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The Effectiveness of Vitamin C in Preventing and Relieving the Symptoms of Virus-induced Respiratory Infections

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ABSTRACT

Background: An ever increasing demand to evaluate the effect of dietary supplements on specific health conditions by use of a "significant scientific" standard has prompted the publication of this study.

Objective: To study the effect of megadose Vitamin C in preventing and relieving cold and flu symptoms in a test group compared with a control group.

Design: Prospective, controlled study of students in a technical training facility.

Subjects: A total of 463 students ranging in age from 18 to 32 years made up the control group. A total of 252 students ranging in age from 18 to 30 years made up the experimental or test group.

Method: Investigators tracked the number of reports of cold and flu symptoms among the 1991 test population of the facility compared with the reports of like symptoms among the 1990 control population. Those in the control population reporting symptoms were treated with pain relievers and decongestants, whereas those in the test population reporting symptoms were treated with hourly doses of 1000 mg of Vitamin C for the first 6 hours and then 3 times daily thereafter. Those not reporting symptoms in the test group were also administered 1000-mg doses 3 times daily.

Results: Overall, reported flu and cold symptoms in the test group decreased 85% compared with the control group after the administration of megadose Vitamin C.

Conclusion: Vitamin C in megadoses administered before or after the appearance of cold and flu symptoms relieved and prevented the symptoms in the test population compared with the control group. (J Manipulative Physiol Ther 1999;22:530-3)

Key Indexing Terms: Vitamin C; Cold; Preventive Medicine; Dietary Supplements

INTRODUCTION

Although the US Recommended Daily Allowance of vitamin C is 75 mg for an adult man and 70 mg for an adult woman,[1] the popular literature has recommended doses well in excess of these figures for the treatment of respiratory infections.[2,3] However, an optimum dose has not yet been determined.[4] Despite significant positive results, very little work has been published in the technical literature on the effectiveness of vitamin C in the treatment or prevention of colds and influenza. One of the deterrents has undoubtedly been the assumption that as a water-soluble vitamin, excess vitamin C is passed off in the urine, and therefore the application of megadoses is ineffective. However, Murata et al[1] have reported that 24-hour excretions of 5000-mg doses of vitamin C, administered in 2 types of timed-release capsules, releasing 100% of the dose in 7.0 and 13.7 hours, were only 23.4% and 7.7%, respectively. Positive results in treating the symptoms of virus-induced respiratory infections by the application of moderate-to-large doses of vitamin C (300 mg and 2000 mg) have been reported by Bucca et al,[2] Bernasconi and Massera,[3] Hemila,[4] Hunt et al,[5] and Peters et al.[6]

This study, evaluating the effect of megadoses of vitamin C in controlling flu and cold symptoms, was composed of observations over 10-day intervals of 252 students in a rigidly controlled environment. Although the treatment plan was prospective, it was not randomized or double blind. The test program on the use of vitamin C was carried out from January to September 1991 at a technical training facility in Santiago, Chile. The 463-student control group entered the training facility from January to December 1990. The control group received conventional treatment for reported symptoms.

METHODS

Test Climate

The test site, Santiago, Chile, is in a semiarid region, approximately 70 miles inland from the Pacific Ocean. The annual mean temperature in Santiago is 59°F, with extremes during January to September, 1991, of 88°F and 36°F. Average relative humidity for the period was 68%.

Physical Facilities

The technical training facility, made up of dormitories, classrooms, and cafeteria, was located in a single structure with internal heating and air conditioning. Dormitory accommodations consisted of double bunks with a maximum loading of 40 square feet per occupant, although normal loading during the years 1990 and 1991 was less than 50% of capacity.

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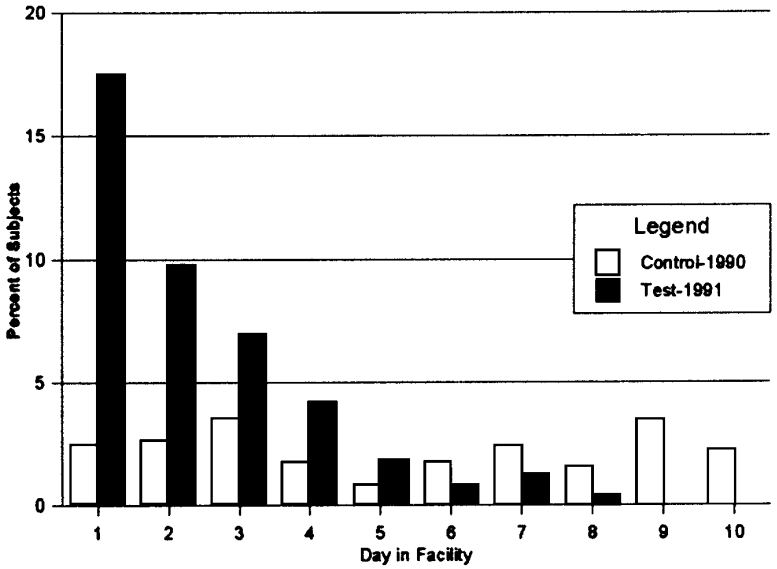

Fig 1. *Incidence of reported flu symptoms—test group vs control group.*

Sanitary Conditions

Sanitary conditions were good; the students showered once a day, food service personnel wore required protective face masks, and kitchen sanitary conditions were maintained and monitored periodically by health service inspectors.

