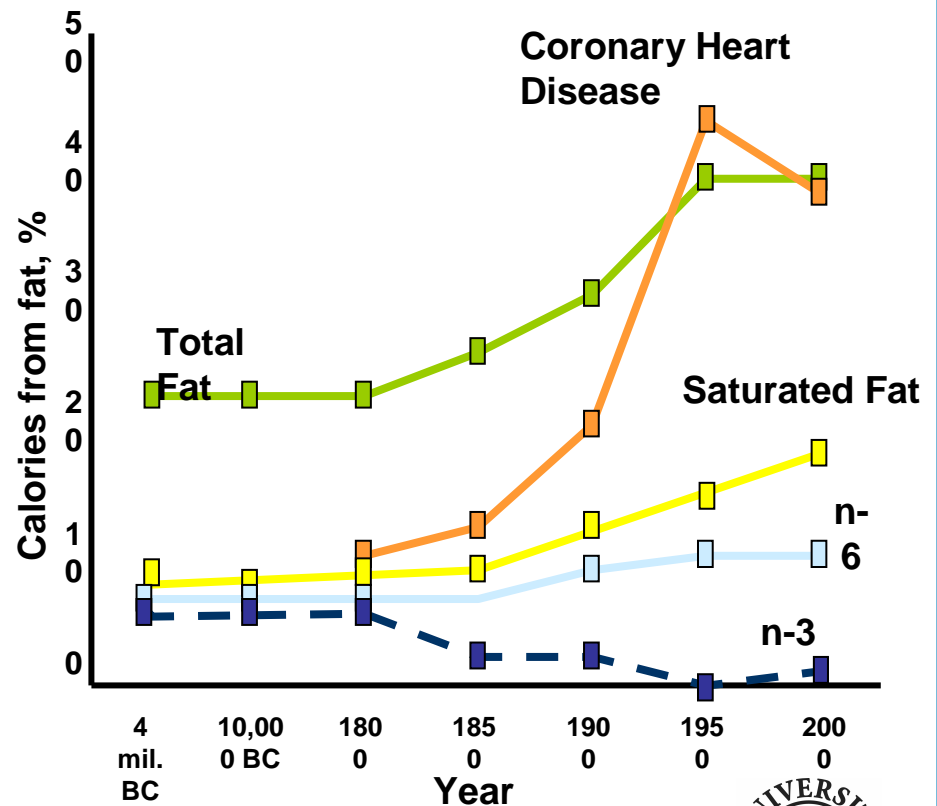


Can seal oil contribute to better human health?

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Historical background

- Old food lore of seafood
- It makes you smart
- It makes you stay healthy
- Has obtained some support in science
- Dietary habits have changed
- Last 200 years
- Relative total fat, saturated fat and n-6 increased
- Relative n-3 decreased
- Incidents of CHD increased



Greenland Eskimos, on their traditional diet - lower incidence of CHD

(Dyerberg et al., 1978)

- Omega-3 protects against atherosclerosis and thrombosis
- Marine mammals and Fish
- Visceral organs (liver, kidney, heart)
- Raw or minimal processed food

Functional “molecules” from seafood

n-3 (omega-3) Fatty Acids:

eicosapentaenoic (EPA, 20:5), docosahexenoic acid (DHA, 22:6)

Peptides/ Proteins:

Fish protein hydrolysates

Angiotensin converting enzyme (ACE) inhibitors

Serine protease inhibitors

Amino acids:

taurine, lysine, histidine, glutamine

Vitamins: A, D, E and K ...Ubiquinone CoQ10....niacin, B6, B12

Minerals and trace elements:

potassium, calcium, magnesium, zinc, selenium, iodine

..be aware of the risk of overfocusing single aspects..

Different types of cholesterol

-HDL-cholesterol: the **good** cholesterol

-LDL-cholesterol: the **bad** cholesterol

Therefore we want to increase HDL-cholesterol and reduce LDL-cholesterol

HDL-cholesterol is enhanced by:

- Physical exercise
- Alcohol (red wine is recommended)
- Omega-3 fatty acids (specially in seal-and whale oil)

LDL-cholesterol is reduced by:

- Intake of fish
- Less intake of saturated fatty acids (bacon, lamb, etc)
- More intake of white meat
- Increased intake of vegetables

*Intake of food that contains cholesterol
may be beneficial:*

Those who don't have inherited hypercholesterolemia can eat egg and other products which contain cholesterol with a positive effect

Why? The cholesterol in the diet will reduce the production of cholesterol in the liver!

