Sunscren use and the risk for melanoma: a quantitative review
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CRD summary
This meta-analysis of 18 case-control studies found no link between sunscreen use and an increased risk of melanoma. The authors used an appropriate methodology, but did not explore how assumptions about missing data might have affected the results. The findings should be interpreted with caution because the included studies were of low quality, used older sunscreen reparations, and had inadequate measures of sunscreen use.

Authors' objectives
To assess the evidence of any association between sunscreen use and an increased risk of melanoma in humans.

Searching
The authors searched MEDLINE (from 1966 to April 2003) and Cancerlit, personal files, and the reference lists of identified articles for published studies; the search terms were reported. There were no language restrictions.

Study selection
Study designs of evaluations included in the review
Cohort, case-control, and cross-sectional studies were eligible for inclusion. The studies included in the review were all case-control studies. Case reports and commentaries were excluded.

Specific interventions included in the review
Studies were eligible for inclusion if they assessed sunscreen use. Studies that focused on tanning enhancements or sun oils were excluded.

Participants included in the review
Adults and children who had been tested for melanoma were eligible for inclusion. The authors assumed that the diagnosis of melanoma was based on histologic examination. The authors reported details of the age range of the participants in each of the included studies.

Outcomes assessed in the review
Studies that reported sunscreen use in relation to melanoma were included. The main outcome appeared to be the diagnosis of melanoma. Studies were included if they reported odds ratios (ORs), or the proportion of cases and controls who used sunscreen.

How were decisions on the relevance of primary studies made?
Two people screened titles and abstracts to exclude studies that did not meet the inclusion criteria. If relevance was unclear, two authors who were blind to publication details and the 'Introduction' and 'Discussion' sections of the articles independently assessed the studies. Studies of tanning lotion or enhancements (rather than sunscreen) were assessed independently. Six non-English language studies were reviewed by a multilingual person.

Assessment of study quality
The authors calculated a quality assessment score by rating use of an adequate control group, questionnaire standardisation and pre-testing, blinding and potential confounding factors (e.g. sun exposure, sensitivity, age, gender and frequency of sunscreen use). Two independent, blinded reviewers used a scale to create an overall quality score for each study.

Data extraction
Two authors, blind to publication details and the 'Introduction' and 'Discussion' sections of each article, abstracted data independently. Inconsistencies were resolved by review and consensus. A third party was used to resolve disagreements if necessary. ORs adjusted for as many potential confounders as possible were extracted. The authors extracted data about sunscreen use, where available, stratified by the participant's sun sensitivity.

Methods of synthesis

How were the studies combined?

For each study and level of sunscreen use, the authors calculated the natural log of the OR and its variance based on reported confidence intervals (CIs) or other data. The authors imputed an OR of 1.0 for studies reporting no association between sunscreen and melanoma that did not report an OR. Random-effects and fixed-effect models were used to obtain pooled OR estimates.

How were differences between studies investigated?

The authors stratified findings according to the level of sunscreen use and sun sensitivity. They examined subgroups of studies that reported adjustments for sensitivity, sunburn and other sun exposure, and conducted statistical tests of heterogeneity. Further differences between the studies were examined using linear regression models.

Results of the review

The meta-analysis included 18 case-control studies with more than 13,309 participants. The total number of participants was unclear because one study did not report this information.

The authors reported the inter-rater reliability and study quality scores. The quality scores ranged from 1 to 15 out of a possible 19.

There was no significant association between people who had ‘ever used’ sunscreen and melanoma (pooled OR based on 18 studies 1.0, 95% CI: 0.8, 1.2), but there was statistically significant heterogeneity between the studies (P<0.001). Excluding studies that did not adjust for sun sensitivity gave an OR of 0.8 (9 studies; 95% CI: 0.6, 1.0).

An analysis of dose-response relationships found that there was no difference in melanoma according to whether people had ‘never or rarely’ used sunscreen, ‘sometimes’ used sunscreen, or ‘almost always’ used sunscreen (OR based on 12 studies 1.1, P=0.09). There was statistically significant heterogeneity between these studies.

Authors’ conclusions

There was little evidence of an association between sunscreen use and melanoma.

CRD commentary

The authors clearly outlined their research question in terms of the interventions, participants, outcomes and study designs. They searched two databases to identify potentially relevant studies, but made no attempt to locate unpublished material. This meant that some relevant studies might have been excluded. The review methods were described in some detail, and efforts were made to minimise bias and errors in the study selection, data extraction and quality assessment processes. The criteria used to rate the validity of the included studies also appeared appropriate. However, the authors did not use the quality scores to judge whether studies should be included in the analysis, or to weight their findings. All of the included studies were case-control studies, which may have limited predictive value.

The authors reported a number of details about each study included in the review, but the average period between sunscreen use and melanoma testing was unclear. The authors reported the dates when the data were collected for each study, but not the length of follow-up and sunscreen use examined. This made it difficult to draw conclusions about the existence or strength of any associations between sunscreen use and melanoma.

The methods used to assess statistical heterogeneity and to control for confounding factors appeared appropriate. However, there were some potential difficulties with the method of analysis. For example, the authors assumed an OR of 1.0 for ‘neutral’ studies where no OR was reported. It was unclear how these assumptions might have impacted on the
findings.

The authors acknowledged that measures of sunscreen use may be of questionable value. Overall, their conclusions appear to be supported by the data presented, but it should be noted that they were based on the results of case-control studies which might have been subject to a number of biases.

**Implications of the review for practice and research**

Practice: The authors stated that studies to date did not provide evidence of an increased risk of melanoma with sunscreen use. As most of the included studies were conducted before newer sunscreen preparations were available, it may be some time before there is any evidence of a potential protective effect of regular sunscreen use.

Research: The authors stated that further research into the effects of prolonged sun exposure due to sunscreen use is needed. They suggested that future studies should contain detailed measurement of sunscreen use and confounding factors.

**Funding**

U.S. National Cancer Institute, grant number 1R03CA88834-01.

**Bibliographic details**


**PubMedID**

14678916

**Original Paper URL**

http://www.annals.org/cgi/content/full/139/12/966

**Indexing Status**

Subject indexing assigned by NLM

**MeSH**

Confounding Factors (Epidemiology); Dose-Response Relationship, Drug; Humans; Melanoma /chemically induced /prevention & control; Odds Ratio; Research Design /standards; Risk Factors; Skin Neoplasms /chemically induced /prevention & control; Sunscreening Agents /administration & dosage /adverse effects

**AccessionNumber**

12004008070

**Date bibliographic record published**

31/08/2005

**Date abstract record published**

31/08/2005

**Record Status**

This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.