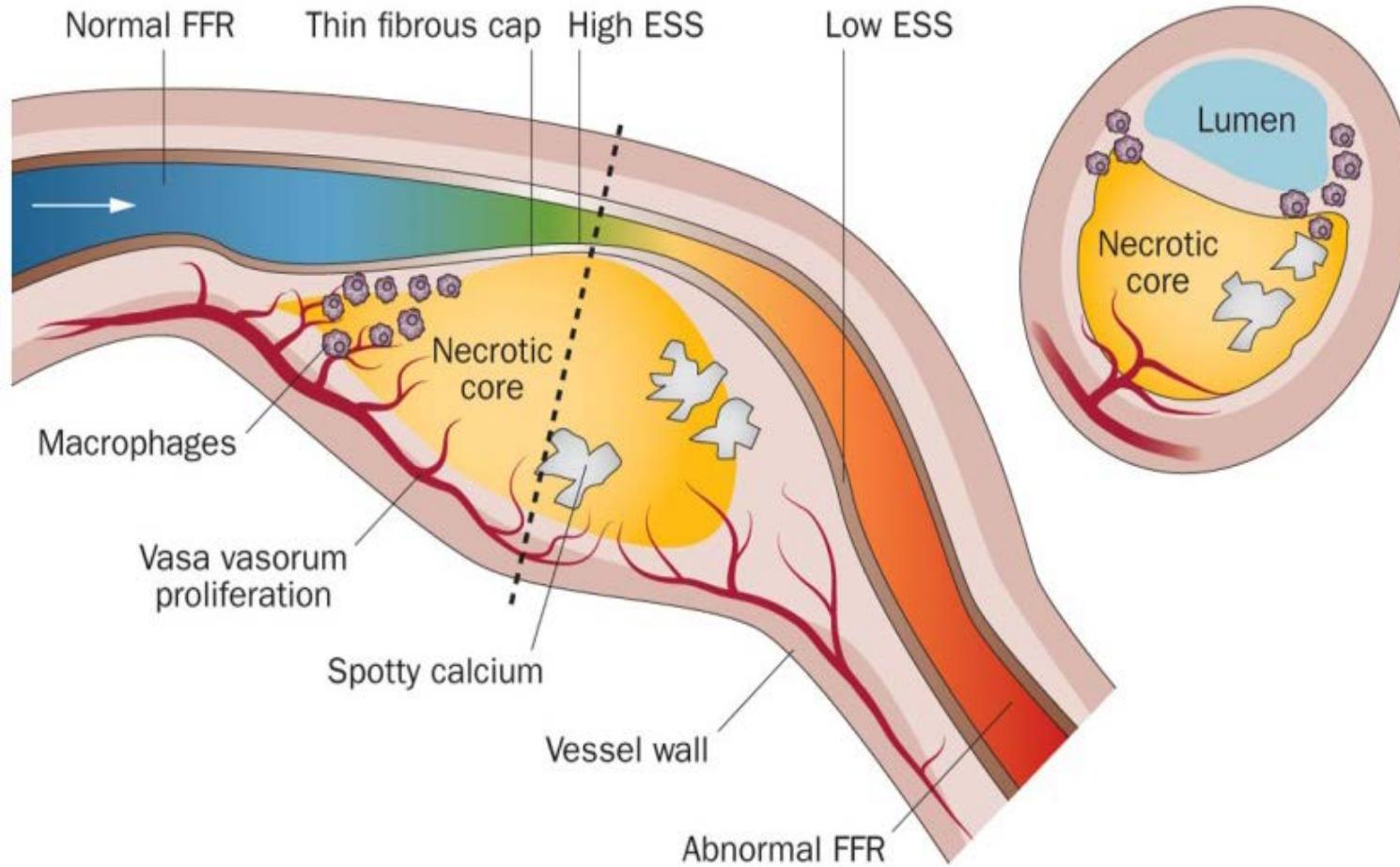




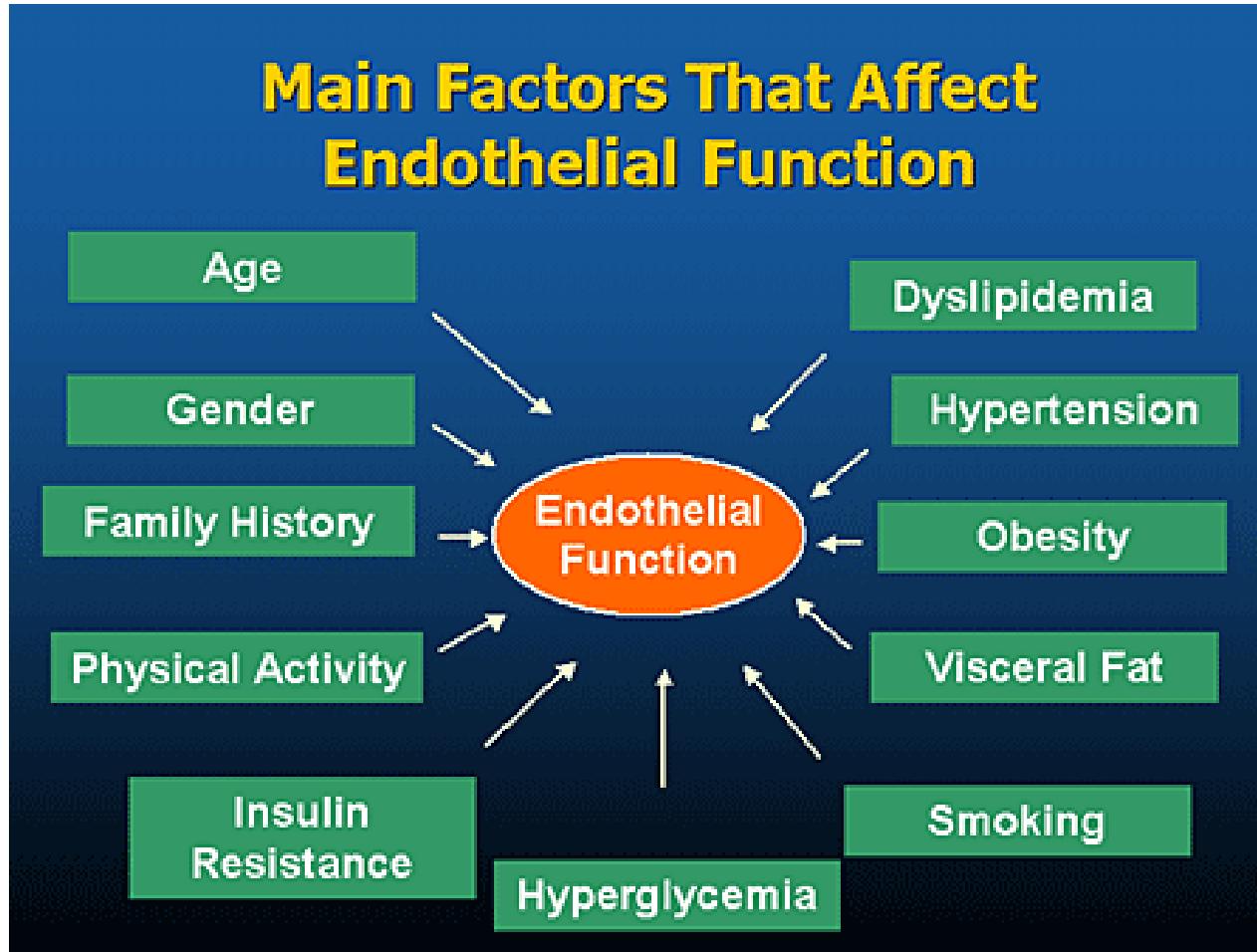
ATHEROSCLEROSIS



ATHEROSCLEROSIS



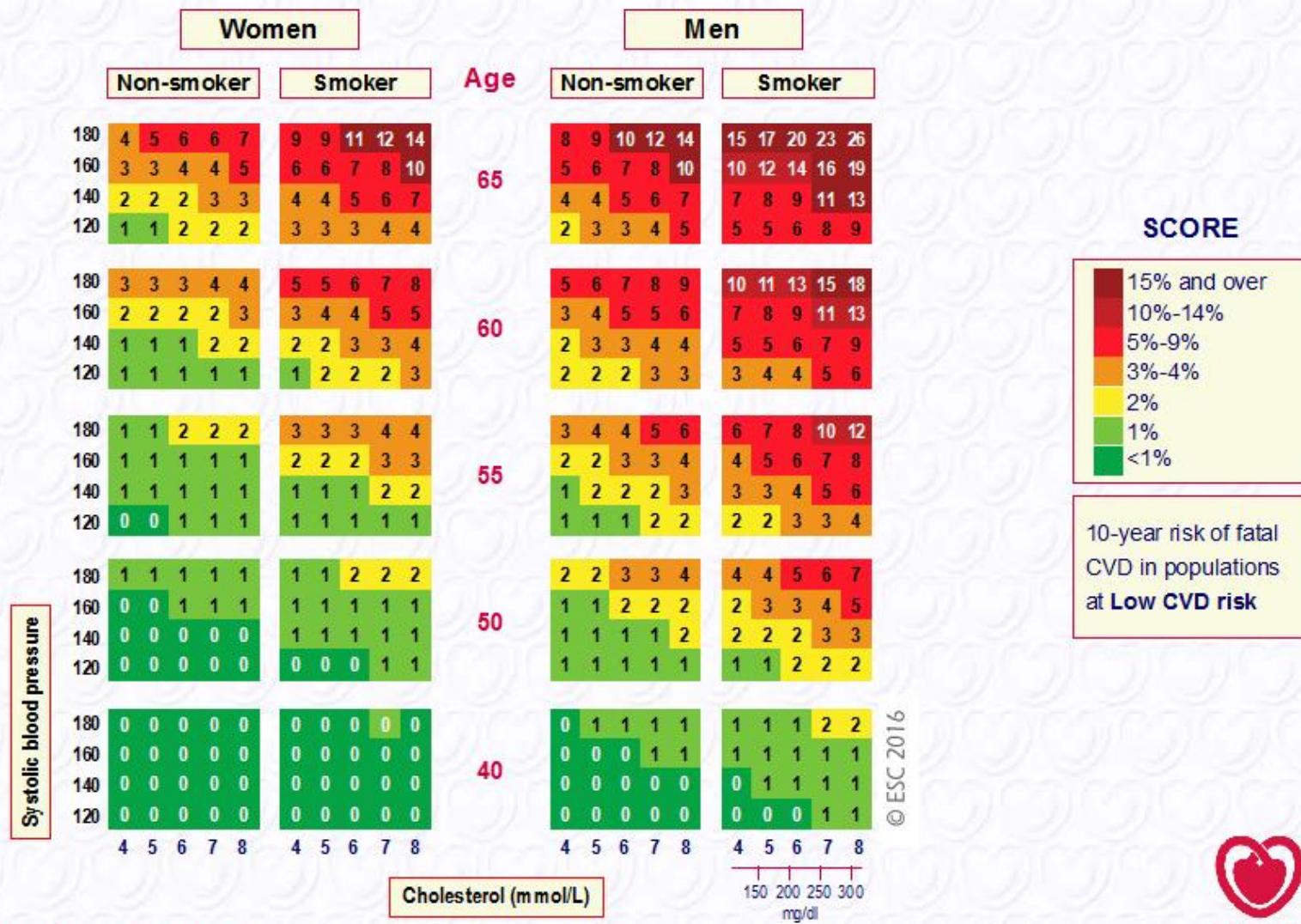
ATHEROSCLEROSIS



Impact of combination of risk factors on risk

Gender	Age (years)	Cholester- ol (mmol/L)	SBP (mmHg)	Smoker	Risk (10 year risk of fatal CVD)
F	60	7	120	No	2%
F	60	7	140	Yes	5%
M	60	6	160	No	9%
M	60	5	180	Yes	21%

SCORE chart: 10-year risk of fatal cardiovascular disease in populations of countries at low cardiovascular risk



Examples of risk modifiers that are likely to have reclassification potential

Socio-economic status, social isolation, or lack of social support.

Family history of premature CVD.

BMI and central obesity.

CT coronary calcium score.

Atherosclerotic plaques determined by carotid artery scanning.

ABI

Assessment of family history/(epi)genetics

Recommendations	Class	Level
Assessment of family history of premature CVD (defined as a fatal or non-fatal CVD event or/and established diagnosis of CVD in first degree male relatives before 55 years or female relatives before 65 years) is recommended as part of cardiovascular risk assessment.	I	C
The generalized use of DNA-based tests for CVD risk assessment is not recommended.	III	B

