IN THE NEWS

Risky business

Sun bathing could be an even more dangerous hobby than has previously been thought, as new research indicates that sunscreen lotions might not effectively protect against skin cancer.

Professor Roy Sanders and colleagues — from the research charity Raft, based at the Mount Vernon hospital in London, UK — exposed skin that was removed from consenting patients to ultraviolet A (UVA) light at levels similar to those found in sunlight. They then compared the effects of applying three different brands of high-factor sunscreen lotion. Although the sunscreen prevented the skin from burning — attributed to another component of sunlight, UVB — the UVA could still penetrate the skin, leading to release of free radicals, which can cause DNA damage and lead to the formation of malignant melanoma.

Roy Sanders said that "This is a problem because if people are using these creams on the supposition that they do offer protection then they might be putting themselves at higher risk of skin cancer" (*BBC News Online*, 29 September 2003). The sun protection factor (SPF) of sun lotion refers only to protection from UVB, so using sunscreen might actually be harmful, as it encourages people to stay in the sun for longer.

The sunscreen manufacturers Boots have fought back though, as they claim that their products are important for sun protection, as "staying out of the sunshine completely is not an option most people care for" (*The Independent*, 29 September 2003).

Emma Greenwood

CARCINOGENESIS

Inhaling can seriously damage your health

Despite evidence that it is responsible for ~3,000 deaths per year in the United States alone, there is still some debate about just how harmful passive smoking really is. This is due, in part, to a gap in our knowledge about the mechanisms by which the inhalation of environmental tobacco smoke (ETS) might cause cancer. A study by John Cooke and colleagues now indicates that ETS promotes tumour growth and angiogenesis, strengthening the link between passive smoking and cancer.

Cooke and co-workers exposed mice that had been injected with lung tumour cells to ETS and studied the effects of this on tumour growth and angiogenesis. They saw an increase in tumour growth in these mice that was five times greater than that in unexposed animals. The exposed mice also showed an increase in tumour blood-vessel density that was double that seen in control mice, indicating that components of ETS promote angiogenesis.

Nicotine is one of the main components of ETS and, although it is only a weak carcinogen, there is evidence that it can promote tumour development through indirect mechanisms. It has recently been shown that nicotine can induce angiogenesis by activating nicotinic acetylcholine receptors (nAchRs) on the surface of endothelial cells, which stimulates their proliferation and the subsequent formation of blood vessels. To test whether increases in tumour size and angiogenesis in mice exposed to ETS were due to the effects of nicotine, Cooke and colleagues tested whether this effect could be blocked by mecamylamine, an inhibitor of nAchRs. When exposed mice were treated with this drug, the formation of new blood vessels was almost completely abolished, indicating that nicotine has a key role in the induction of angiogenesis by ETS.

The authors also investigated the effect of ETS on the levels of two other angiogenesis promoters, monocyte chemoattractant protein 1 (Mcp1) and vascular endothelial growth factor (Vegf). Increased levels of both of these proteins were found in serum from exposed mice. Mecamylamine blocked the increase in Vegf levels by approximately two-thirds, indicating that nicotine induces angiogenesis through Vegf signalling as well as by having a direct effect on endothelial cells. However, mecamylamine had little effect on Mcp1 levels, indicating that other compounds that are present in ETS in addition to nicotine can stimulate angiogenesis.

Statins — which are best known for their use in treating high cholesterol levels — are potential angiogenesis inhibitors as they inhibit the secretion of Mcp1 and interfere with signalling downstream of the Vegf receptor. Cooke and colleagues tested the effect of one of these molecules, cerivastatin, on tumour development in mice that were exposed to ETS.

Cerivastatin substantially blocked the increases in both tumour size and angiogenesis in these mice, indicating a possible method of counteracting the harmful effects of inhaling this type of smoke.

Interestingly, the effects of ETS described here indicate a role for nicotine in promoting the growth of existing tumours rather than in initiating tumour formation. This indicates that it acts in concert with other more strongly carcinogenic ETS components to exert its harmful effects. The authors estimate that the levels of nicotine and other toxic chemicals that are present in the ETS used in these experiments were similar to those that are encountered by people in smoky environments such as bars and casinos. This study therefore provides compelling evidence that passive smoking can stimulate tumour growth and that it does indeed pose a serious threat to human health.

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References and links

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FURTHER READING Hecht, S. S. Tobacco carcinogens, their biomarkers and tobacco-induced cancer. *Nature Rev. Cancer* **4**, 733–744 (2003)
WEB SITE
John Cooke's lab:
http://cardiology.stanford.edu/VascularMedicine/endothelial_biology.htm