

## Vitamin C and the Common Cold

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### Summary

A double-blind trial of the prophylactic effect of a large dose of vitamin C in upper respiratory tract infection in 2 groups of adult volunteers was carried out during a period of 3 months in 1973. No differences in the incidence of infection in vitamin C and control groups were detected.

### Introduction

In the view of many, including the present authors, the effect of vitamin C as a prophylactic agent in upper respiratory infections has not been satisfactorily demonstrated in clinical trials. The subject has been reviewed over the years by many authors, notably Pauling (1970), who published a popular book based on selected trial results and his own experience with 'mega-dose therapy'. There is no consensus, however, and it is fair to say that the case for vitamin C is 'not proven' (Editorial, *British Medical Journal*, 1973). The controversy is likely to continue. The present situation has been succinctly stated by Tyrrell (1974). Anderson and his colleagues (1972) showed that a regular daily dose of 1g vitamin C (as four 250-mg divided doses) had no effect on the incidence or severity of upper respiratory tract signs and symptoms, although his subjects in the vitamin C group had illnesses which were less severe and therefore caused less time off work and less time confined to bed.

Against this background we decided to investigate the effect of 1 g vitamin C daily (either as a single dose or 500 mg b.d.) on the incidence of upper respiratory tract infection in a group of healthy working adults. The results have already been briefly reported (Carson et al., 1974).

### Method

The trial was carried out in two centres, Southampton and High Wycombe. At each, one firm with one part-time medical officer took part but the trials were run concurrently. The number of volunteers who took part was rather smaller than expected and although one group took 1 tablet daily and the other the same amount as 2 tablets, in all other respects the groups were comparable and have been combined for assessment of results. The method of recruitment differed in the 2 centres but approximately 150 volunteers entered the trial at both. On entry, all subjects had to complete a card by giving not only their names and occupations but also their relevant medical history, average number of colds experienced in winter, smoking habits and some information on diet. They were then given sufficient tablets or matching lactose dummies for the 80-day period of trial according to a random sequence code. At Southampton subjects were given Redoxon effervescent tablets (1 g sodium ascorbate) or placebo and were instructed to take one tablet in water daily. At High Wycombe subjects were given Redoxon tablets (0.5 g sodium ascorbate) or placebo and instructed to take one twice daily.

### Record Cards

In addition to the introductory card completed at the outset, monthly calendar cards were provided on which subjects had to tick a space daily if symptom-free or indicate any of 7 cardinal symptoms. The back of the card was to be used for recording any symptoms not listed and stating if at any time

medical advice had been sought. The symptom list was: running nose, sneezing, headache, sore throat, cough, fever, 'confined to bed'.

At both centres sufficient tablets and cards for the whole period were issued to each subject on the day he or she attended the works surgery to enter the trial. To judge by the drop-out rate, at least in Southampton, this was unwise. The alternative method of issuing sufficient tablets and cards for, say, 2 or 4 weeks at a time might have lessened the drop-out rate.

### Results

With comparatively small numbers at each centre results were considered together and comparisons between centres made where appropriate.

One hundred and forty-seven subjects entered at High Wycombe (74 vitamin C; 73 dummy) and 148 at Southampton (79 vitamin C; 69 dummy). The proportion of males and females was very different at each centre – High Wycombe 110 : 37 and Southampton 73 : 75. In analysing results, however, males and females were considered together.

### Drop-outs

Any subject failing to take tablets or keep records for a *minimum* of 40 days was considered a drop-out and excluded from statistical analysis. The proportion of drop-outs in Southampton (24 per cent of those who started) was significantly higher ( $P < 0.01$ ) than at High Wycombe (11 per cent of those who started). However, the relative proportions of drop-outs in the vitamin C and placebo groups did not differ (*Table I*).

### Smoking

Both at Southampton and High Wycombe about 40 per cent of those completing at least 40 days of the trial were smokers. They were evenly divided between the vitamin C and placebo groups and had about the same incidence of colds as the non-smokers.

### Definition of Colds

Colds were defined in four different ways bases on symptomatology and each definition was then considered according to its length as follows:

**Definition 1** An episode which *started* with the 'nose' symptoms of running nose or sneezing.

**Definition 2** An episode which *started* with nose symptoms or with a sore throat.

**Definition 3** An episode which *included* nose symptoms.

**Definition 4** An episode which *included* nose or throat symptoms.

**Definitions 5–8** Episodes defined as above but with a *minimum length of 4 days*.

The total number of symptom-free days experienced by each group was counted. Averages are shown

*Table I.* Proportion of drop-outs in both groups

	<i>Dropped out</i>	<i>Completed at least 40 days</i>	<i>Total</i>	<i>Grand totals</i>
<b>Southampton</b>				
Active	23	56	79	148
Placebo	12	57	69	
<b>High Wycombe</b>				
Active	9	65	74	147
Placebo	7	66	73	
<b>Totals</b>				
Active	32	121	153	295
Placebo	19	123	142	

in *Table II* (column *W*). Similarly the number of days on which each of the 5 chief symptoms was recorded (as above plus cough and headache) were totalled and averaged for each group (columns *R-C*). The differences between groups were very small.