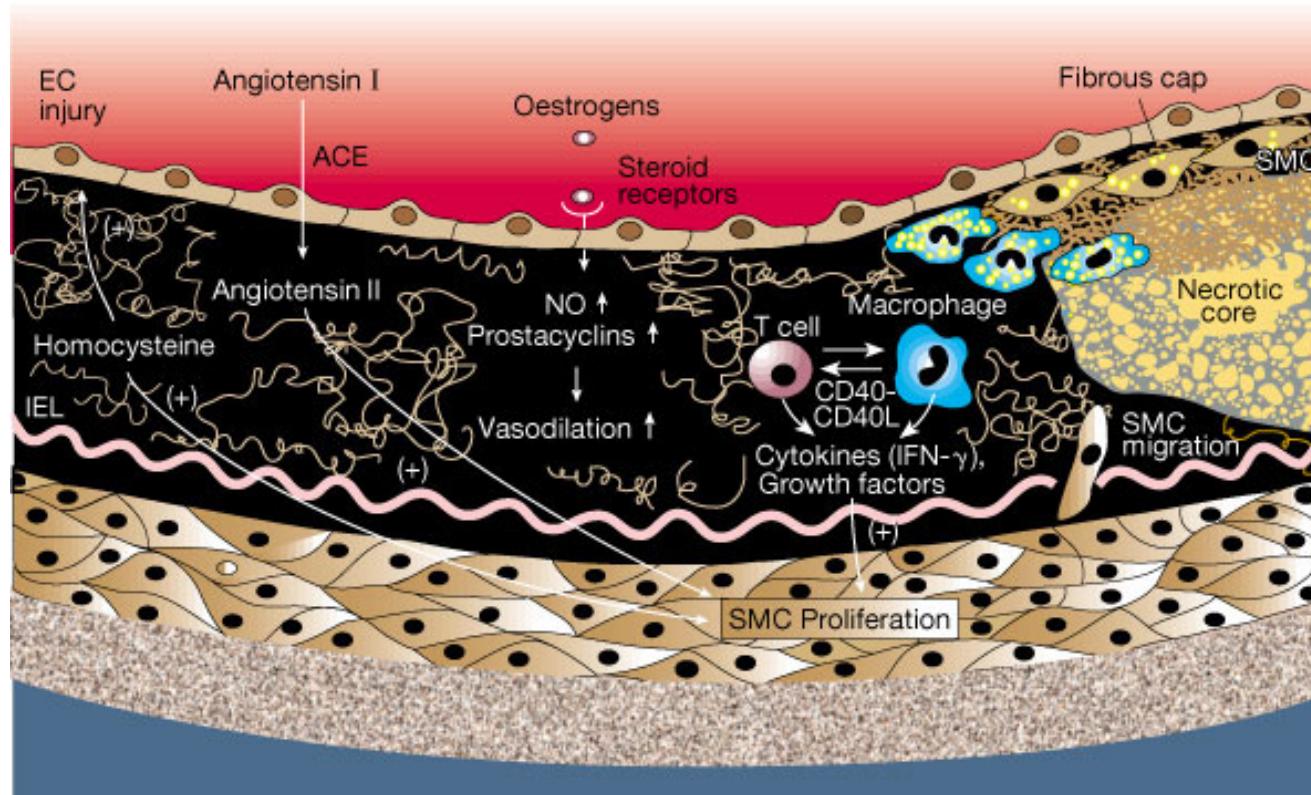
Individuals <50 years of age

Recommendations	Class	Level
<p>It is recommended to screen all individuals under 50 year of age with a family history of premature CVD in a degree relative (under 55 year of age in males, under 65 year of age in females) for familial hypercholesterolaemia using a validated clinical score.</p>	I	B

Assessment of circulating and urinary biomarkers

Recommendations	Class	Level
Routine assessment of circulating or urinary biomarkers is not recommended for refinement of CVD risk stratification.	III	B

ATHEROSCLEROSIS IS AN INFLAMMATORY DISEASE



Autoimmune disease

Recommendations	Class	Level
<p>The use of a 1.5 factor risk multiplier for CV risk in rheumatoid arthritis should be considered, particularly if disease activity is high.</p>	IIa	B
<p>The use of a 1.5 risk multiplier for CV risk in immune inflammatory diseases other than rheumatoid arthritis may be considered on a patient-by-patient basis, depending on disease activity/severity.</p>	IIb	C

RISK CATEGORIES

Very high risk: SCORE $\geq 10\%$

- documented cardiovascular disease on imaging
 - Myocardial infarction
 - Angina pectoris
 - Stroke
 - Aortic aneurysm
 - Peripheral arterial disease

RISK CATEGORIES

Very high risk: SCORE $\geq 10\%$

- documented cardiovascular disease
 - Significant plaque:
coronary angiography
carotid ultrasound

