Cigarette Mainstream Smoke Exposure Increases Plaque Size in the Brachiocephalic Artery in Apolipoprotein E-Deficient Mice on Chow and Milk-Fat-Enriched Diets

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Introduction
Atherosclerosis is the pathologic condition for most of the coronary and arterial vascular diseases. Epidemiologic studies have demonstrated dose-response associations between smoking and the presence and progression of subclinical and clinical atherosclerosis.

The apolipoprotein E-deficient (ApoE-/-) mouse is an established model of atherosclerotic lesion development. In particular, the brachiocephalic artery, which is the first branch from the ascending aorta, is a site of predilection for the development of atherosclerotic plaques (1).

Methods
Male ApoE-/- mice (20 per group) were whole-body-exposed for 12 months (6 h/d, 5 d/week) to mainstream cigarette smoke (200 µg TPM/l) or to normal chow. The mice were fed one of two different diets (see Table 1) differing in cholesterol content: (i) chow (0.2% cholesterol), and (ii) milk-fat-enriched diet (1.5% cholesterol).

Cholesterol was measured in the plasma and aortic arches of halothane-anesthetized mice. The cholesterol levels were determined by high performance liquid chromatography (HPLC).

For statistical analysis, one-way ANOVA and linear regression were performed. Data are presented as means ± SE. Asterisks represent statistical significance (*: p <0.05; **: p <0.01; ***: p <0.001).

Objective
Investigate the chronic influence of cigarette mainstream smoke (CMS) on the development of atherosclerotic plaques on plaques size in the brachiocephalic artery in ApoE-/- mice.

Results

Body Weight Development

- Body weight was up to 10% lower in the normal chow diet group (200 µg TPM/l vs sham) over the 12-month time course (p <0.05).

Absolute Plaque Size in the Brachiocephalic Artery

- Smoke exposure significantly increased plaque size in the normal chow diet group (200 µg TPM/l vs sham) over the 12-month time course (p <0.001).
- Smoke exposure significantly increased the fraction area of plaque size in the normal chow diet group (200 µg TPM/l vs sham) over the 12-month time course (p <0.05).

Plaque Size in the Aorta

- Aortic plaque content was significantly higher in milk-fat-enriched diet groups compared to normal chow diet groups (p <0.01).

Conclusion
The data presented here suggest that atherosclerosis as measured in the brachiocephalic artery is significantly increased by exposure to 200 µg TPM/l cigarette mainstream smoke in ApoE-/- mice on chow and milk-fat-enriched diets.

Acknowledgements
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References

Figure 1: Image of the Aortic Tree of an ApoE-/- Mouse

Figure 2: Opened Aortic Arch with Atherosclerotic Plaques (3 months)

Figure 3: Representative Images of Resin-Fuchsin-Glained Cross Sections of the Brachiocephalic Artery Showing Atherosclerotic Plaques

Figure 4: Body Weight Development of ApoE-/- Mice

Figure 5: Amount of Cholesterol in the Aortic Arch of ApoE-/- Mice

Figure 6: Absolute Plaque Size in the Brachiocephalic Artery

Figure 7: Fraction Area of Plaque Size as a Percentage of the Brachiocephalic Artery

Figure 8: Amount of Plaques in the Aortic Arch of ApoE-/- Mice

Figure 9: Percentage of Atherosclerotic Plaques in the Aortic Arch of ApoE-/- Mice

Figure 10: Absolute Plaque Size in the Brachiocephalic Artery

Figure 11: Relative Plaque Size in the Brachiocephalic Artery