

EFFORTS



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DEFINING COPD EXACERBATIONS: IMPACT ON ESTIMATION OF INCIDENCE AND BURDEN IN PRIMARY CARE

Summary

Aims

To investigate the impact of definition on the incidence of chronic obstructive pulmonary disease (COPD) exacerbations in primary care.

Methods

In a one-year prospective, observational study, data from diary cards were used to determine the incidence of symptom- and healthcare-defined exacerbations. One hundred and twenty seven patients completed =80% of days in the diary card and were included in the analysis.

Results

Incidence of COPD exacerbation varied according to definition. Mean yearly rates were 2.3 for symptom- and 2.8 for healthcare-defined exacerbations. Although patients with FEV1 < 50% had a higher mean yearly rate of healthcare-defined exacerbations than those with FEV1 = 50% (3.2 vs 2.3; p = 0.003), patients with less severe disease reported recurrent exacerbations. There was limited agreement between symptom- and healthcare-defined exacerbations.

Conclusion

Lung function does not appear to be a valid criterion for assigning COPD management directed at patients with recurrent exacerbation.

Source: Primary Care Respiratory Journal

COUGH AND PHLEGM CAUSE FOURFOLD INCREASE IN COPD INCIDENCE

Young adults (ages 20 to 44) with normal lung function who later develop chronic cough and phlegm have a fourfold higher risk of developing chronic obstructive pulmonary disease (COPD). The results of this 10-year respiratory study appear in the first issue for January 2007 of the American Journal of Respiratory and Critical Care Medicine, published by the American Thoracic Society.

Isa Cerveri, M.D., of the Division of Respiratory Diseases at San Matteo Hospital and University of Pavia in Italy, and 19 associates showed that the presence of chronic cough and phlegm among study participants was an independent and statistically significant predictor of COPD. Of the 5,002

individuals in the study cohort, 123 were diagnosed with COPD. All participants had normal lung function at baseline.

COPD is the fourth leading cause of death in the United States, killing 122,283 Americans in 2003. It results from chronic bronchitis and emphysema, two lung diseases which frequently co-exist and cause obstruction to airflow that interferes with normal breathing. Smoking is the primary cause of COPD. "In a large international cohort of individuals from ages 20 to 44, the 10-year cumulative incidence of COPD was 2.8 percent," said Dr. Cerveri. "It was 4.6 percent in adults aged 40 to 44. This finding points out that COPD is a major health problem even in young adults who are usually not considered to be at risk. In agreement with previous research, we found that the progression toward airflow obstruction is a continuous and gradual process, where sudden changes are extremely unlikely." Among the study group, about 77 percent of the 123 COPD cases were smokers. In the sample as a whole, about 55 percent smoked.

The authors noted their results confirm that, from a public health perspective, the prevention of smoking and smoking cessation are the most effective strategies to deter the occurrence of COPD and reduce its burden. "Our results show that the presence of chronic cough and phlegm is not an innocent symptom, but is an early marker of airflow obstruction," said Dr. Cerveri.

In addition to cough and phlegm in participants, researchers considered such factors as sex, age, dyspnea (breathlessness), smoking habits and level of education. All participants received lung function tests and blood workups at the beginning and end of the study.

In an editorial on the research in the same issue of the journal, Jørgen Vestbo, M.D., of Hvidovre University Hospital in Denmark and the University of Manchester in the United Kingdom, wrote: "The virtue of the study by Drs. Cerveri and colleagues lies in its size and thus the ability to calculate estimates with acceptable reliability. In this respect, it adds to previous work from the same group and indicates that the statement '15 percent of smokers will develop COPD' is wrong and that lifetime risk of COPD in smokers is significantly higher, probably about 35 to 50 percent."

