J.Cell.Mol.Med. Vol 6, No 2, 2002 pp. 276-277

Images in Cellular / Molecular Medicine

Experimental atheroma formation in the coronary artery of the hyperlipemic hamster

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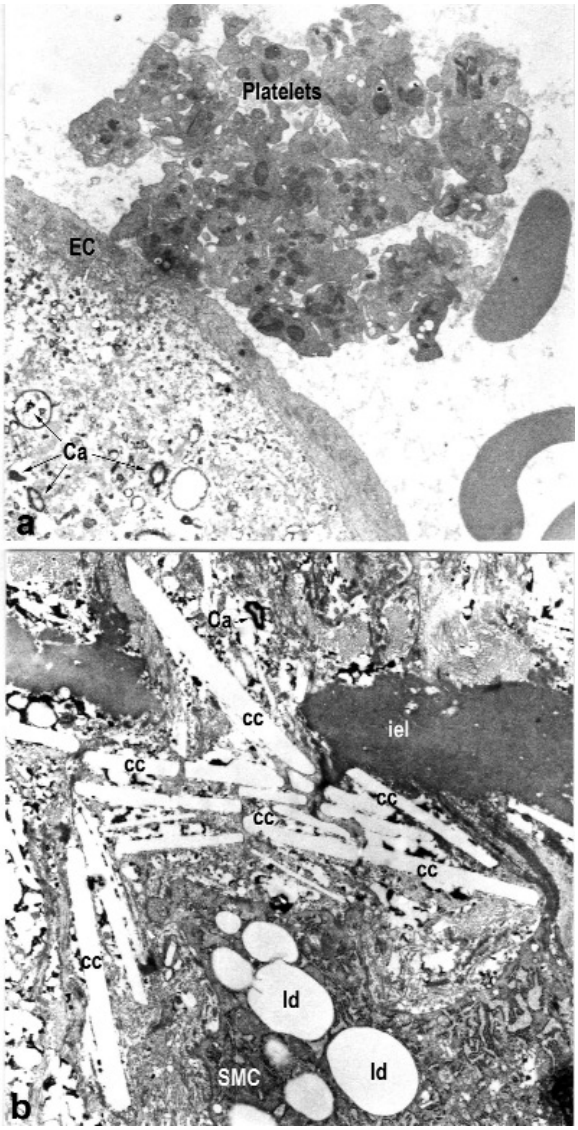

Fig. 1 Intima of a fibrolipid plaque from hyperlipemic hamster coronary artery. **a.** The endothelium (**EC**), rich in lipid droplets (**ld**), overlays lipid loaded monocyte-derived macrophages (**MDM**) and smooth muscle cells (**SMC**), turned into foam cells. Under a fragmented internal elastic lamina (**iel**) SMC from the media are also converted into foam cells (x 21.600). **b.** A cholesterol monohydrate crystal (**cc**), originating from the extracellular lipid deposits, is aggressing the endothelium, almost penetrating through it (x 12.600).

Keywords: hyperlipemia - atherosclerosis - lipoproteins - thrombosis - platelets - cholesterol crystals

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The Golden Syrian hamsters were successfully used to investigate vascular changes that take place during diet-induced atherogenesis [1, 2]. The hyperlipemic hamster model has several evident advantages: (i) as in humans, the main plasma cholesterol carrier is LDL and the lipoprotein metabolism displays similarities to that in man, (ii) the hamster LDL receptor gene has been isolated and characterized and shows strong similarities to the human gene, (iii) atherosclerotic plaques develop with a clear predilection for lesion-prone areas (aortic arch, aortic valves and coronary arteries).

In general, development of hamster atheroma includes a sequence of events generated by hyperlipemia and leading to fatty streak and fibro-fatty plaque formation (Fig. 1a). Ultrastructurally, these were identified as: endothelial cells (EC) activation, lipid accumulation in the intima, EC-monocyte interaction, monocytes migration into the intima and their activation as monocyte-derived macrophages (MDM), that take up lipids to become foam cells (Fig. 1a). Sometimes, excess free cholesterol generates cholesterol crystals formation, producing a cytotoxic attack on EC (Fig. 1b). Following, smooth muscle cells (SMC) migrate from the media, proliferate in the intima and become foam cells. The final stage consists of necrotic lipid rich core, calcium deposition, neovascularization, mural thrombi and occlusive acute thrombosis (Fig. 2a, b).