RISK CATEGORIES

Very high risk: SCORE $\geq 10\%$

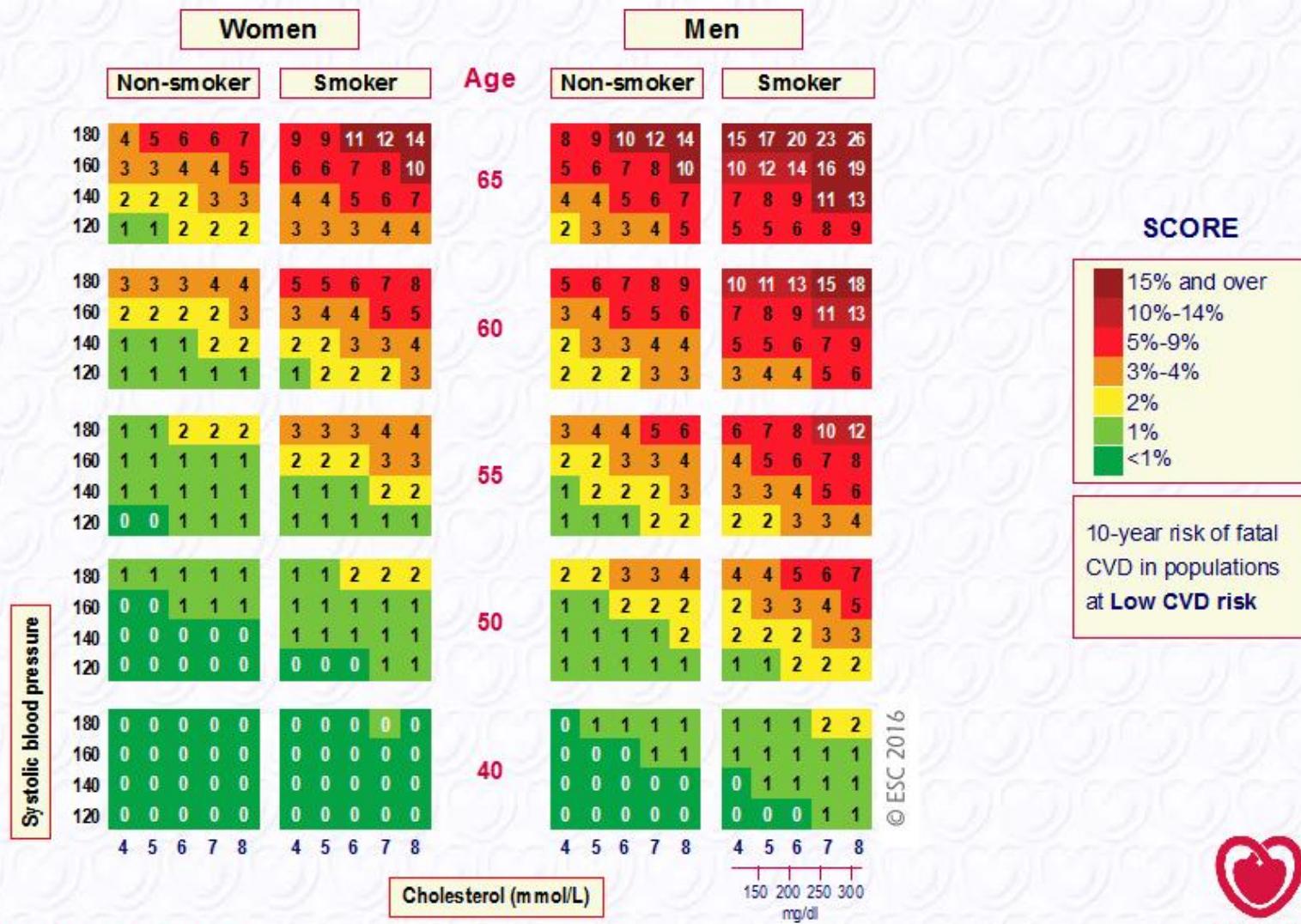
- Diabetes mellitus:
 - with target organ damage:
 - e.g. proteinuria
 - with major risk factor:
 - e.g. smoking, hypercholesterolemia

RISK CATEGORIES

Very high risk: SCORE $\geq 10\%$

- Severe chronic kidney disease:
 $GFR < 30 \text{ mL/min}/1.73\text{m}^2$

SCORE chart: 10-year risk of fatal cardiovascular disease in populations of countries at low cardiovascular risk



PREVENTION

EVERYONE

- Tobacco: no exposure in any form
- Diet: low in saturated fat, focus on:
 - whole grain
 - vegetables + fruit
 - fish
- Body weight: BMI 20 – 25 kg/m²

