Cedric and Frank Garland\textsuperscript{1} observed that metropolitan states in the south-west of the US had lower mortality rates from colon cancer in 1959–61, on average ~10 per 100,000 per year age-adjusted in white males, than metropolitan states in the north-west, on average ~15 per 100,000. They reported that the rank order coefficient of correlation between colon cancer mortality and solar irradiance across the metropolitan states was ~0.7. It was ~0.6 across non-metropolitan states and the same values were obtained when cancer mortality rates for US counties in 1950–69 were used instead of the whole-of-state values. They noted, from broad regional data, that the probably mainly south to north gradient in colon cancer mortality did not appear to correlate well with patterns of dietary meat, fruit, or vegetable intake but acknowledged that its correlation with solar irradiance might still be due to confounding with some other dietary, behavioural, or, perhaps, genetic factor.

Apperly\textsuperscript{2} had reported an association between mortality from all cancers and solar irradiance across the states of the US 40 years earlier and suggested ‘it may be possible to reduce our cancer deaths by exposing suitable skin areas to sunlight… insufficient to cause skin cancer’. While the Garlands did not acknowledge this work they can be reasonably excused for not having uncovered it.

Unsurprisingly, the Garlands advanced the possibility that photolytic production of vitamin D in the skin might explain the correlation between colorectal cancer mortality and solar irradiance. This is the major source of vitamin D for most human populations. They advanced an argument about anti-inflammatory effects of calcium (the absorption of which is promoted by vitamin D) in the bowel mucosa and evidence of a protective effect of milk against colon cancer in one US study (milk was and is mandatorily fortified with vitamin D in the US) in support of this possibility.

The Garlands and others published papers reporting on correlations in the US between solar irradiance and cancers of the breast,\textsuperscript{3} prostate,\textsuperscript{4} and ovary\textsuperscript{5} over the subsequent decade or so. None of these, or the original paper on colon cancer, initially attracted much attention. Indeed, the International Agency for Research on Cancer’s 1992 monograph on the carcinogenic risk of solar and ultraviolet radiation to humans stated that ‘no adequate data were available to the Working Group’ when referring to all cancers other than skin, lip, and ocular cancers.\textsuperscript{6}

The Garland’s papers on breast and colon cancer were evaluated by the Group, of which I was a member, but considered to be of little evidentiary value because they were geographical correlation studies.

The Garlands, however, successfully pursued their hypothesis that a protective effect of vitamin D might underlie the inverse association they observed between colon cancer mortality and solar irradiance and stimulated the conduct of analyses of the associations between colon cancer mortality and, respectively, dietary vitamin D intake and plasma vitamin D in subjects in the Western Electric Health Study and the Washington County, Maryland, cohort study. Both analyses suggested that vitamin D was strongly protective against colon cancer.\textsuperscript{7,8} A recent review has assessed the evidence for a protective effect of vitamin D per se against cancer as substantial for colorectal cancer, inconsistent for prostate cancer, and ‘too sparse to support a conclusion’ for breast cancer.\textsuperscript{9} Thus for colorectal cancer at least, the Garland’s work initiated a valuable research direction, although not yet exploited for cancer prevention.

That sun exposure, whether mediated by vitamin D or not, might have protective effects against cancer was not explored further, except by way of additional, broad geographical correlation analyses, until the papers of Luscombe et al.\textsuperscript{10} in 2001 and Freedman et al.\textsuperscript{11} in 2002. The former observed a strong inverse association between recalled personal sun exposure and risk of prostate cancer, which has since been confirmed by a second, essentially identical study by the same investigators.\textsuperscript{12} The latter found inverse associations of occupational sun exposure, evaluated from job title, with colon and breast cancers but not with prostate or ovarian cancers.

Subsequently, and unexpectedly (because the opposite was hypothesized) an apparently strong protective effect of sun exposure has been observed against non-Hodgkin lymphoma,\textsuperscript{13} and since confirmed,\textsuperscript{14} and sun exposure has been reported to improve survival after a diagnosis of cutaneous melanoma, independently of efforts at earlier diagnosis.\textsuperscript{15} What an irony! Variation in survival with season of diagnosis has also been reported for cancers of the breast, colon, and prostate, cutaneous melanoma and Hodgkin lymphoma.\textsuperscript{16–18}

The worms are at last wriggling out of the can that the Garlands opened 25 years ago.

\textbf{References}


6 International Agency for Research on Cancer. Solar and Ultraviolet Radiation. IARC Monographs on the Evaluation of Carcinogenic Risks to


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