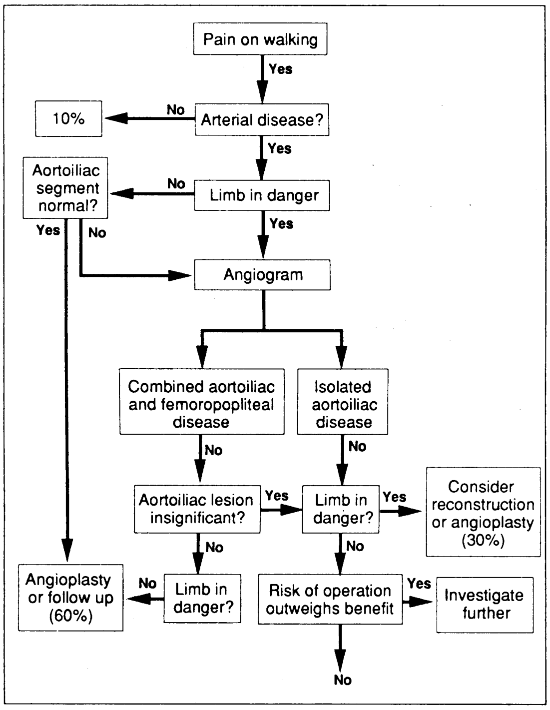

Initial management of patients with suspected arterial disease with decisions based on history, clinical examination, and information from non-invasive tests.

Further support for this comes from the Cleveland Clinic, where in a series of 1000 consecutive patients the presence of occult coronary disease was detected by routine coronary angiography in a large proportion of patients. The five year survival of patients with peripheral arterial disease and cardiac disease was 43% in the presence of severe three vessel coronary disease and 85% in the absence of such disease. Of those patients who had their severe coronary vessel disease corrected, however, 72% survived. Because of these figures a mortality of 20-40% at three years in patients with peripheral arterial disease is no longer acceptable. Referral of a patient for peripheral vascular reconstructive surgery provides an ideal opportunity for the diagnosis of associated coronary artery disease; such an opportunity may never occur again in his or her lifetime."

The questions posed by the physician and the clinical decisions that are based on the answers can be summarised by an algorithm. In my experience 10% of patients who attend because of pain on walking do not have arterial disease. I also find that 60% of the patients have mild claudication with superficial femoral occlusion and a normal iliac segment. These are treated conservatively. Thus 70% of patients are spared any further investigation and only 30% require an arteriogram.

Conclusion

Non-invasive tests permit:

- Confident exclusion of arterial disease
- Assessment of the affected segment
- Objective evidence of severity of disease

In summary, non-invasive tests are valuable adjuncts to the history and clinical examination. They permit confident exclusion of arterial disease, assessment of the affected segment, and objective evidence of the severity of disease. Finally, objective measurements of the progression of the disease and the follow up of reconstructions can be monitored.

The diagrams of blood velocity wave forms and systolic pressures are reproduced by kind permission of Churchill Livingstone. We acknowledge with thanks the assistance of the audiovisual department, St Mary's Hospital, London, in the preparation of the illustrations.

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Health and the Environment

Dangers of ozone depletion

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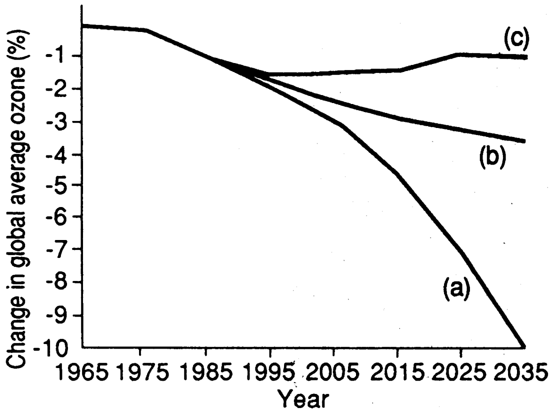
Atmospheric ozone absorbs ultraviolet light from the sun, especially in the ultraviolet range (290-320 nm), and protects plants and animals from its damaging effects. Loss of ozone from the earth's outer atmosphere could have dire consequences for human health.