PREVENTION

EVERYONE

- Exercise:
 - 150 min./wk moderate aerobic
 - 75 min./wk vigorous aerobic
- Blood pressure:
 - < 140/90 mmHg

Classification of physical activity intensity and examples of absolute and relative intensity levels

Absolute intensity			Relative intensity		
Intensity	MET	Examples	%HR max	RPE (Borg scale score)	Talk Test
Light	1.1-2.9	Walking <4.7 km/h, light household work.	50-63	10-11	
Moderate	3-5.9	Walking briskly (4.8-6.5 km/h), slow cycling (15 km/h), painting/decorating, vacuuming, gardening (mowing lawn), golf (pulling clubs in trolley), tennis (doubles), ballroom dancing, water aerobics.	64-76	12-13	Breathing is faster but compatible with speaking full sentences.
Vigorous	≥6	Race-walking, jogging or running, bicycling >15 km/h, heavy gardening (continuous digging or hoeing), swimming laps, tennis (single).	77-93	14-16	Breathing very hard, incompatible with carrying on a conversation comfortably.

PREVENTION

Lipids: LDL is the target

- Very high risk:
 - < 1.8 mmol/L
 - 50% reduction if baseline is 1.8 – 3.5

PREVENTION

Lipids: LDL is the target

- High risk:
 - < 2.6 mmol/L
 - 50% reduction if baseline is 2.6 – 5.2

PREVENTION

Lipids: LDL is the target

- Low -moderate risk:
 - < 3.0 mmol/L

PREVENTION

Lipids: non-HDL cholesterol

- Very high risk:
 < 2.6
- High risk:
 < 3.3
- Moderate – low risk:
 < 3.8

PREVENTION

Lipids: HDL cholesterol

no target but $> 1.0 \text{ mmol/L}$ in men

and $> 1.2 \text{ mmol/l}$ in women

indicates lower risk

PREVENTION

Lipids: Triglycerides
no target

< 1.7 mmol/L indicates lower risk

> 1.7 mmol/L indicates need to
look for other risk factors

PREVENTION

Diabetes mellitus:

HbA1C: < 53 mmol/L

PREVENTION

How do we get there?



Facilitating changes in behaviour

Recommendations	Class	Level
Established cognitive-behavioural strategies (e.g. motivational interviewing) to facilitate lifestyle change are recommended.	I	A
Involvement of multidisciplinary healthcare professionals (e.g. nurses, dieticians, psychologists) is recommended.	I	A
In individuals at very high CVD risk, multimodal interventions integrating medical resources with education on healthy lifestyle, physical activity, stress management and counselling on psychosocial risk factors, are recommended.	I	A

Ten strategic steps to facilitate behaviour change

1. Develop a therapeutic alliance.
2. Counsel all individuals at risk of or with manifest cardiovascular disease.
3. Assist individuals to understand the relationship between their behaviour and health.
4. Help individuals assess the barriers to behaviour change.
5. Gain commitments from individuals to own their behaviour change.
6. Involve individuals in identifying and selecting the risk factors to change.
7. Use a combination of strategies including reinforcement of the individual's capacity for change.
8. Design a lifestyle-modification plan.
9. Involve other healthcare staff whenever possible.
10. Monitor progress through follow-up contact.