Diet

Nutritionally balanced meals of approximately 2200 calories per day were provided, the composition of which was approximately 20% protein, 30% lipids, and 50% carbohydrates. The menu varied on a day-to-day basis, but the menu was the same for each group of students.

Training Schedule

Each group of students occupied the facility for the 10-day study program. The students followed a rigorous, highly controlled uniform schedule. The daily routine, which was identical for each group, was as follows.

6:00-6:30: Arise, shower, dress
6:30-7:00: Individual study
7:00-7:30: Breakfast
7:30-8:30: Individual study
8:30-12:00: Classroom study
12:00-1:00: Lunch
1:00-6:30: Classroom study
6:30-7:00: Free time
7:00-8:00: Dinner
8:00-9:30: Classroom study
10:00: Lights out

During the 30 minutes free time, the students were permitted to leave the building for light exercise as desired. Free time was also provided on day 7 from 2:30 to 7:00 PM. Active sports, including soccer and basketball, were available, and the students were free to visit centers of interest in the city.

Experimental Population

The population making up the test and control groups was highly homogenous. Age range and distribution are shown in Table 1. Each student was screened by a physical examination by his or her local physician before entering the training center to verify the absence of communicable disease or physical disability. Copies of the results of the medical examination were forwarded to the training center along with the student's application. Each group of students arrived at the facility the day before the 10-day training period and departed the day after the completion of training. Class sizes ranged from 7 to 48 students, with an average class size during 1990 of 20.6 and during 1991 of 21.1.

Table 1. *Age distribution of experimental population*

	1990 (control group)			1991, January-September (test group)		
	Men	Women	Total	Men	Women	Total
Number	296	167	463	169	83	252
Average age	20.8	22.6	21.4	20.75	22.8	22.1
Maximum age	27	32		27	30	
Minimum age	18	19		18	20	

Demographic makeup of students during 1990 was 70% Chilean, 29% Bolivian, and 1% other; during 1991 it was 73% Chilean, 26% Bolivian, and 1% other. The other countries represented were Argentina, Paraguay, and the Dominican Republic.

Treatment

Control group. The question of respiratory infections was not specifically broached with the students during the 1990 classes. Students reported symptoms of illness at their own initiative when the symptoms were severe enough to request intervention. Colds and flu were generally not reported unless the student felt physically ill. Although records were not kept of the number of students requiring bed rest, in nearly every group 1 or more students required from half a day to 3 days bed rest to recuperate from influenza. Treatment consisted of administering pain relievers and

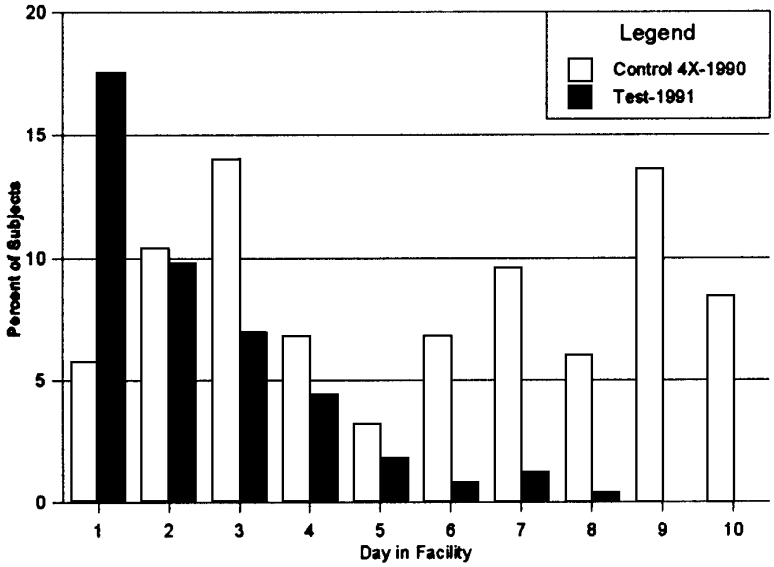

Fig 2. *Incidence of reported flu symptoms—normalized control group versus test group.*

decongestants. In a few cases symptoms were severe enough to require skilled medical intervention.

Test group. During the orientation period for the 1991 classes, students were asked to report any existing cold or flu symptoms and to report the earliest signs of the onset of sore throat or nasal congestion during their stay. Anyone reporting flu symptoms was treated with 1000 mg of vitamin C per hour for 6 hours, repeating the treatment for up to 3 days, as necessary, followed by 1000 mg 3 times a day for the remainder of the training period. Students receiving the 1 g/h treatment were required to report on their symptoms at the end of each 6-hour period. All students not reporting initial symptoms were given 1000 mg of vitamin C 3 times a day.