He continued: "The predictive value of chronic cough and phlegm is probably more surprising given the fact that this cohort was young and had normal lung function at baseline." Dr. Vestbo concluded: "How does the study impact our understanding of the natural history of COPD? As recently

reported in this journal, it has taken the respiratory community a painstakingly long time to do properly sized studies in young adults with sound methodology and state-of-the-art analysis.

With COPD epidemiology growing in the European Community Respiratory Health Survey and other cohorts of young adults, we may get a better picture of early events in COPD---although our colleagues in pediatric epidemiology will probably continue to claim that we are still only looking at 'the elderly!'"

Source: American Thoracic Society



ASSOCIATIONS BETWEEN RESPIRATORY SYMPTOMS, LUNG FUNCTION AND GASTRO-OESOPHAGEAL REFLUX SYMPTOMS IN A POPULATION-BASED BIRTH COHORT

Background

Several studies have reported an association between asthma and gastro-esophageal reflux, but it is unclear which condition develops first. The role of obesity in mediating this association is also unclear. We explored the associations between respiratory symptoms, lung function, and gastro-esophageal reflux symptoms in a birth cohort of approximately 1000 individuals.

Methods

Information on respiratory symptoms, asthma, atopy, lung function and airway responsiveness was obtained at multiple assessments from childhood to adulthood in an unselected birth cohort of 1037 individuals followed to age 26. Symptoms of gastro-esophageal reflux and irritable bowel syndrome were recorded at age 26.

Results

Heartburn and acid regurgitation symptoms that were at least "moderately bothersome" at age 26 were significantly associated with asthma (odds ratio = 3.2; 95% confidence interval = 1.6–6.4), wheeze (OR = 3.5; 95% CI = 1.7–7.2), and nocturnal cough (OR = 4.3; 95% CI = 2.1–8.7) independently of body mass index. In women reflux symptoms were also associated with airflow obstruction and a bronchodilator response to salbutamol. Persistent wheezing since childhood, persistence of asthma since teenage years, and airway hyperresponsiveness since age 11 were associated with a significantly increased risk of heartburn and acid regurgitation at age 26. There was no association between irritable bowel syndrome and respiratory symptoms.

Conclusion

Reflux symptoms are associated with respiratory symptoms in young adults independently of body mass index. The mechanism of these associations remains unclear.

Background

An association between symptoms of asthma and gastro-esophageal reflux is now well-recognized, with a number of studies reporting a much higher prevalence of reflux symptoms in patients with asthma than in control subjects. Objective measurements using endoscopy and esophageal pH monitoring confirm a high prevalence of reflux in asthma].

The association between gastro-esophageal reflux and asthma could have several explanations. Reflux may

precipitate asthma, either via a vagal reflex initiated by gastric fluid in the esophagus, or by micro-aspiration of gastric contents into the trachea. Conversely, asthma may promote reflux due to the increased pressure swings in the thorax during respiration. During 24 hour monitoring of esophageal pH and asthma symptoms, reflux appeared to precipitate asthma symptoms and cough far more often than asthma precipitated reflux]. However, although episodes of gastro-esophageal reflux might trigger wheezing in an individual who has asthma, this does not necessarily indicate an aetiological association between having reflux disease and the asthmatic phenotype. The association between asthma and reflux could also be mediated by obesity, which is a risk factor for both conditions. Finally, reflux could give rise to asthma-like symptoms, such as nocturnal cough, but have no effect on lung function or airway responsiveness.

Population-based studies of asthma and reflux are rare. A postal questionnaire of British adults confirmed an association between reflux symptoms and symptoms suggestive of bronchial hyper responsiveness and also found an association between respiratory symptoms and irritable bowel syndrome. The European Community Respiratory Health Study found a strong association between symptoms of nocturnal reflux and asthma and respiratory symptoms in a random sample of young adults. This remained significant after adjustment for body mass index. A recent follow-up study of the same participants 5 – 10 years later, found both obesity and nocturnal reflux symptoms to be independent risk factors for the onset of asthma.