Ozone is present in greatest abundance in the stratosphere (15-50 km above ground level.) In 1985 Joe Farman of the British Antarctic Survey reported considerable losses of ozone over the Antarctic during springtime. This confirmed fears first aired in the early 1970s that chlorofluorocarbons (CFCs), released into the atmosphere from aerosol sprays, light industry, and refrigeration, were destroying stratospheric ozone. Although less severe, depletion of ozone was also reported over the North Pole during the spring of 1989, and there is now evidence of generalised thinning of the ozone layer across the northern hemisphere. In 1988 the Ozone Trends Review Panel estimated a loss of 2-3% since the early 1970s at latitudes 53-64° north.[1]

Steady state concentrations of ozone in the stratosphere depend on the balance of the processes that form it and destroy it. Ozone is formed by the photochemical breakdown of molecules of oxygen. This occurs slowly and with a regeneration half time of three to four years. Chlorofluorocarbons are almost inactive at ground level, which allows them to rise unchanged into the stratosphere. There they generate free radicals which catalyse the photochemical breakdown of ozone. Chlorofluorocarbons have a long half life, persisting in the atmosphere for up to 100 years. Large amounts have been produced only since the second world war, and during the 1980s atmospheric concentrations increased at a rate of about 5% a year.

An estimated 15% of the ozone layer over the Antarctic was destroyed in the winter of 1989-90. Recently the National Aeronautics and Space Administration estimated a 4-5% loss of ozone over the northern hemisphere during the past decade.[2] Levels will continue to fall until well into the next century, possibly by as much as 20%. A 1% reduction in total column ozone is estimated to cause an increase in the amount of biologically effective ultraviolet B reaching the earth's surface of 1·5-2% (figure).[3]



Global average changes in ozone concentrations for three patterns of chlorofluorocarbon use: (a) continuous growth; (b) 50% reduction by 1998; (c) replacement of halogenated chlorofluorocarbons by hydrochlorofluorocarbon 22. From Isaksen[3a]

Ozone depletion and health

The effects of ozone depletion on health are due mainly to the increased action of ultraviolet B on the skin and eyes (box). Sunburn and snow blindness result from acute exposure to intense sunlight. Long term exposure to the sun is associated with skin cancer and cataract formation.

Potential health effects of stratospheric ozone depletion[4]

Direct effects of ultraviolet B

Acute:
- Erythema (sunburn)
- Keratitis (snow blindness)

Chronic:
- Skin cancer
- Cataracts

Indirect effects of ultraviolet B

Decreased immune surveillance:
- Increased susceptibility to cutaneous infection
- Carcinogenesis

The relation between exposure to the sun and skin cancer is well documented. Ultraviolet B falls within the photoabsorption spectrum of DNA and, when not eliminated by ozone in the stratosphere or melanin in the skin, it causes direct damage to DNA.

NON-MELANOCYTIC SKIN CANCER

Both basal cell and squamous cell carcinomas are commoner in fair skinned people and are found on areas exposed to the sun for long periods, particularly the head and neck. Incidences of both increase with age and with proximity to the equator and are higher in people who work outside such as farmers and fishermen.

In the United States there are currently an estimated 400 000 new cases of non-melanocytic skin cancer each year and 6000 deaths.[4] Among white Australians non-melanoyctic skin cancer is more than three times commoner than all other cancers combined. By the age of 75, two thirds of Australians will have been affected.[5] Provided that other factors remain equal, a 10% reduction in total column ozone would result in an extra 160 000 cases of non-melanocytic skin cancer in the United States each year and about 8000 in Britain.[4]

MALIGNANT MELANOMA

Malignant melanoma is far less common than non-melanocytic skin cancer but it affects younger people and has a higher mortality. For this reason it has become an important public health issue.