Mechanism of atherogenesis

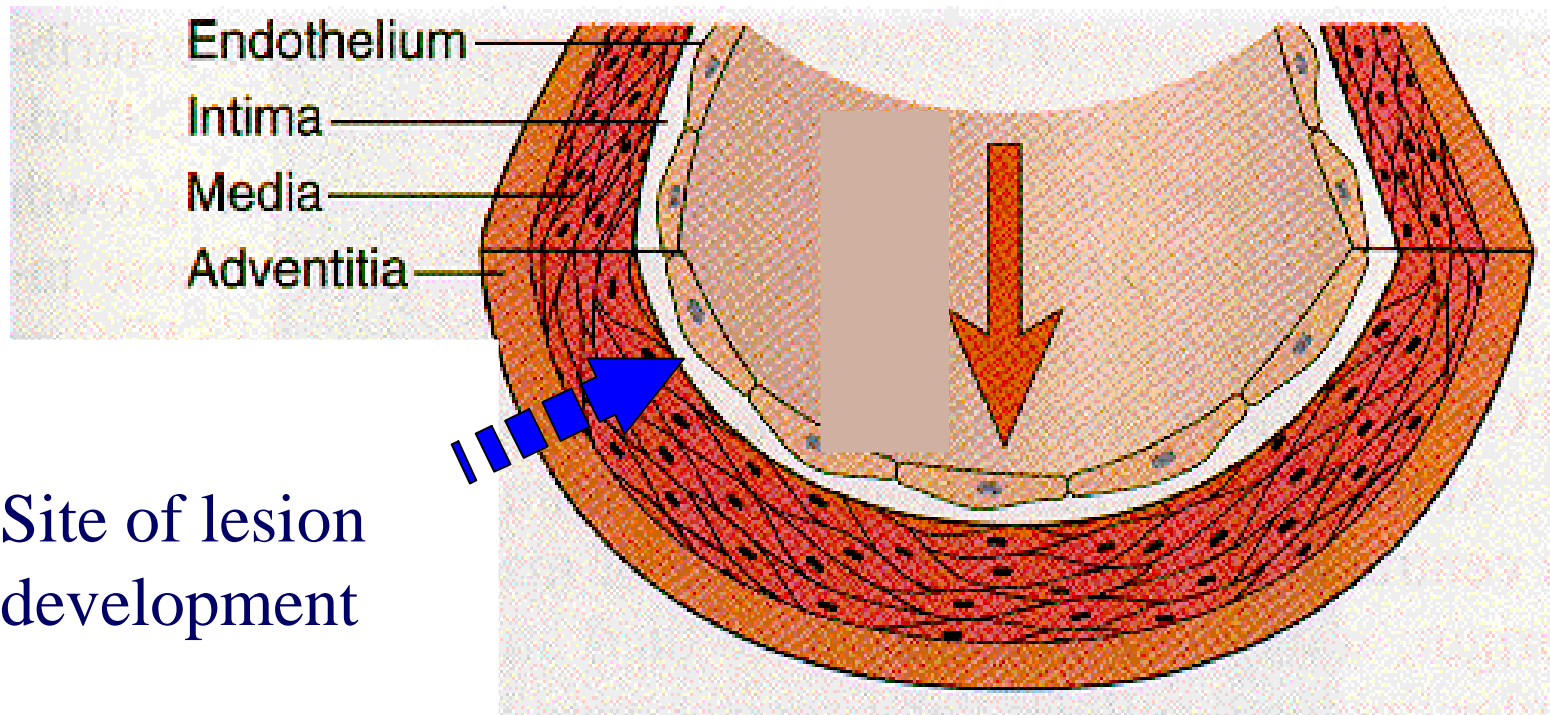
-a short review

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Atherogenesis

Arterial wall



Site of lesion
development

Differences in death of chronic diseases between Greenlanders and Danes

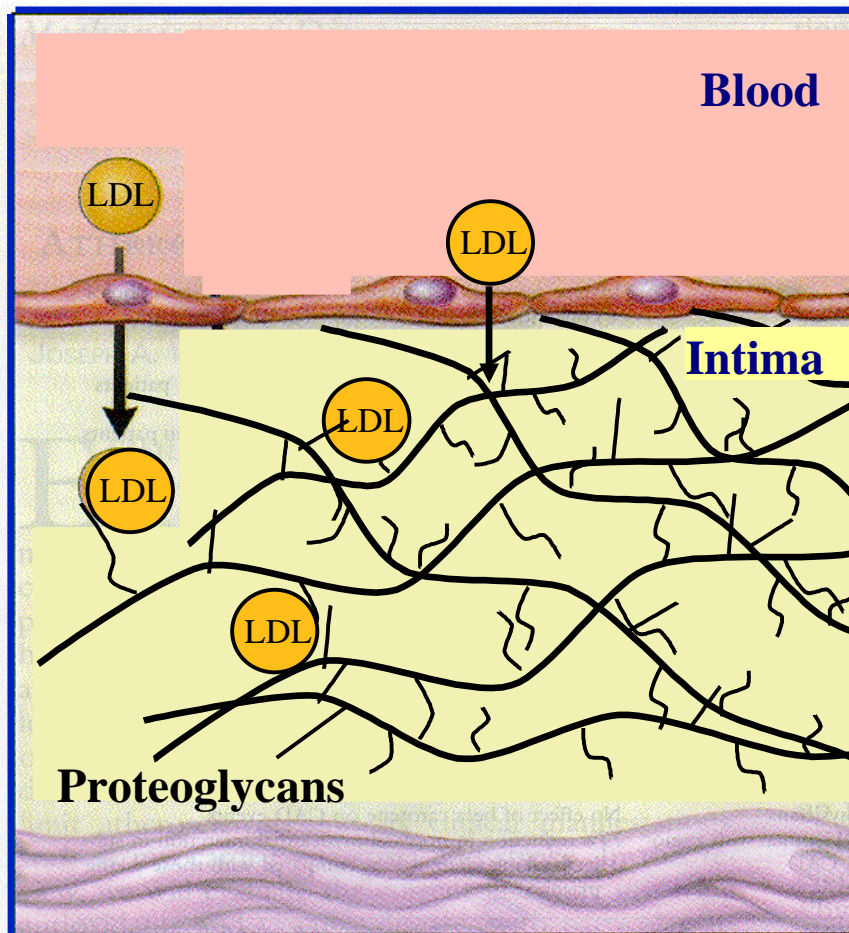
	Eskimos/Danes
Stroke	2/1
Acute myocardial infarction	1/10
Psoriasis	1/20
Diabetes	Rare
Asthma	1/25
Thyrotoxicosis	Rare
Multiple Sclerosis	0
Epilepsia	2/1
Rheumatoid arthritis	Low

Kromann and Green, ACTA Med Scand 1980, 208, 401.