We explored the relations between symptoms and objective evidence of asthma, reflux and obesity in the Dunedin Multidisciplinary Health and Development Study – a birth cohort of approximately 1000 individuals followed to age 26. We hypothesized that if asthma predisposes to gastro-esophageal reflux, then long-standing persistent asthma would be associated with the highest risk of reflux symptoms. Conversely, if reflux precipitates asthma, adult reflux symptoms would be most strongly associated with adult-onset asthma.

Methods

The Dunedin Multidisciplinary Health and Development Study is a cohort study of 1037 children (52% male) born April 1972 to March 1973 [15]. Follow-up assessments have been conducted at ages 3, 5, 7, 9, 11, 13, 15, 18, 21, and 26 years when 980 (96%) of 1019 living study members participated. The Otago Ethics Committee approved the study and written informed consent was obtained at each assessment.

At age 9, the accompanying adult was questioned about current and previous asthma, wheeze and cough. This information was updated at subsequent assessments. Current asthma was defined as diagnosed asthma with at least one episode of asthma or wheezing symptoms within the previous year. Current wheeze was defined current wheeze as episodes of wheezing in the last year, excluding those with only one or two episodes each lasting less than one hour. At age 26 Study members were asked if they had woken with coughing in the previous year when they did not have a cold. Current smoking was defined as smoking daily for at least one month during the past year. Cumulative lifetime smoking history was assessed as total "pack-years" smoked up to age 26 years where one

pack-year is the equivalent of smoking one pack of 20 cigarettes every day for a year.

Height without shoes, and weight in light clothing, were measured to calculate Body Mass Index (BMI) in kg/m². Spirometry to measure the forced expiratory volume in one second (FEV₁) and forced vital capacity (FVC) was measured at ages 9, 11, 13, 15 and 21 years using a Godart water-sealed spirometer. At age 18 years spirometry was performed before and after nebulised salbutamol using a Morgan rolling seal spirometer. At age 26 years, spirometry was performed before and after salbutamol 200 g inhaled from a metered dose inhaler via a valved spacer using a SensorMedics body plethysmograph. Airway responsiveness to methacholine was measured at ages 9, 11, 13, 15 and 21 years using a validated modified Chai protocol. A provoking concentration of methacholine to induce a 20% fall in FEV₁ (PC₂₀) of 8 mg/mL or less indicated airway hyper responsiveness. When methacholine challenge was not undertaken (at ages 18 and 26), or if a low FEV₁ precluded testing at other ages for safety reasons, an increase in FEV₁ of 10% or greater after inhaling salbutamol (bronchodilator response) was taken as also indicating airway hyper responsiveness. Skin prick testing at age 21 included house dust mite (*Dermatophagoides pteronyssinus*), grass, cat, dog, horse, kapok, wool, *Aspergillus fumigatus*, *alternaria*, *penicillium*, and *cladosporium*. A wheal diameter 2 mm greater than saline control was considered positive and atopy was defined as a positive response to one or more allergens.

At age 26 Study members were asked questions from the Bowel Symptom Questionnaire. These included whether they had had "heartburn (a burning pain or discomfort behind the breastbone rising up in the chest)" and if they had had "a bitter or sour tasting fluid that comes to your throat or mouth" (acid regurgitation). Each symptom was scored according to how bothersome it was: 0 = I have not been bothered by this symptom; 1 = A little bit bothersome; 2 = Moderately bothersome; 3 = Quite a bit bothersome; 4 = Extremely bothersome. For this analysis, reflux symptoms were included if they were at least moderately bothersome (score 2 and above).

Irritable bowel syndrome was defined using the Manning criteria. This required abdominal pain or discomfort plus at least two of the following six symptoms: pain relief by defecation, looser stools at the onset of pain, more frequent stools at the onset of pain, abdominal distension, mucus per rectum and feeling of incomplete rectal evacuation. These criteria are highly specific for irritable bowel syndrome and identify more cases than the Rome criteria.