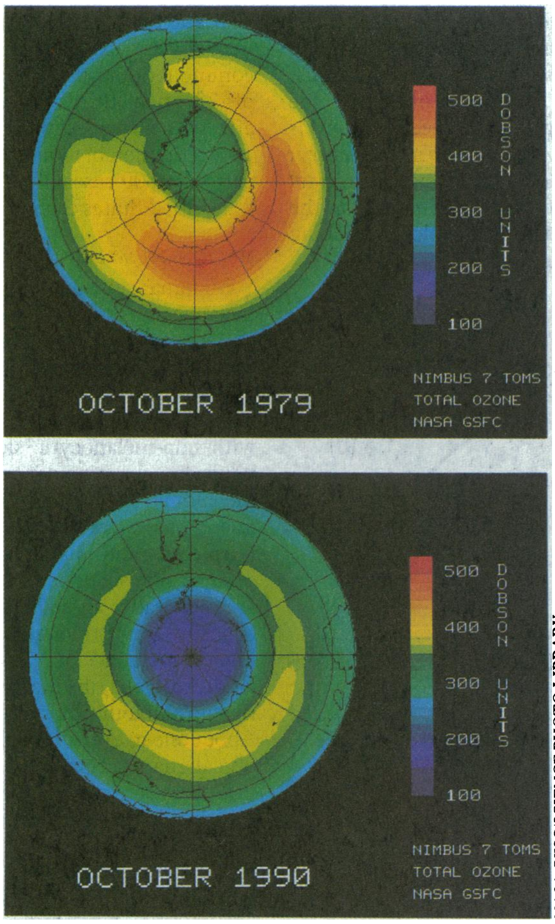
Both genetic and environmental factors are important in the aetiology of malignant melanoma. As with non-melanocytic skin cancers, a relation exists between the incidence of cutaneous malignant melanoma and proximity to the equator. Malignant melanoma is commonest in fair skinned people who burn easily and in people in the higher socioeconomic groups. Short bursts of sunbathing—"flash frying"—are generally agreed to be more dangerous than exposure over prolonged periods. Australians have the highest incidence of malignant melanoma. In Queensland, Australia, the incidence is 10 times higher than in Britain and four times higher than in the United States. About one in every 150 white male Queenslanders dies of malignant melanoma.

Attempts to predict the effect of ozone depletion on the incidence of malignant melanoma are more complicated and less reliable than for non-melanocytic skin cancers, but a 10% loss of ozone could increase mortality by up to 10% and incidence by as much as 20%.[6] Throughout the world the incidence of malignant melanoma is increasing and the age at diagnosis is falling.[7] However, publicity about the high mortality associated with malignant melanoma may persuade people to change their behaviour, resulting in less sunbathing and a fall in package holidays to the Mediterranean.

CATARACTS

The association with exposure to ultraviolet light is less clear for cataracts than for skin cancer. Senile

Australia's "slip slop slap" campaign increased public awareness



NASA GFSC/SCIENCE PHOTO LIBRARY

Satellite maps show worsening depletion of ozone layer over Antarctica between 1979, when the hole was first identified, and 1990

cataracts are extremely common. In the United States they result in more than 600 000 operations each year. They are seen by some as the inevitable consequence of aging, but some evidence suggests that the incidence increases with decreasing latitude. In addition, cataracts can be induced experimentally by exposure to ultraviolet light, especially ultraviolet B and C. The United States Environmental Protection Agency has estimated that a 10% reduction in ozone by 2050 would cause over 600 000 additional cases of senile cataract in the existing population of America and 4·5 million additional cases in people born in the United States over the next 40 years.[8]

IMMUNOSUPPRESSION

The immunosuppressant effect of ultraviolet B irradiation has been shown experimentally in mammals and could play a part in the development of cutaneous infections and skin cancer. Exposure to ultraviolet light may increase susceptibility to leishmaniasis and leprosy, and cold sores due to herpes simplex virus tend to be activated by sunlight.

Immunosuppression may indirectly increase the risk of skin cancer by reducing the body's immune surveillance. It is known that some skin cancers are commoner when the immune system is compromised by disease or drugs. In patients receiving immunosuppressive treatment after organ transplantation the incidence of squamous cell carcinoma may be 40 times higher than in controls.[9]

Urgent need for action

The need for action is urgent. The long residency time of chlorofluorocarbons in the atmosphere means that even if production is stopped completely their destructive effects will continue for many years. Since the Montreal accord in 1987, calling for a 50% cut in production by 1998, further progress has been made towards halting production of chlorofluorocarbons. In June 1990, 93 countries signed a United Nations agreement to stop producing chlorofluorocarbons by the end of the 1990s. Central to this agreement was the establishment of an international fund of $240 million to help countries in the Third World develop alternatives to chlorofluorocarbons.

On an individual level, skin cancer remains a preventable disease. Intensive education and publicity campaigns are needed, such as the successful "slip slop slap" campaign in Australia (slip on a shirt, slop on some sunscreen, and slap on a hat). People should be made aware of the risks of the sun and of ultraviolet tanning beds and should learn to recognise and look out for the early signs of skin cancer.

Conclusion

Ozone in the stratosphere shields us from the sun's damaging rays and is vital to life on earth. Unless its destruction is halted we can expect large increases in skin cancers and cataracts over the next few decades, not to mention widespread ecological changes. Doctors and other health professionals are in a position to influence both individual behaviour and government action, and they should work to avert this human and ecological catastrophe.

I thank Dr Robin Russell Jones for his help with this article.

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