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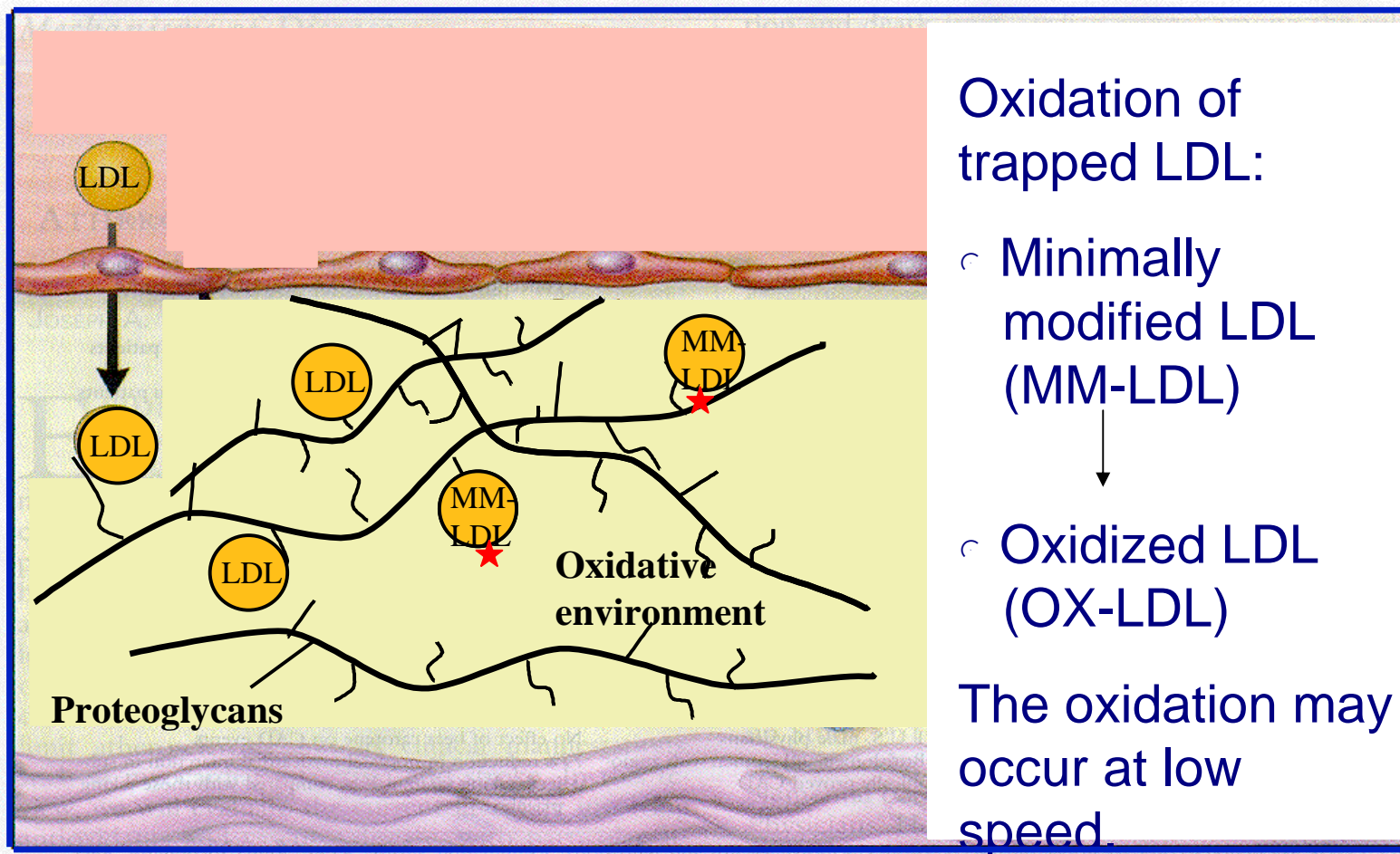
LDL trapment in arterial intima



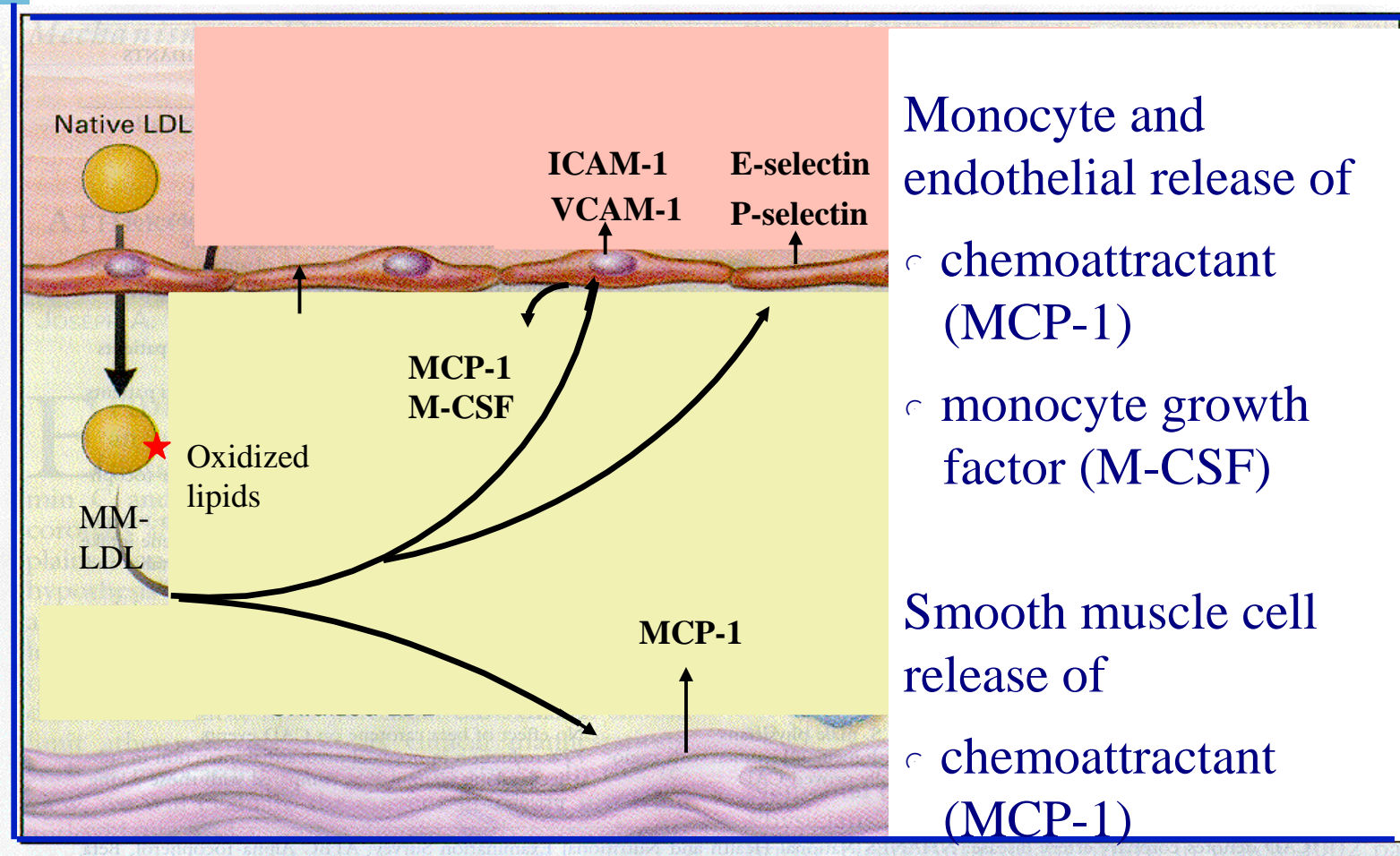
Binding of LDL to PG
in arterial intima:

- Long LDL residence time (weeks versus min for other tissue)
- High LDL conc (10-fold higher than in other tissue)

LDL oxidation



Effects of minimally modified LDL



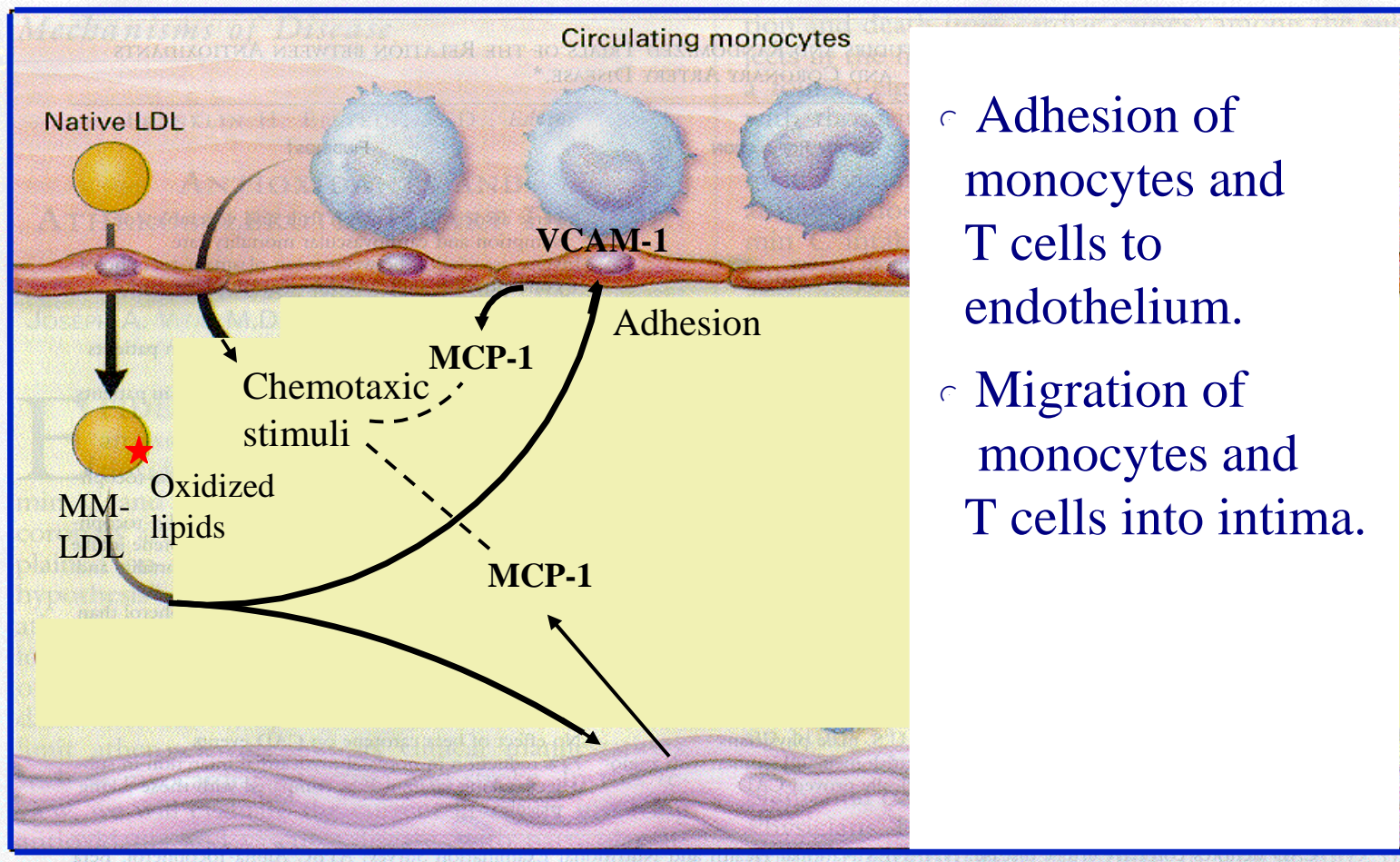
Monocyte and endothelial release of

- chemoattractant (MCP-1)
- monocyte growth factor (M-CSF)

Smooth muscle cell release of

- chemoattractant (MCP-1)