Statistical Analysis

Cross-sectional associations between asthma, wheeze, cough, bronchodilator responsiveness and the FEV₁/FVC ratio and gastro-intestinal symptoms of heartburn, regurgitation and irritable bowel syndrome at age 26 were analyzed by logistic or linear regression using the gastro-intestinal symptoms as the independent (predictor) variables. Heartburn and regurgitation symptoms were considered individually and in combination. All analyses controlled for sex and BMI. Analyses tested for

interactions between sex and gastro-intestinal symptoms and, because of known sex differences in the association between body mass index and asthma in this cohort, analyses were repeated for each sex separately. We also tested for an interaction between reflux symptoms and atopy. Further analyses adjusted for smoking status.

Longitudinal associations between asthma, wheeze, and airway hyper responsiveness at earlier ages and reflux symptoms at age 26 were examined by logistic regression. Asthma and wheeze were used as the independent (predictor) variables in these analyses and were categorized according to the age at which they were first reported and whether they were still present at age 26. Thus asthma was classified as "child-persistent" asthma if an asthma diagnosis was first reported at age 9 or 11 and still present at age 26, "teen-persistent" if first reported at age 13, 15 or 18 and still present at age 26, "adult-onset" if first reported at age 21 or 26 and "remittent" if asthma had been reported at an earlier assessment but not at age 26. The same classifications were made for wheezing. Associations between airway hyperresponsiveness at earlier assessments and reflux symptoms were analyzed for each age using logistic regression. All analyses adjusted for sex. Further analyses of hyper responsiveness adjusted for current asthma and symptoms of wheeze.

Pregnant women (n = 33) and Study members with symptoms meeting American Psychiatric Association criteria for eating disorders (n = 25) at age 26 were excluded from all analyses. Analyses were performed using Stata version 9 (Stata corporation, College Station, TX).

Results

Heartburn and acid regurgitation symptoms that were at least "moderately bothersome" were reported by 12.5% and 6.0% respectively while 4.1% reported both. The frequencies of heartburn and acid regurgitation did not differ between men and women whereas irritable bowel syndrome was more common in women than men (20.3% and 13.6% respectively, p = 0.007, 95% CI for difference 1.9–11.6%).

Heartburn and acid regurgitation symptoms were significantly associated with a diagnosis of asthma, symptoms of wheeze and waking with a cough. These associations were similar in men and women and were independent of BMI. None of the respiratory outcomes was associated with irritable bowel syndrome.

There were significant interactions between sex and acid regurgitation symptoms for the bronchodilator response and the FEV₁/FVC ratio. In women, but not men, there were significant associations between reflux symptoms and a lower FEV₁/FVC ratio and increased bronchodilator responsiveness to salbutamol.

Atopy (assessed at age 21) was not associated with either heartburn (OR = 0.91, 95% CI: 0.59–1.40, p = 0.67) or regurgitation (OR = 1.04, 95% CI: 0.57–1.90, p = 0.90). The associations between reflux symptoms and asthma diagnosis were not significantly different between those who were atopic and those who were not. However, there were trends to stronger associations between reflux symptoms and wheeze, waking with

cough, and bronchodilator responsiveness in those who were not atopic which were of borderline statistical significance.

Current smoking was associated with both heartburn (OR = 1.55, 95% CI: 1.04–2.31, $p = 0.03$) and regurgitation (OR = 1.77, 95% CI: 1.02–3.08, $p = 0.04$). Adjusting for current smoking or cumulative lifetime pack-year smoking history in addition to sex and BMI did not materially alter any of the analyses.

Reflux symptoms were not significantly more common in those with persistent asthma since childhood, but were significantly increased in those with asthma since their teens and those with adult onset-asthma compared to those who denied ever having asthma (figure 1). Those with a history of asthma which had remitted by age 26 did not have an increased risk of reflux symptoms. By contrast both childhood-persistent and teen-persistent wheeze were significantly associated with adult reflux symptoms (figure 2). Adult-onset wheeze was significantly associated with heartburn symptoms only. Those who had a history of wheeze which had improved by age 26 did not have a significantly increased risk of reflux symptoms.

