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“FRUIT AND VEGETABLE INTAKE AND RESPIRATORY HEALTH”

Editorial

Nutrition and lung health

Lung diseases have increased significantly in the last 10 years and account for substantial morbidity and mortality. The influence of dietary factors has generated growing interest because of their potential impact on the genesis and evolution of lung diseases, particularly in how they may modulate the effects of environmental exposures. These factors include antioxidants, omega-3 fatty acids, and other micronutrients that might affect the immune response. Several epidemiological studies have suggested that greater intake of fresh fruits and antioxidant vitamins, particularly vitamin C, are related to lesser prevalence of cough, wheeze and asthma, and to a lower decline in lung function, and COPD symptoms (Romieu, 2001,2005) but there is little information on healthy dietary patterns in relation to obstructive lung disease. Three recent studies provide additional evidence for the impact of diet on lung diseases, in particular that high consumption of fruits and vegetables, fish and whole grain products as part of a “prudent dietary pattern” is related to higher pulmonary function and less respiratory symptoms in children (Burns, 2007) and lower incidence of COPD in adults (Varraso, 2007). Similarly, children with a better adherence to the traditional Mediterranean diet, high in fruits, vegetables, fish, nuts, and whole grain products had fewer asthma and allergic rhinitis symptoms (Chatzi, 2007). It is time for health professionals to promote a “healthy dietary pattern” starting in childhood as part of public health messages in order to improve respiratory health

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Fruits, vegetables and the Mediterranean diet could reduce the risk of asthma and allergies in children

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Diet has been recently recognized as a potential risk factor for asthma and allergic disorders, although the epidemiological evidence to date is still conflicting. We recently found a beneficial effect of commonly consumed fruits, vegetables and nuts, and of a high adherence to a traditional Mediterranean diet during childhood on symptoms of asthma and rhinitis.

The survey was conducted in 2001, in four rural areas of the Mediterranean island of Crete in Greece. School children aged between 7 and 18 years were invited to participate in the study (n=690). The parents were invited to complete a questionnaire that included questions on the child's respiratory and allergic symptoms, family history of allergic diseases, birth order and sibling numbers, levels of parental education and occupation. A detailed food frequency questionnaire of 58 items was used to assess usual dietary intake in children. The degree of adherence to a traditional Mediterranean diet was based on the KidMed index, a Mediterranean Diet quality index constructed to evaluate food habits in a population of Spanish children. The index ranged from 0 to 10, and was categorised into three levels: (1) ≥ 6 , optimal Mediterranean diet; (2) 4–5, medium quality Mediterranean diet; (3) ≤ 3 , low quality Mediterranean diet.

The prevalence of any wheezing, and rhinitis symptoms in the past were 16.8% and 18.7% respectively. When these symptoms were combined with atopy, the prevalence rates for wheezing and rhinitis were 5.4% and 6.7% respectively.

At least twice a day, 80% of children ate fresh fruit, and 68% ate vegetables. Daily consumption of grapes, oranges, apples, and fresh tomatoes was found to have beneficial effect on wheezing symptoms. Daily intake of grapes was also inversely associated with current allergic rhinitis and current seasonal allergic rhinitis after adjusting for potential confounders. Consumption of nuts more than three times per week was inversely associated with wheezing, whereas weekly intake of margarine appeared to be harmful on

asthma and allergic rhinitis symptoms.

There were 27.9% of children who had a low quality of Mediterranean Diet according to KidMed index, 43.8% who had intermediate values, and 28.3% with a high index. A high level of adherence to the Mediterranean diet was found to be protective for allergic rhinitis, while a more modest protection was observed for wheezing and atopy.

The prevalence of asthma and allergic diseases has increased dramatically over the past few decades with the highest incidence occurring in children. Epidemiological and immunological studies suggest that dietary modification or supplementation in childhood could reduce the development of allergic disorders. Fruits and vegetables are rich sources of antioxidant vitamins such as vitamins C, E and carotenoids, and other antioxidants such as selenium and flavonoids, that are thought to reduce airway inflammation by protecting airway cells from endogenous and exogenous oxidative damage. Nuts are a very rich source of vitamin E, the body's principal defence against oxidant-induced membrane injury in human tissue, via its role in breaking the lipid peroxidation chain reaction. On the other hand, margarine is a rich source of omega-6 polyunsaturated fatty acids (PUFAs) that promote the formation of prostaglandins with a consequent increase in the likelihood of atopic sensitization, asthma, and atopic disease.