Effects of minimally modified LDL



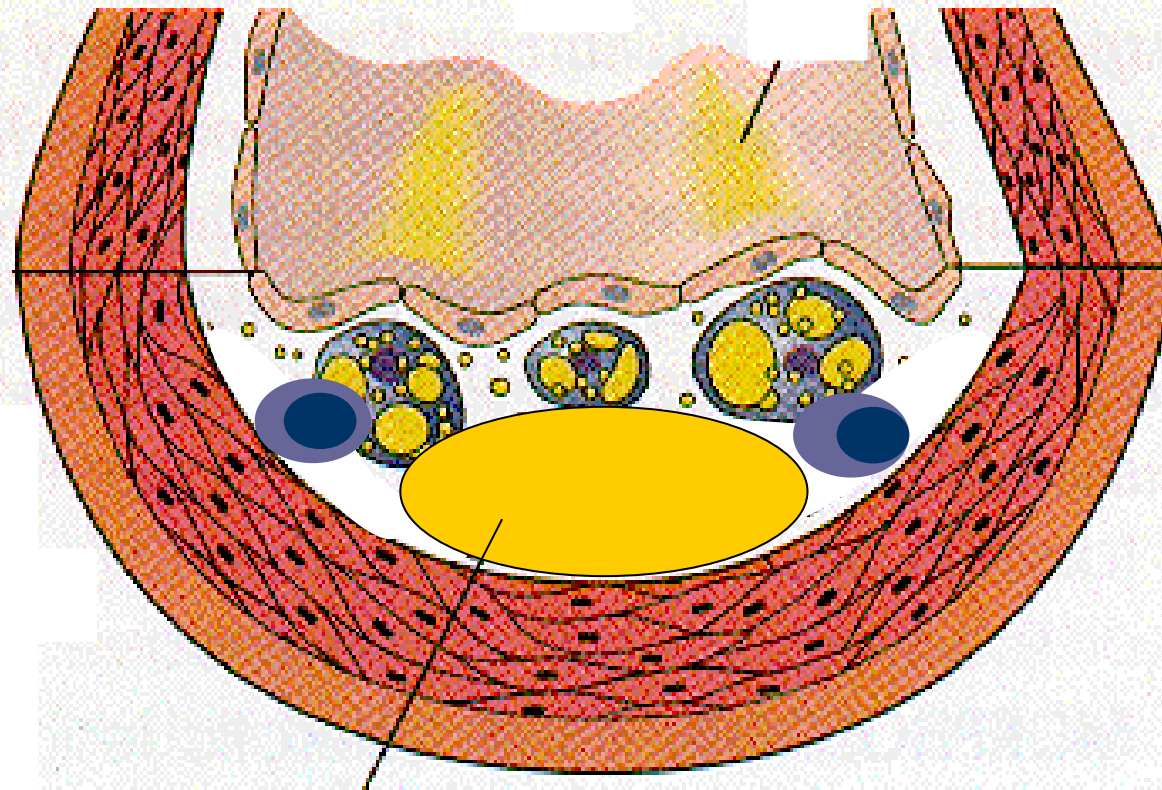
- Adhesion of monocytes and T cells to endothelium.
- Migration of monocytes and T cells into intima.