A weekly clinic was held at the facility, where all students with illness symptoms were examined by a physician. Bacterial and viral throat infections were differentiated by the examining doctor during the clinic.

RESULTS

Control Group-1990

Fig 1 shows the percent of the students that reported flu symptoms on each of the 10 days in the training facility during 1990 and 1991. It is noted that in the control group (1990) the incidence of reported symptoms tended to decrease during the first 5 days and increase during the final 5 days. Apparently, those who entered with the flu tended to improve, while at the same time infecting others who developed symptoms during the later part of their stay. Of the 463 students passing through the training facility during 1990, a total of 104, or 22%, reported flu symptoms.

Test Group-1991

The higher initial incidence of reported symptoms in 1991 over 1990, as shown in Fig 1, is because in 1991 the subjects were requested to report any sign of sore throat or nasal congestion on entering the facility, whereas no requests to report symptoms were made in 1990. The precipitous decrease in reported symptoms with time in the test group compared with the control group is readily apparent. The figure for day 6 represents only 2 individuals, and that for day 8 represents only 1 individual. Not a single student in the test group reported flu symptoms during the last 2 days, compared with 27 on the last 2 days in the control group. Furthermore, and of major significance, during the entire period, January to September 1991, reported symptoms were sufficiently mild that not 1 student lost any class time because of respiratory infection.

It is also important to note that those students diagnosed with streptococcal infections experienced no significant improvement as a result of the vitamin C treatment but responded as expected to conventional penicillin treatment.

Of 47 subjects reporting flu symptoms on entering the training facility, 23 experienced relief of symptoms with 1 6-hour treatment of 1000 mg of vitamin C per hour, 19 with 2, and 5 with 3 such treatments.

The assumption was made earlier that the disparity in initial reported symptoms between the control and test groups was due to the requirement of the test group to report the onset of symptoms no matter how mild they were. Thus it would be expected that the actual fraction of the population that entered the training facility with prior symptoms was approximately the same for the 2 years in question. Assuming a roughly equal fraction of initial infections for the control and test groups, a more accurate comparison of the effect of vitamin C could be made by incorporating a normalization factor to account for the reporting difference.

The normalization factor was defined as the quotient of the average of the first 3 days' reported incidence for the 2 groups. The data for the control group was multiplied by the normalization factor to give a truer comparison of the reported incidence between the 2 groups. The normalized data for the 2 groups is shown in Fig 2.

Assuming that prior infections did not endure for more than 3 days after beginning the training program, the relative effectiveness of vitamin C in preventing the onset of influenza could be quantified by dividing the normalized reported incidence of days 4 through 10 in the test group by that in the control group, which shows a remarkable reduction of infection in the test group of more than 85%.

DISCUSSION

When Congress created the Nutrition Labeling Education Act of 1990, it delegated to the Food and Drug Administration (FDA) the job of establishing a "procedure and standard respecting the validity" of health claims for dietary supplements including vitamin products. The FDA established a fairly high standard for vitamin manufacturers and thus heightened the need for studies such as this to be published. Between the time of initial submission to the date of eventual publication of this study, the FDA's "significant scientific" standard had been challenged.

A recent court ruling by the United States Court of Appeals for the District of Columbia Circuit Court determined that "four FDA 'final rules' prohibiting certain nutrient-disease relationship claims were invalid under the First Amendment to the U.S. Constitution." The Court also held invalid the agency's interpretation of its "significant scientific agreement" rule for review of health claims, which the court said the FDA never defined.

Although the ruling is hailed as a significant victory for food supplement advocates, we are sure to see ever increasing pressure for vitamin manufacturers and food supplement formulators to back up health-related claims on their labels. This scientific study contributes meaningfully to evaluation of conditions affected by megadose vitamin therapy.

In the accepted hierarchy of credibility in clinical trials, the randomized, prospective, double-blind clinically controlled scientific study is the most credible. Although some of the preceding elements are absent from this study, it is nevertheless, a prospective, clinically controlled study.

There are many synonyms or acronyms for cold and flu. Most generally, flu refers to constitutional symptoms of fever and aching with occasional gastrointestinal upset. Cold generally refers to symptoms in the upper respiratory tract. The 2 may or may not accompany each other. Both are largely viral infections.

For more than 30 years, vitamin C in megadose quantities has been recognized as an effective agent against colds and flu. Nobel laureate Linus Pauling was an early advocate of the treatment of colds and flu with Vitamin C.[7] Despite such positive evidence, few prospective vitamin studies have heretofore been conducted in such an homogenous, highly controlled environment.

CONCLUSION

On the basis of reported subjective symptomatic relief and also on the lack of reported new symptoms of cold and flu between the control group and the test group, this study shows that megadose Vitamin C therapy can help prevent, as well as therapeutically treat, the symptoms of cold and flu.

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