Dietary patterns such as the Mediterranean Diet account for cumulative and interactive effects among nutrients, reflect real-world-dietary preferences, and may be particularly suitable for analysis in asthma epidemiology where many dietary components could be related with the outcome of interest. The results of the present study, indicating a protective effect of children's adherence to the Mediterranean diet on rhinitis and asthma symptoms probably reflect a high exposure to several antioxidant compounds and their adverse effect on the oxidative stress damage of lung tissues.



Adolescent's respiratory health may benefit from eating fruit and foods rich in n-3 fatty acids

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Diets with high consumption of foods rich in antioxidant and anti-inflammatory micronutrients may promote children's optimal respiratory health. We have recently reported that adolescents with the lowest dietary intakes of antioxidant and anti-inflammatory micronutrients had lower pulmonary function and increased respiratory symptoms.

Adolescence is a period of rapid physical growth, yet adolescents often have poor dietary habits. Micronutrients, such as antioxidants, aid in lung growth and defenses; consequently, low dietary intake may result in lower attained lung function and increased respiratory symptoms, such as chronic cough, wheeze, and asthma.

We examined the association of dietary factors (fruit, vegetables, vitamins C and E, beta-carotene, retinol, n-3 fatty acids) with respiratory health in a cohort of 2,112 twelfth-grade students in 13 communities in the United States and Canada during the 1998 to 1999 school year. Students performed a standardized forced expiratory maneuver according to American Thoracic Society methods, using a rolling-seal spirometer (Spiroflow; PK Morgan; Andover, MA). Results were corrected to body temperature and pressure saturated with water. Students completed a standardized respiratory questionnaire patterned after the American Thoracic Society-Division of Lung Disease questionnaire, as well as a semiquantitative food frequency questionnaire designed for adolescent populations. We assessed the associations between dietary factors (including vitamin supplements) and lung function with linear mixed regression models, and respiratory symptoms with logistic regression using a generalized estimating equation adjusted for individual and group-level covariates.

We found that both lower dietary fruit and vitamin C intakes were associated with lower lung function compared with higher intakes. Low fruit intake (<0.25 serving a day) was associated with lower forced expiratory flow in one second (FEV1) (-1.3% of predicted; 95% confidence interval [CI], -2.4 to -0.2% of predicted), and low dietary vitamin C intake (<85 mg a day) was associated with lower forced vital capacity FVC (-1.3% of predicted; 95% CI, -2.4 to -0.2% of predicted).

Low fruit intake was also associated with increased odds of chronic bronchitic symptoms (odds ratio [OR], 1.36; 95% CI, 1.03 to 1.73) and asthma (OR, 1.34; 95% CI 0.93 to 1.94) compared with higher intake. Low dietary n-3 intake (<5.2 mg/day) was associated with increased odds of chronic bronchitic symptoms (OR, 1.37; 95% CI 1.05 to 1.81), wheeze (OR, 1.34; 95% CI 1.06 to 1.69), and asthma (OR, 1.68; 95% CI 1.18 to 2.39) compared with higher intake.

Most of the adolescents in this cohort had dietary intakes of fruit, vegetables, vitamins, and n-3 fatty acids below the Institute of Medicine's recommended dietary reference intakes (DRIs). Among these adolescents the median serving of fruit was 0.6 a day. Additionally, only 11% of the adolescents consumed five or more multivitamin tablets a week. Fruit is an important source of antioxidants, such as vitamin C and flavonoids, as well as fiber. Although vitamin supplementation can help meet the DRIs, it does not completely alleviate low fruit intake since flavonoids and fiber are not included. Also, there is evidence that suggests a synergistic biological effect of micronutrients that occurs with the consumption of whole foods, such as fruit.