Airway hyper responsiveness to methacholine (or bronchodilator responsiveness in those unable to inhale methacholine) at age 9 years was not significantly associated with reflux symptoms at age 26. However, hyper responsiveness to methacholine at all subsequent ages was significantly and strongly associated with combined heartburn and acid regurgitation symptoms at age 26. These associations were independent of a current asthma diagnosis or current wheeze symptoms at the age at which the methacholine challenge was undertaken (data not shown). There was no association between responsiveness to salbutamol at age 18 and reflux symptoms at age 26. The findings were similar if these analyses excluded the Study members who had had responsiveness to salbutamol measured instead of methacholine challenges at ages 9, 11, 13, 15 and 21 for safety reasons.

Discussion

This study confirms that there is a strong association between symptoms of gastro-esophageal reflux and symptoms of asthma in this population-based cohort of young adults. These associations were independent of BMI and smoking. Acid regurgitation tended to be a stronger predictor of respiratory symptoms than heartburn, but those with both heartburn and acid regurgitation had the highest risk of respiratory symptoms. The association of reflux symptoms with objective indicators of respiratory function was different for men and women. In women both bronchodilator responsiveness and a lower FEV1/FVC ratio were associated with reflux symptoms, whereas in men there was little evidence of an association. The reasons for these sex differences are unclear.

Although this study provides longitudinal follow-up of asthma, wheeze and airway responsiveness since childhood, data on gastro-esophageal reflux symptoms were not collected during childhood or adolescence and we are unable to establish the temporal sequence between respiratory symptoms and airway responsiveness and gastro-esophageal reflux. However,

symptomatic gastro-esophageal reflux is uncommon in children and adolescents after infancy. We hypothesised that if asthma precipitates gastro-esophageal reflux, there would be strong associations between childhood persistent asthma and reflux symptoms. Although childhood wheeze (but not asthma) did significantly predict adult reflux symptoms, teenage-onset asthma and wheeze were better predictors of adult reflux symptoms suggesting that the association between airway and esophageal dysfunction emerges or strengthens during adolescence. This is supported by the association between airway hyperresponsiveness to methacholine from age 11 onwards and adult reflux symptoms. The strongest association between diagnosed asthma and reflux symptoms was in those with adult-onset asthma, but the findings for wheeze and airway responsiveness are consistent with the hypothesis that longstanding wheeze contributes to the development of reflux, even though it may not have been diagnosed as "asthma".

Perhaps the most striking finding was that airway hyper responsiveness to methacholine at age 11 years and older predicted the combination of heartburn and acid regurgitation symptoms 15 years later. These associations were generally similar in males and females. By contrast, there was no association between bronchodilator responsiveness at age 18 and adult reflux, while the cross-sectional association between bronchodilator responsiveness and reflux at age 26 was significant in women only. The association between methacholine responsiveness at age 9 and adult reflux was not statistically significant. Methacholine responsiveness was more common at this age and often asymptomatic. For many, this was a self-limiting phenomenon, and long-term associations would not be expected.

Why methacholine responsiveness in later childhood and adolescence predicts gastro-esophageal reflux symptoms years later is unknown. Episodes of airway narrowing may lead to increased pressure swings in the thorax during the respiratory cycle and promote failure of the gastro-esophageal sphincter. However, the association was independent of both diagnosed asthma and wheezing symptoms, which suggests that frequent episodes of bronchoconstriction were an unlikely cause of the association. Alternatively, the two phenomena may be linked by altered vagal function, since the vagus nerve controls lower esophageal tone as well as airway calibre and responsiveness. Autonomic function tests in patients with both asthma and gastro-esophageal reflux have demonstrated heightened vagal tone, but it is unclear if this was a primary abnormality or a consequence of either asthma, gastro-esophageal reflux or their treatment.

