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Vitamin C and the Common Cold

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One of the more comprehensive studies on vitamin C's effect on colds was conducted by Hemila. This review study included all "placebo controlled studies published since 1971 (18 total studies) in which at least 1g/day of vitamin C had been regularly given to the study subjects."<sup>1</sup> The strength of this review is that it only includes high dose studies (> 1.0g/day). At these higher doses, studies should be able to detect the true effects of vitamin C since there is evidence that higher doses give better results.<sup>1</sup>

The conclusion of the review was that the previous studies, overall, showed no marked effect of vitamin C on incidence of colds. There were 4 studies in the review that did not go along with this conclusion, but these studies had some flaws. Two of these studies contained fewer than 25 patients<sup>2,3</sup>, one was "poorly described and not published in a regular forum<sup>4</sup>, and the fourth was the only non-double-blind study of the entire group.<sup>5</sup> Another important discovery is that some studies actually found slight increases in incidence of colds. This further suggest that there is not a statistically significant connection between incidence of colds and vitamin C.<sup>6</sup> Therefore, there seems to be little evidence to support regularly ingesting vitamin C for the purpose of preventing colds.

Vitamin C, however, was shown in the studies to decrease "the duration or the severity of symptoms of common colds."<sup>1</sup> Statistical analysis revealed "the probability that, purely by chance, one of the vitamin groups would find a decrease in morbidity (defined as severity of symptoms) is extremely small ( $p=.0000005$ ).<sup>1</sup> Furthermore, there was a dose dependent relationship; subjects that used 1g/day had a mean decreases in severity of symptoms of 19% and subjects that used 2-4g/day had a mean decreases in severity of 29%. Systemic bias can be ruled out in the studies since all the individual studies included in the review, except one, were double blind.

### Biochemical Model

The protective effects of vitamin C have been attributed to its ability to provide protection against oxidizing agents that are produced by neutrophilic leucocyte cells.<sup>8</sup> These cells protect the body by engulfing viruses and bacteria (phagocytosis), fusing the ingested particle with an intracellular vesicle, and digesting them using several proteases. In addition to the proteases, the neutrophil also has other strongly reactive substances such as superoxides, hydrogen peroxide, and hypochlorite (bleach). These reactive substances escape, to some extent, from the cell and cause damage in the extracellular space. Two experiments showed that vitamin C was able to protect extracellular components from hypochlorite.<sup>8,9</sup> Another study showed that vitamin C inhibits neutrophils from infiltrating the lungs and therefore may prevent the lungs from injury (thereby reducing cold symptoms).<sup>10</sup> Furthermore, several researchers have concluded that vitamin C "is apparently the most efficient antioxidant in human plasma and therefore, the concentration may be a significant factor in counteracting the escaped antioxidants." <sup>11,12</sup>

Rhinoviruses, which cause common colds, do not seem to cause direct damage to the host. Instead, they cause damage by attracting the bodies' defense cells (neutrophils) to the site of injury. These cells then can cause the symptoms of a cold as discussed above.

Some evidence that implicates neutrophils as causing the symptoms in colds is research which showed that "human embryonic lung fibroblast cultures start to produce a chemo-attractant for the neutrophils and there is a strong correlation between the severity of the symptoms and the number of neutrophils in the nasal passage.<sup>13,14</sup> Therefore, vitamin C, by reducing the number of oxidizing agents produced by neutrophils, might be able to reduce the severity of symptoms during a common cold.

### Vitamin C and Physical Stress

Persons who engage in heavy exercise have been shown to have a higher incidence of respiratory infections. In a review of three placebo-controlled studies of the effects of vitamin C on persons undergoing heavy physical stress, Hemila found that the incidence of colds was much lower in the group that was being administered vitamin C.<sup>15</sup> The groups included in this study were "school children at a skiing camp in the Swiss Alps, military troops training in Northern Canada, and participants in a 90km running race." <sup>15</sup> During the study on the 90km race participants, the same researchers also ran a parallel study with subjects (using the same protocol) that were not participating in the race. The results showed that vitamin C did not decrease the incidence of colds in the group that did not run the race. The obvious implication here is that vitamin C does not decrease the incidence of colds in normal subjects; people under physical stress, however, seem to have a decreased incidence of colds when they use vitamin C.<sup>16</sup> This is consistent with the previous studies which also showed that vitamin C was only able to reduce the symptoms of colds rather than the incidence of colds.

### Summary

From a review of the evidence, a few points are clear. First, vitamin C does not appear to reduce the incidence of colds in "normal" people; it only decreases the incidence of colds in people who are under heavy physical stress. Thus, excess vitamin C should not be ingested just to avoid colds unless the person happens to be a training athlete or is under any other physical stress. There are, however, other benefits of vitamin C which are not discussed in this paper and which might warrant daily intake of vitamin C at doses higher than the 60 mg/day that is currently recommended by the RDA.<sup>17</sup> Second, since vitamin C seems to reduce the symptoms of colds, it is advisable that people use vitamin C during episodes of the common cold. Finally, there are biochemical models that explain how vitamin C might be able to have these effects.

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