

COMMITTEE ON THE MEDICAL EFFECTS OF AIR POLLUTANTS

**OZONE – EFFECTS ON RESPIRATORY SYMPTOMS IN PANEL STUDIES
– SUMMARY**

1. As paper COMEAP/2003/9a covers a lot of different pieces of evidence on respiratory symptoms, the Committee may find it helpful to have a short summary.

Associations with health outcomes

2. The paper concludes the following about the associations of ozone with respiratory symptoms:

- (i) Ozone does not appear to be associated with upper respiratory symptoms, respiratory infections, wheeze or medication use although, for the latter 3 outcomes, there may be too few studies for this to be conclusive,
- (ii) Ozone does appear to be associated with lower respiratory symptoms and breathing problems in asthmatics and, possibly, in non-asthmatics undergoing vigorous exercise,
- (iii) Ozone appears to be associated with cough only in asthmatics exposed to high concentrations.

3. These conclusions depend upon the following:

- (i) Amalgamating qualitative results from studies with different averaging times, with panels of either adults or children and from all over the world.
- (ii) Including single pollutant models as well as looking at a sub-set of multi-pollutant models
- (iii) Assuming the studies are capable of detecting an association if there is one although some are small and many do not distinguish respiratory symptoms due to respiratory infections from other respiratory symptoms.
- (iv) A strict cut off for statistical significance at $p < 0.05$.

4. The Committee is asked to comment on the approach taken and on the conclusions derived from this approach.

5. In general, quantitative meta-analysis has not been performed due to insufficient numbers of studies with the same outcome, subjects and averaging times. The Committee is asked whether it wishes to see meta-analyses of studies using 1 hour average ozone in which studies anywhere in the world and with either adults or children were included but studies of asthmatics and non-asthmatics were separated.

Thresholds

6. The paper concludes that, in non-asthmatics who are not vigorously exercising, an association with lower respiratory symptoms is only found above 120 ppb 1 hour average, possibly well above.
7. This conclusion depends upon:
 - (i) dismissing the linear response with cough found by Schwartz *et al* (1994) in a plot including control for particles on the basis that a) the association was not statistically significant in a multi-pollutant model b) other studies of cough at lower ozone concentrations did not show associations. (Schwartz *et al* argued that the lack of statistical significance was due to loss of statistical power rather than true confounding.)
 - (ii) regarding the association in vigorously exercising adults (Brunekreef *et al* 1994) as real although no multi-pollutant model was performed.
 - (iii) the absence of evidence from studies with maximum ozone concentrations between those found in Europe and those found in California/Mexico city such that it is unknown whether associations would be found just above 120 ppb 1 hour average or only well above.
8. The paper also concludes that it is prudent to assume that associations with lower respiratory symptoms may extend below 40 ppb 8 hour average in asthmatics, particularly those not on anti-inflammatory medication.
9. This conclusion depends, at least in part, upon:
 - (i) the linear response for chest symptoms found by Thurston *et al* (1997) without control for temperature or sulphate being robust since the association was significant after control for sulphate and the sulphate association was heavily influenced by just one high sulphate day.
 - (ii) The ozone concentrations in Desqueyroux *et al* (2002) (maximum 43 ppb 8 hour average) being urban background rather than roadside measurements (which might suggest ozone levels were low only on a very localised basis).
 - (iii) Accepting the results of Delfino *et al* (1998) which found significant results below 80 ppb in a sub-group of less symptomatic asthmatics not on anti-inflammatory medication
 - (iv) The analytical method used by Higgins *et al* (1995) (who found an association with broncho-dilator use below 27 ppb 24 hour average) being satisfactory.
10. The Committee is asked if it agrees with the conclusions in paragraphs 6 and 8 above.

Personal exposure

11. Two studies (Delfino *et al* 1996, 1997) which examined associations with personal exposure are described. One found an association and the other did not. The Committee may wish to comment on these studies and the method used to assess personal exposure.

Coherence

12. The Committee may wish to comment on the coherence of these findings with findings on other health outcomes i.e.

- (i) A clear but small effect on lung function in both asthmatics and non-asthmatics,
- (ii) Only weak evidence for an association of ozone with asthma admissions,
- (iii) Better evidence for an association of ozone with respiratory hospital admissions and COPD admissions.

**Secretariat
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