### Average Colds

As part of the introductory information, the subjects were asked to note their usual experience of colds per winter. This averaged out at 1.8 overall. During the study period of 80 days, 386 colds (Definition 4, *Table III*) were actually experienced giving an overall average rate of 1.6. In view of the shorter length of the study period this suggests that the estimate of the number of colds usually experienced was accurate and that the usual number of colds were experienced during the study period. There is no evidence that treatment with vitamin C affected the number of colds experienced.

The number of missing days was also examined. These were the days on which no record was kept by a subject who had given in records of between

Table II. Average number of days symptom reported

	<i>No. in group</i>	<i>W</i>	<i>R</i>	<i>S</i>	<i>T</i>	<i>H</i>	<i>C</i>
<b>Southampton</b>							
Active	56	65.52	3.46	3.96	2.66	2.41	2.11
Placebo	57	68.74	2.19	3.67	1.82	2.77	1.91
<b>High Wycombe</b>							
Active	65	67.75	3.54	3.18	1.68	1.31	2.52
Placebo	66	67.14	4.61	2.23	1.39	1.26	2.00

*W* = Well; *R* = Running Nose; *S* = Sneezing; *T* = Sore throat; *H* = Headache; *C* = Cough.

Table III. Episodes of 'cold', Definition 4

	<i>No. in group</i>	<i>No. of episodes</i>	<i>Average per subject in group</i>	<i>No. of subjects experiencing 'cold'</i>	<i>Average per subject experiencing colds</i>
<b>Southampton</b>					
Active	56	85	1.52	38	2.24
Placebo	57	84	1.47	38	2.21
<b>High Wycombe</b>					
Active	65	121	1.86	47	2.57
Placebo	66	96	1.45	46	2.09

40 and 80 days. The Southampton vitamin C group and both groups at High Wycombe each included 9 or 10 subjects with an average of just over 15 missing days. The Southampton placebo group had 7 subjects with an average of just over 7 missing days. This is just significantly different from the others ( $t = 2.40$ ,  $P < 0.05$ ).

The number of episodes of Definition 4 colds is shown (Table III) together with the average incidence of episodes in the whole group and the number of subjects in each group who experienced at least one episode. The differences are remarkably small and are all non-significant.

### Discussion

These two trials, considered here as one, are open to criticism in at least 3 respects.

First, the number of subjects who actually completed a minimum of 40 days' treatment was small for this type of investigation. Secondly, we cannot say for certain what proportion of subjects in either group actually took all the tablets handed out. No check was made on returned packs and none on random urine samples for vitamin C concentration. The subjects were volunteers and we

have assumed that they were well motivated as a group. The assumption that tablet taking was conscientious is therefore not unreasonable. Thirdly, no extra vitamin C was taken during an episode of infection. That was a deliberate decision. We were interested solely in the possibility of there being an effect on incidence, not on symptomatology generally nor severity of symptoms in particular. Subjective assessment of severity is unreliable; one man's 'throat tickle' is another man's 'rasping pharyngitis'. Anderson's first trial combined prophylactic and therapeutic vitamin C (Anderson et al., 1972). This not only complicates the day-to-day management but renders statistical analysis more complex. The Canadian workers in fact separated prophylactic and therapeutic groups in their second trial (Anderson et al., 1974).

Severity of symptoms and time off work were not recorded. The Canadian trial (Anderson et al., 1972) did show a statistically significant difference in favour of vitamin C in the number of days off work (not necessarily because the subjects had colds) but the second Canadian trial (Anderson et al., 1974) has not in fact confirmed those findings.

### Conclusions

In spite of the shortcomings mentioned above, the results of this trial do not bear out the conclusions of others (Ritzel, 1961; Wilson and Loh, 1973; Coulehan et al., 1974) that a large dose of vitamin C taken daily by a group of healthy people is likely to reduce the incidence of upper respiratory infections, including the common cold.

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### REFERENCES

Anderson T. W., Reid D. B. W. and Beaton G. H. (1972)

- Vitamin C and the common cold: a double-blind trial. *Canadian Medical Association Journal* **107**, 503.
- Anderson T. W., Suranyi G. and Beaton G. H. (1974) The effect on winter illness of large doses of vitamin C. *Canadian Medical Association Journal* **111**, 31.
- Carson M., Corbett M., Cox H. and Pollitt N. (1974) Vitamin C and the common cold. *British Medical Journal* **1**, 577.
- Coulehan J. L., Reisinger K. S., Rogers K. D. and Bradley D. W. (1974) Vitamin C prophylaxis in a boarding school. *New England Journal of Medicine* **290**, 6.
- Editorial (1973) Ascorbic acid and common cold. *British Medical Journal* **3**, 311.
- Pauling L. (1970) *Vitamin C and the Common Cold*. San Francisco, W. H. Freeman.
- Ritzel G. (1961) Ascorbic acid and infections of the respiratory tract. *Helvetica Medica Acta* **28**, 63.
- Tyrrell D. A. J. (1974) Vitamin C and the common cold. *Prescribers' Journal* **14**, 21.
- Wilson C. W. M. and Loh H. S. (1973) Common cold and vitamin C. *Lancet* **1**, 638.

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