Advanced lesion

Lipid core formation

Atheroma

AHA
lesion
type IV



Extracellular
lipid core

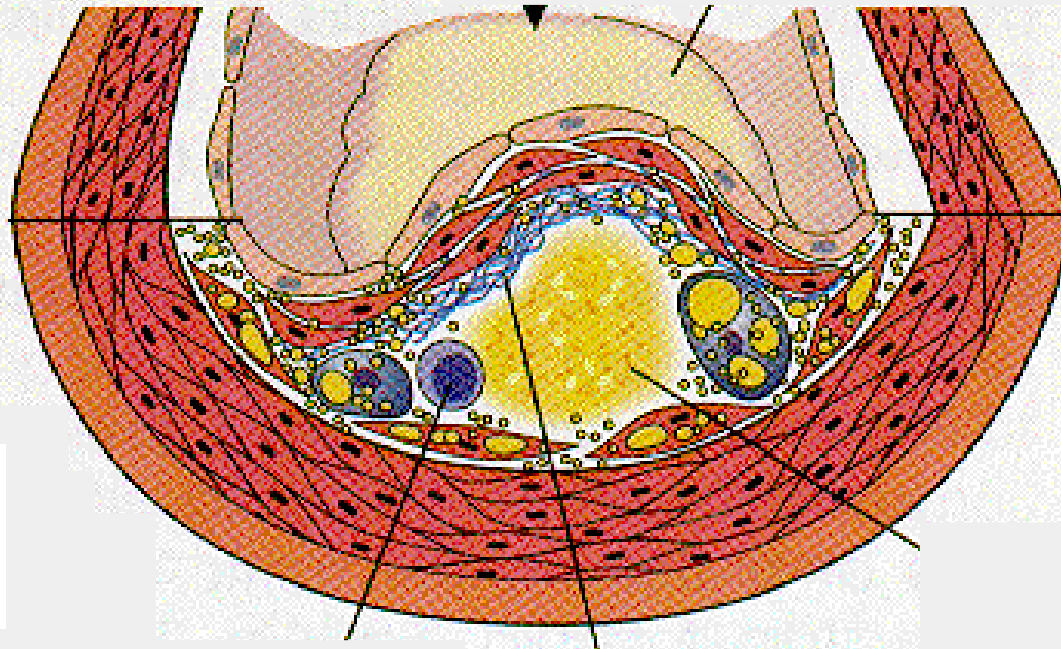
cholesterol
cholesterol ester

Advanced lesions

Intimal smooth muscles cause marked expansion of the intimal lesion due to

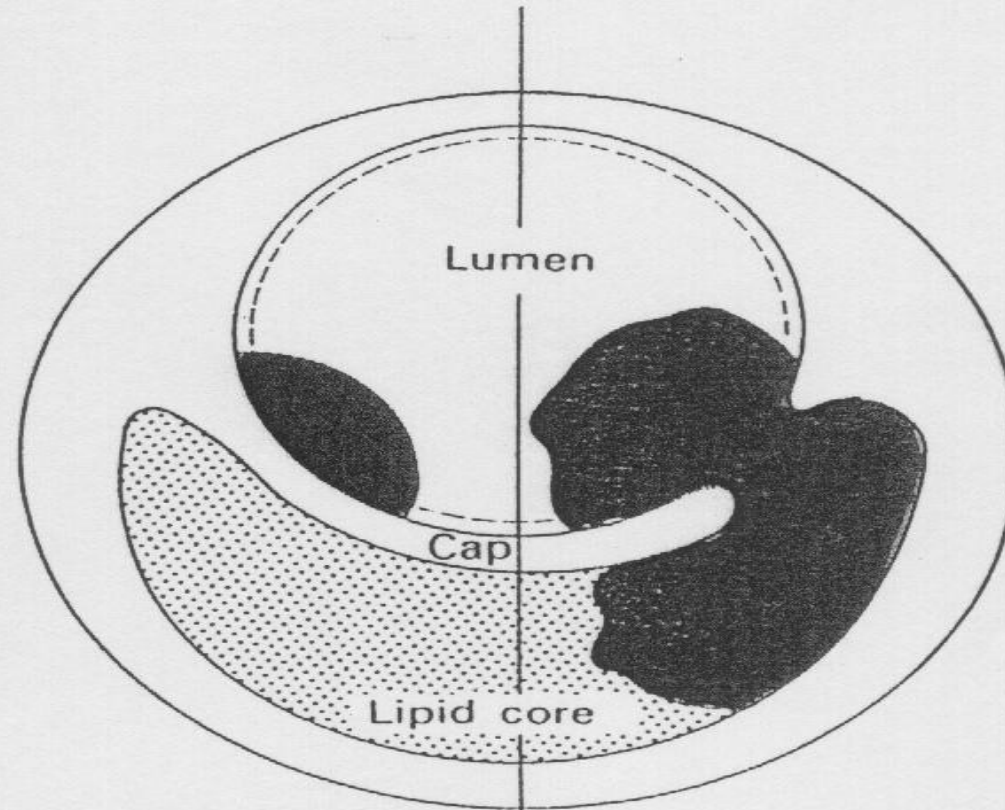
- proliferation
- collagen synthesis
- fibrous cap formation

Fibro- atheroma



AHA lesion
type Va

Rupture of plaque



Superficial injury – Endothelial denudation Deep injury – Plaque disruption

Fig. 3 Diagrammatic representation of superficial and deep intimal injury.

Effects of marine oils associated with reduction in

- inflammatory reactions
- atherogenesis (development of atherosclerosis)
- thrombus formation
- depression
- psoriasis
- inflammatory bowel disease (IBD)
- ADHD

Platelet activity

- Intake of marine oils reduces the activity of platelets (reduce platelet aggregation, adhesion to vessel wall, generation of pro-inflammatory products)
- Important: Platelets are important in thrombosis, atherosclerosis, myocardial infarcts (MI), brain infarcts (stroke)

Oxidation rate of fatty acids depends largely on number of double bonds

Fatty acid	Number of double bonds	Induction period (h) 25 C	Rel. rate of oxidation
18:0	-	--	1
18:1	1	82	100
18:2	2	19	1200
18:3	3	1.3	2500
20:5 EPA	5	--	?
22:6 DHA	6	--	

Adverse effects of omega-3 fatty acids?

- omega-3 fatty acids are also incorporated in LDL-particles
- particles are thereby more susceptible for oxidation
- increased lesion (atherosclerosis) formation in the vessel wall?

History of clinical studies with marine oils in our laboratory

9 clinical studies

- 1986 Cod liver oil (CLO)
- 1987 Concentrate of EPA + DHA (85% , K85=Omacore)
- 1992 Cold pressed whale oil, refined seal oil, CLO, seal oil/CLO,
- 1994 Cold pressed and refined whale oils, CLO, seal oil/CLO, olive oil/CLO
- 1999 Smoked salmon, salmon filet, cod filet, CLO
- 1999 CLO products from various stages of refinement
- 2000 Cold pressed and refined whale oil, seal oil, and CLO
- 2003 Seal oil, CLO, Salmon pate, OliVita
- 2004 Salmon pate , CLO capsules

In our clinical studies on marine oils (9 studies) we had several interesting observations:

- The beneficial effect of e.g. cold pressed whale oil was superior to cod liver oil despite only half of the omega-3 fatty acids content
- Refinement of marine oils removed a large part of the beneficial effects

WHY: Removal of antioxidants and quite possibly other unknown products

Administration of marine oils; 10 weeks

Parameter	Control	Seal	Cod liver	Seal+CL	Whale
<i>Serum:</i>					
<i>triacylglycerol (TG)</i>	-		L*	-	-
<i>total cholesterol</i>	"		-	-	-
-					
<i>HDL cholesterol</i>	"		-	-	H*
<i>H***</i>					
<i>Coagulation factors:</i>					
<i>Prothrombin F1 + 2</i>	"		-	-	-
<i>L*</i>					
<i>Lipopolysaccharide stimulated(LPS) whole blood:</i>					
<i>tumornecrosis factor- α TNFα (monocytes)</i>	"	-	-	-	L*
<i>tissue factor activity (TF) (monocytes)</i>	"	-	-	L*	L*
<i>thromboxane B2 (TXB2)</i>	"	-	-	-	L**

- no significance, L lower, H higher, * p< 0.05, ** p< 0.01, *** p< 0.005

Østerud et al., 1995 Lipids, **30** (12): 1111 - 1118.

Seal oil studies

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We have performed 4 clinical studies where intake of seal oil was one of the test substances

Results: Similar effects as fish oil except that HDL-cholesterol (the positive cholesterol) is more enhanced with seal oil compared to fish oil and uptake of omega-3 fatty acids from seal oil is better compared to fish oil

Seal oil study in Canada i 1999 (Conquer et al. 96: 239-50)

20 g seal oil per day in capsules for 6 weeks

Results: 2.7 to 4.3 times increase in EPA, and DHA increased between 1.5 to 2.4 times.