The hyperlipemic hamster has been used for the evaluation of numerous pharmacologic agents with various mechanisms of action [3, 4, 5, 6, 7], proving that hamster is a useful model for assessing the effects of many anti-atherosclerotic drugs.

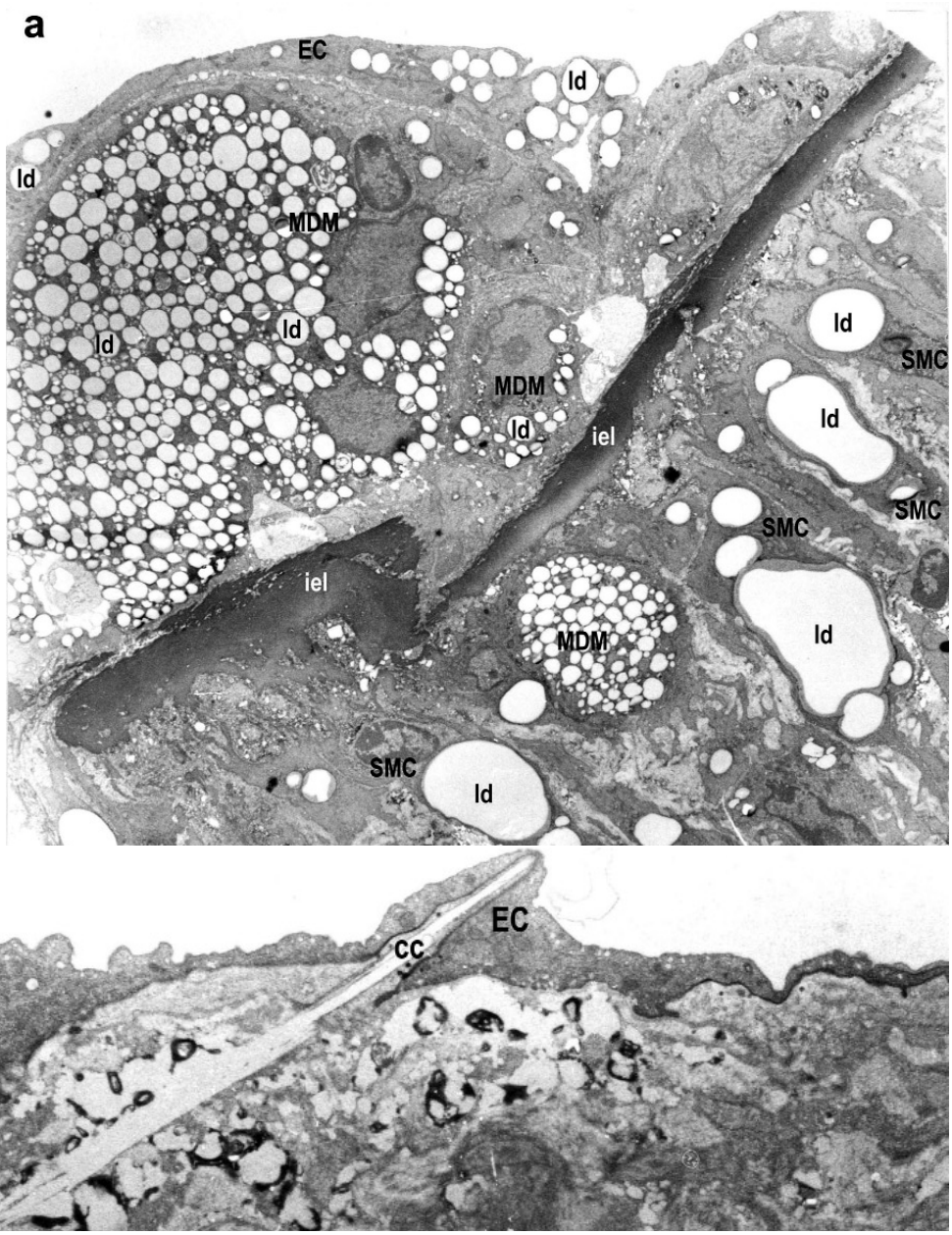

Fig. 2 Coronary artery intima of a hyperlipemic hamster. **a.** A group of aggregated platelets is adherent to the endothelium (**EC**), overlaying a necrotic area, comprising calcium deposits (**Ca**) (x 14.400). **b.** At the base of the atherosclerotic plaque, numerous cholesterol monohydrate crystals (**cc**), are penetrating through the fragmented internal elastic lamina (**iel**), next to a SMC converted into foam cell (x 8.800).

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