Adolescents often have dietary intake of important nutrients below levels recommended for health promotion. This may affect the attainment of optimal lung function. Although the lower pulmonary function associated with lower dietary fruit and vitamin C intakes in our study was not likely to have a functional impact on current respiratory health, it suggests that these adolescents may not attain their potential maximum lung function. Our study suggests chronic cough and wheeze are associated with low dietary micronutrient intakes. Both symptoms and lower maximum lung function may be associated with airway remodeling and later impairment of adult lung function. These factors may have long-term consequences because lower lung function in adults has been associated with increased morbidity and premature mortality. Prevention of the onset of smoking in this age group is a primary objective. However, promoting the consumption of fruit and foods rich in n-3 fatty acids may protect respiratory health in rapidly growing adolescents.



Prudent diet may help lower risk of chronic obstructive pulmonary disease

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Consuming a diet rich in fruits, vegetables, whole grains and fish – labeled the “prudent diet” – may do more than help you lose a few pounds. We recently reported that the prudent diet might reduce the risk of chronic obstructive pulmonary disease (COPD) by half.

Data were collected from a large prospective cohort of US male health professionals, aged 40-75 years (Health Professionals Follow-up Study). Men answered a detailed questionnaire that included a diet survey and items on lifestyle practice (e.g., smoking habits, physical activity, weight) and medical history. Follow-up questionnaires were sent every two years thereafter to update information. Dietary intake data were collected in 1986, and every 4 years thereafter. Dietary patterns were identified from food frequency questionnaires administered in 1986, 1990 and 1994 using principal component analysis. Two dietary patterns were identified: the prudent diet (characterized by a high intake of fruits, vegetables, fish and whole grain products) and a Western diet (characterized by a high intake of refined grains, cured and red meats, desserts and French fries).

Between 1986 and 1998, we identified 111 self-reported cases of newly diagnosed COPD among 42,917 men. The prudent diet was inversely associated with the risk of newly diagnosed COPD, and even after adjusting for age, smoking and other COPD risk factors, we found that the more strictly a person followed this dietary pattern, the lower their risk for COPD – by a full 50% for the most healthful eaters.

On the other hand, we also found that the “Western” diet (high in refined grains, cured and red meats, fried foods and sweets) appeared to significantly increase COPD risk. One-fifth of the men who indulged most heavily in the Western diet were found to have more than four times the risk for COPD than those who ate least like the Western diet.

Currently, chronic obstructive pulmonary disease (COPD) is the fourth leading cause of mortality in Europe and in the United States. With the increase in cigarette smoking in developing countries, COPD is expected to become the third leading cause of death worldwide by 2020. Cigarette

smoking is the most important risk factor for COPD in developed nations, but not all smokers develop COPD, suggesting that others risk factors also are involved. Among environmental factors, changes in diet have been evoked. Several foods have been associated with chronic obstructive pulmonary disease (COPD) symptoms or lung function, however, all of these studies focused on individual nutrients or foods. Because foods are consumed together and nutrients may interact together, we decided to investigate dietary patterns that provide a broader picture of diet.

The finding that prudent diet (including fruits and vegetables) is associated with a decreased risk of newly diagnosed COPD is consistent with prior epidemiological studies. There are several papers in the literature suggesting a beneficial effect of antioxidants, particularly vitamin C, and to a lesser extent vitamin E on COPD or lung function. By contrast, the Western dietary pattern is highly loaded by processed meats, which one of the most important compound is nitrites. The Western dietary pattern also was loaded by a high intake of foods with a high glycemic index (refined grains, desserts, sweets). It has been suggested that hyperglycemia is related to an impaired lung function. As several foods (e.g., cured meat, refined grains) from the Western diet might be related to COPD, the Western pattern offers a good way to summarize the possible effects of these diverse but highly correlated foods.

Dietary pattern also seemed to go hand-in-hand with other risk-increasing lifestyle choices: we reported that the men who most heavily followed the “Western” diet also had the highest body mass index (BMI), were the least physically active and more likely to smoke, while those inclined toward the “Prudent” diet were more physically active and less likely to be current smokers.

Confirmation of these findings in other populations, particularly with different dietary habits, is warranted. These data provide additional evidence regarding the potential benefits of a diet rich in fruits and vegetables and the potential harms of more traditional Western diet. The most important public health message remains smoking cessation but these data suggest that diet, another modifiable risk factor, might also affect COPD risk.