The « Five As » for a smoking cessation strategy for routine practice

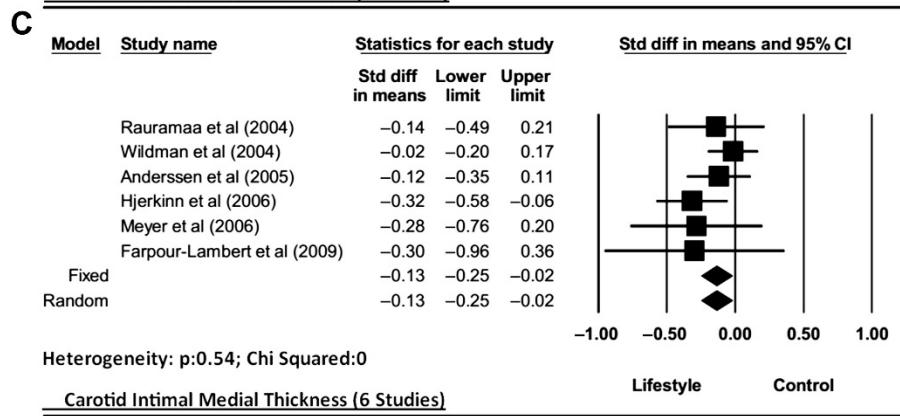
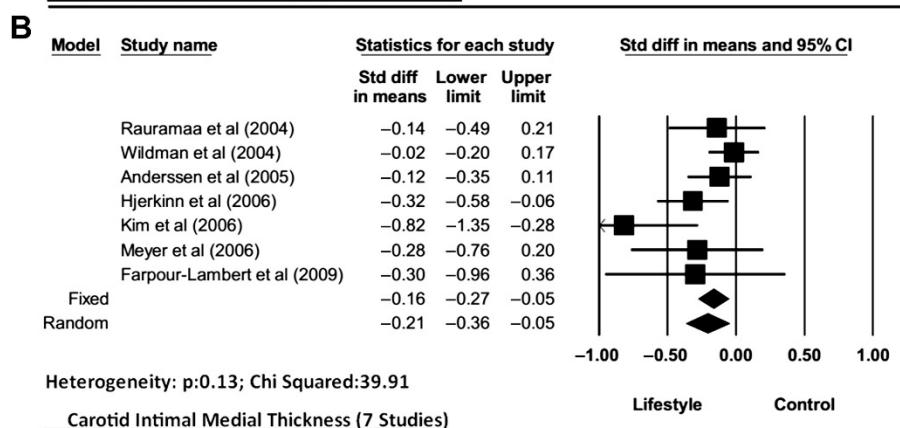
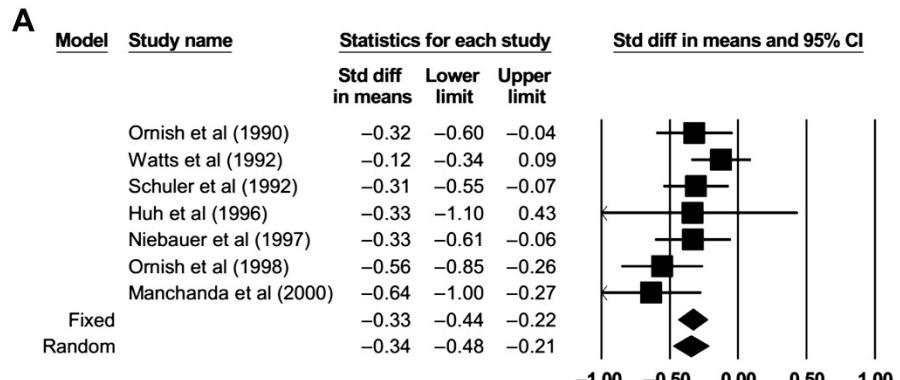
A-ASK:	Systematically inquire about smoking status at every opportunity.
A-ADVISE:	Unequivocally urge all smokers to quit.
A-ASSESS:	Determine the person's degree of addiction and readiness to quit.
A-ASSIST:	Agree on a smoking cessation strategy, including setting a quit date, behavioural counselling, and pharmacological support.
A-ARRANGE:	Arrange a schedule of follow-up.