It is possible that the long-term association between teenage methacholine responsiveness and adult reflux symptoms is due to persistence of gastro-esophageal reflux since adolescence. Although gastro-esophageal reflux is thought to be uncommon in children and adolescents, this may be because it is poorly recognised. In a recent cross-sectional survey, 6% of 13 and 14 year-olds reported having either heartburn or regurgitation symptoms at least once a week in the previous month. Consistent with our findings, reflux symptoms were much more common in the children with asthma. Moreover gastro-esophageal reflux is

often asymptomatic and even "silent" reflux is associated with asthma. Several studies have reported improvements in asthma symptoms or lung function after medical or surgical treatment for gastro-esophageal reflux. Although a recent systematic review found that the evidence was inconsistent and concluded that there was no overall benefit, sub-groups of patients may benefit.

The finding that the association between wheeze, waking with a cough, and bronchodilator responsiveness and reflux symptoms tended to be stronger in those who were not atopic would support a hypothesis that gastro-esophageal reflux causes these symptoms by a mechanism which is distinct from the classic atopic/immunological model of asthma.

The associations between reflux symptoms and asthma were independent of BMI, confirming the finding from the European Community Respiratory Health Survey. This is an important observation since gastro-esophageal reflux has been suggested as a plausible mechanism for the association between asthma and obesity, particularly since the associations between obesity and both asthma and reflux are stronger in women and because estrogen has been implicated in both. We have previously identified an association between asthma and BMI in women in this cohort. This association between asthma and BMI was not materially altered by including reflux symptoms in the model indicating that reflux does not mediate the asthma-obesity association. Perhaps this is not surprising since reflux symptoms in this young adult cohort were only weakly associated with obesity.

We found little evidence of an association between asthma and irritable bowel syndrome, which suggests that the association between asthma and gastro-intestinal symptoms is specific for gastro-esophageal reflux and not a more generalised functional gastro-intestinal disorder. This finding contrasts with results from the postal survey by Kennedy et al which found that symptoms of bronchial hyper responsiveness, irritable bowel syndrome and gastro-esophageal reflux were all significantly and independently associated with each other. The survey by Kennedy et al used a randomly selected sample of adults with a mean age of 38, 12 years older than the participants of this cohort. Moreover, they did not measure lung function but used symptoms to predict bronchial responsiveness.

Strengths of this study include a high rate of follow-up in a population based cohort, prospectively collected data on asthma since childhood, measurements of lung function and airway responsiveness, and directly measured rather than self-reported height and weight. Our findings are coherent across a range of indicators of asthma including a reported diagnosis, wheezing symptoms, and methacholine responsiveness, as well as the symptom of nocturnal cough which could be caused by either asthma or gastro-esophageal reflux. For women there is also coherence with spirometry and salbutamol-responsiveness. Weaknesses of this study include the fact that detailed information on reflux symptoms was only collected at age 26, and that a subjective measure of "bothersome" symptoms was used to indicate clinically significant reflux. Hence we do not know when these

symptoms first occurred, nor do we have data on symptom frequency. However, these factors would reduce the likelihood of identifying significant associations and therefore it is unlikely that these limitations have biased our findings.

Conclusion

Heartburn and acid regurgitation symptoms are associated with asthma diagnosis, wheeze, and morning cough in this population-based birth cohort followed to age 26. In women, reflux symptoms are also associated with bronchodilator responsiveness and airflow obstruction. The associations were independent of BMI and smoking and tended to be stronger in non-atopic individuals. Early-onset persistent wheeze and airway hyper responsiveness were associated with adult reflux symptoms. The mechanism of the association warrants further investigation.