DPA increased 0.5 to 0.7 times

Pro-inflammatory fatty acid arachidonic acids was reduced by 26%

Fibrinogen- a protein associated with risk of coronary heart disease was reduced by 18%

Murphy et al 1999; (Lipids 34: 115-24)

Another study from Canada showed that Guinea pigs had a higher rise in omega-3 fatty acids with seal oil compared to fish oil

Reduced production of thromboxane A₂, a product that makes the platelets more sticky, with both marine oils

Bonefeld-Jorgensen et al 2001 (Int J Circumpolar Health, 60: 25-33).

10 capsules seal oil per day in 10 persons for 6.

5 capsules seal oil per day in 5 persons for 6 weeks.

Positive changes in fatty acid composition regarding ratio between n-6 and n-3 fatty acids.

Positive effects on an inflammatory product in lymphocytes.

Studies from Bergen:

[Brunborg LA Clin Nutr.](#) 2008 Mar 26. [Epub ahead of print]

“Effects of short-term oral administration of dietary marine oils in patients with inflammatory bowel disease and joint pain: A pilot study comparing seal oil and cod liver oil”

CONCLUSION: No significant differences in the two treatment groups were seen; in both groups, the changes in several joint pain parameters, leukotriene B(4) level of plasma, and serum fatty acid profile were putatively favorable.

Development of a new oil mixture

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A combination of seal oil and cold pressed olive oil (OliVita)

OliVita has all the positive effects of omega-3 fatty acids; but even more important, excessive antioxidants/anti-inflammatory products that together with the omega-3 fatty acids, prevent inflammatory reactions

Designed to have similar effects as cold pressed whale oil!

The stability of various oils when heated to 70 °C and exposed to oxidation

Oil reaction	Hours before start of oxidation	”Second”
Seal oil + olive oil	38	
Fish oil + olive oil	23	
Olive oil	> 60	
Soya oil	1.1	
Cod liver oil (CLO)	0.5	9.6
Seal oil	2.1	12.5
Conc. EPA+DHA	< 5 min	

Diet added 15 ml cod liver oil (CLO), OliVita or nothing (Control), % changes in parameters related to coronary heart disease (CHD) before and after intake.

<i>Groups</i>	<i>HDL--chol</i>	<i>hsCRP</i>	<i>MCP-1</i>	<i>TxB2</i>	<i>LTB4</i>
Control	0	+5.1	+8.5	0	+36.6
CLO	+1.4 (i.s.)	+12.5 (n.s.)	-5.2 (0.05)	-14.3 (0.05)	+8.6 (0.001)
OliVita	+8.3 (0.05)	-24.0 (0.001)	-14.3 (0.005)	-17.6 (0.05)	+8.8 (0.001)