Acheiving medication adherence

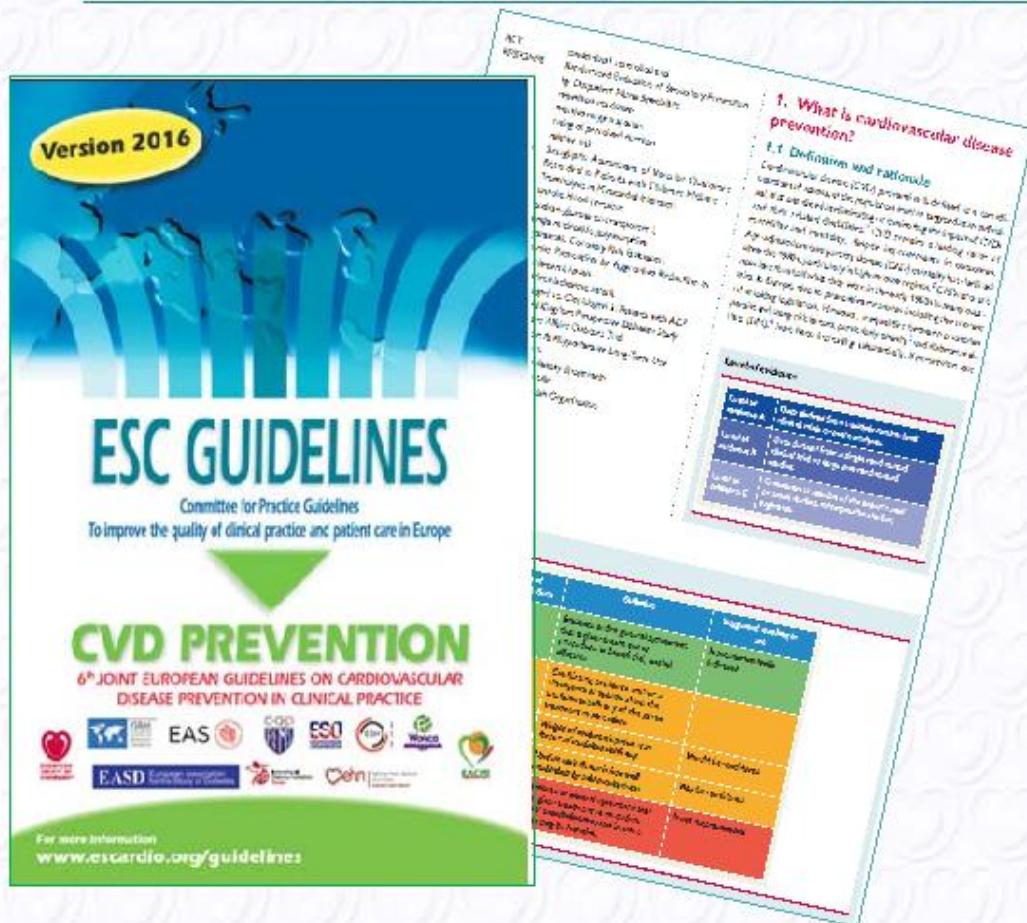
Recommendations	Class	Level
Simplifying the treatment regimen to the lowest acceptable level is recommended, with repetitive monitoring and feedback. In case of persistent non-adherence, multisession or combined behavioural interventions are recommended.	I	A
It is recommended that physicians assess medication adherence, and identify reasons for non-adherence in order to tailor further interventions.	I	C
The use of the polypill and combination therapy to increase adherence to drug therapy may be considered.	IIb	B

Can Lifestyle Changes Remove Plaques in Your Arteries?

New York Times May 18, 2018



European CVD Prevention in Clinical Practice (2016)



ESC POCKET GUIDELINES

Committee for Practice Guidelines

To improve the quality of clinical practice and patient care in Europe



Full Text and other derivative products available at:

www.escardio.org/guidelines

www.escardio.org/guidelines



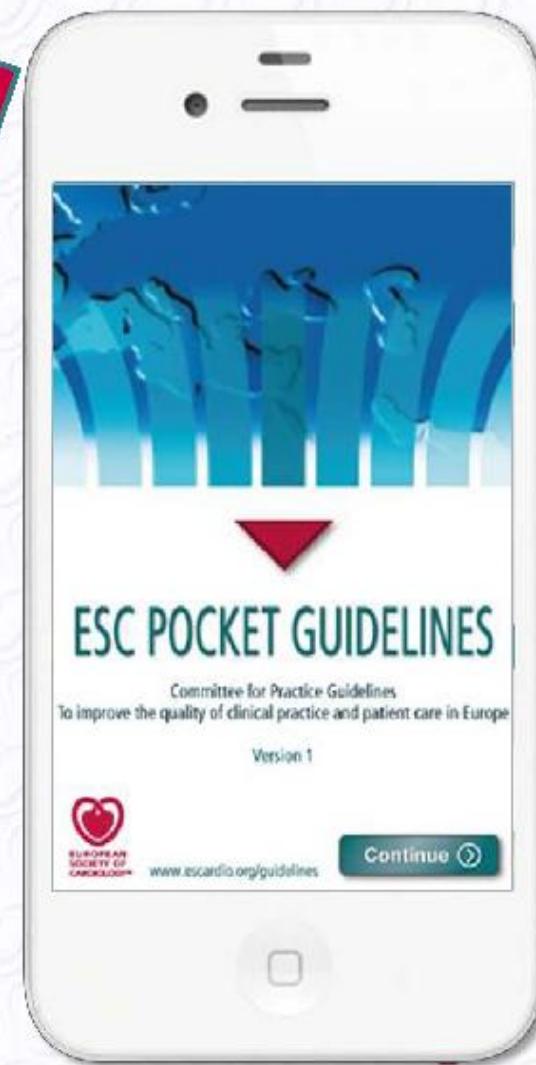
ESC Pocket Guidelines Application



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Thank You!