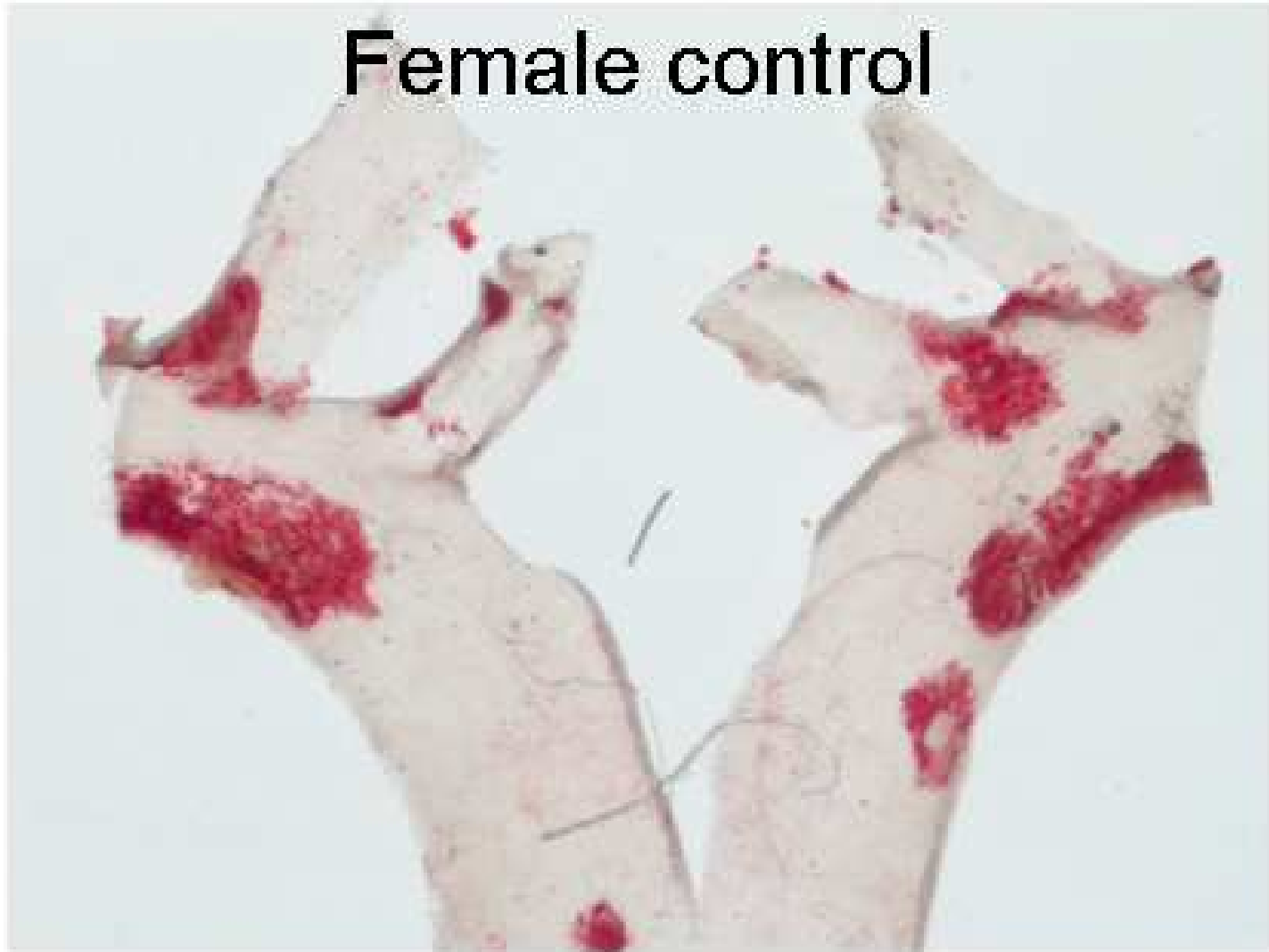
Studies on transgenic mice

Knock out mice (transgenic), who acquire rapidly atherosclerosis were used to detect the effects of dietary oils.

By supplying the diet with various oils we can measure the effect by the quantification of the fatty plaques formed on the vessel wall in these animals.

This gives us a final proof whether the oils may have a beneficial effect on the development of atherosclerosis.

Female control



Female treated with olivita



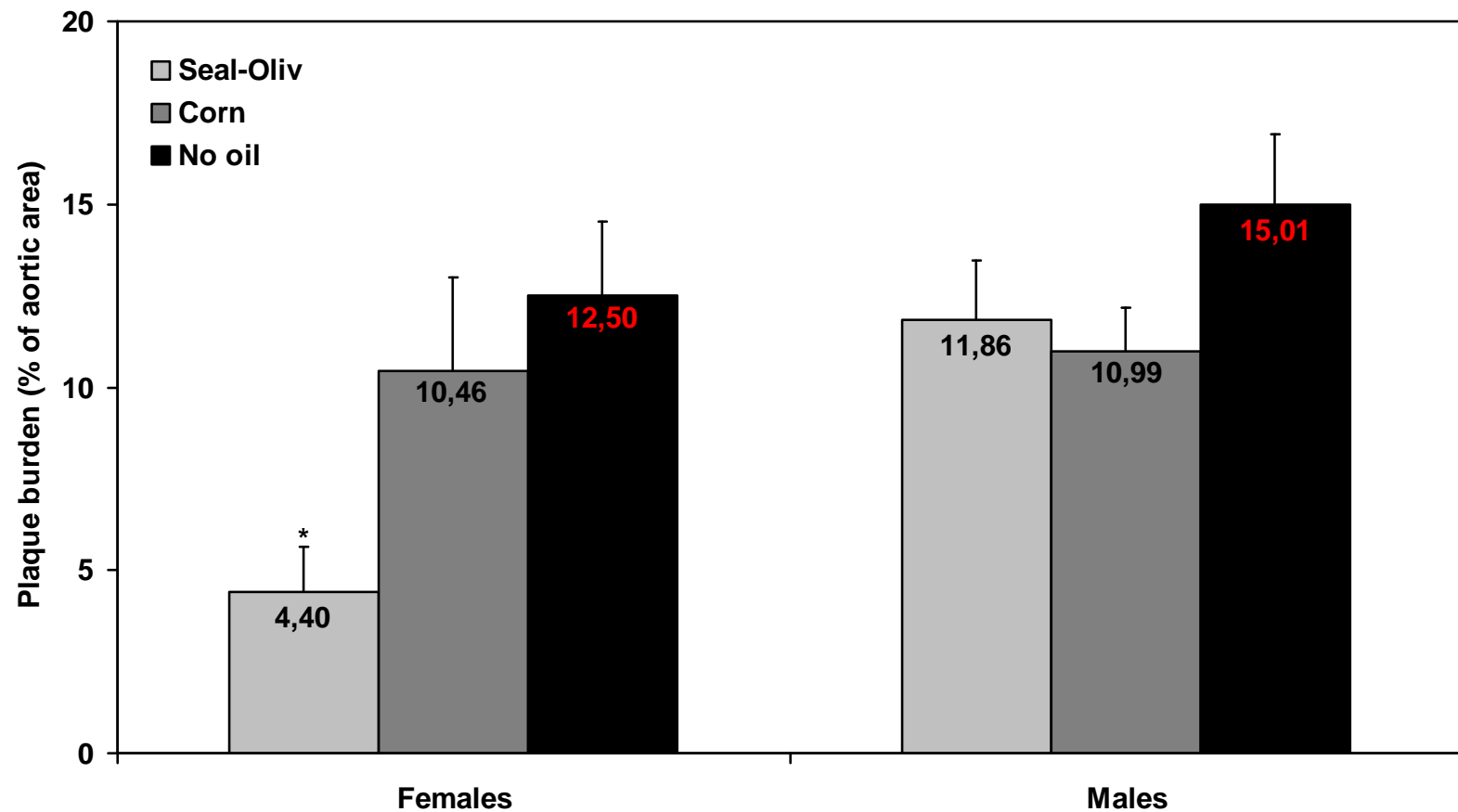
Female treated with Corn oil



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Plaque burden – aortic arch



Eskimo advice - for obvious reasons this may not be perceived as an alternative....

"Every day you should eat something from each of the five basic food groups; fried blubber, boiled blubber, stewed blubber, baked blubber and raw blubber"



Conclusion:

Eat more seafood and supplement it with a combination of seal oil and olive oil that will provide sufficient antioxidants to prevent inflammatory reactions in your body.

Thank you for your attention!

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What causes cardiovascular diseases?

- Inheritance
- High LDL-cholesterol and low HDL-cholesterol
- Diabetes
- High blood pressure
- Lack of physical activity
- Smoking
- Overweight

Amplifying factors:

- milieu-social status
- bacteria
- unhealthy diet