Source: Respiratory Research



CRACKING DOWN ON HEALTH FRAUD

Health Fraud Red Flags

To avoid becoming a victim of health fraud, consumers should learn how to evaluate health-related claims. "I advise consumers to avoid web sites that offer quick and dramatic cures for serious diseases," says David Elder, director of the FDA's Office of Enforcement. "Recognize the red flags and always consult a health professional before using any product or treatment."

Consumers should be wary of:

- Statements that the product is a quick and effective cure-all or a diagnostic tool for a wide variety of ailments. "Beneficial in treating cancer, ulcer, prostate problems, heart trouble, and more ..."
- Statements that suggest the product can treat or cure diseases. "Shrinks tumors, cures impotency ..."
- Promotions that use words like "scientific breakthrough," "miraculous cure," "secret ingredient," and "ancient remedy."
- Text that uses impressive-sounding terms like these: "hunger stimulation point" and "thermogenesis" for a weight loss product.
- Undocumented case histories or personal testimonials by consumers or doctors claiming amazing results. "After eating a teaspoon of this product each day, my pain is completely gone ..."
- Limited availability and advance payment requirements. "Hurry! This offer will not last."
- Promises of no-risk money-back guarantees. "If after 30 days you have not lost at least four pounds each week, your uncashed check will be returned to you."
- Promises of an "easy" fix.

Sources: FTA; U.S. FDA



HEAVY SMOKERS WHO CUT BACK STILL TAKE IN MORE TOXINS THAN LIGHT SMOKERS *U of MN study shows heavy smokers compensate for less cigarettes*

University of Minnesota tobacco researchers have found that heavy smokers who reduce their number of daily cigarettes still take in two to three times more total toxins per cigarette than

light smokers. The study, published in the December issue of *Cancer Epidemiology, Biomarkers & Prevention*, cites compensatory smoking as the chief reason for the increased exposure despite decreased cigarette use.

"We found that the more that heavy smokers reduced their smoking, the more likely they were to increase their intake of toxicants per cigarette, presumably because they took more frequent puffs or inhaled deeper or longer on each cigarette to compensate for fewer cigarettes smoked," said Dorothy Hatsukami, Ph.D., lead researcher on the study. "This indicates that they are trying to maintain a specific level of nicotine in their bodies."

Hatsukami is a professor and researcher with the University of Minnesota Medical School and Cancer Center. She also directs the University's Transdisciplinary Tobacco Use Research Center.

"Our results are consistent with other studies that show that people who decrease their smoking by 50 percent or more do not experience a comparable reduction in risk for lung cancer because they tend to smoke their fewer cigarettes more intensely," Hatsukami said. "The best way to lower the risk for tobacco-caused premature death is to stop smoking altogether."

The study participants included a group of 64 heavy smokers who had reduced their smoking to levels similar with a group of 62 light smokers. The heavy smokers had smoked on average 26 cigarettes per day before their cigarette reduction. All of the heavy smokers had reduced their smoking by at least 40 percent and smoked five cigarettes per day within six months of enrolling in their study. The light smokers used on average 5.6 cigarettes per day.

Hatsukami and her colleagues created a mathematical formula to calculate the degree of smoking compensation in the heavy smokers compared with the light smokers. They measured a biological marker, total NNAL, which indicates the amount of exposure to the tobacco-specific lung cancer-causing agent NNK. Their findings showed that the average level of NNAL in the reduced heavy smokers was more than twice that of the light smokers. This was true even when the two groups smoked about the same number of cigarettes per day. The amount of smoking reduction was shown to be a strong predictor of compensatory smoking, with greater cigarette reduction associated with more compensation.

Based on these findings, Hatsukami said, "Heavy smokers would fare better health-wise by quitting smoking rather than decreasing their cigarette use. Although light smokers have lower levels of disease risk than heavy smokers, a low rate of smoking still means increased risk of disease and death compared to non-smokers and quitters."

A previous study by Hatsukami substantiates that fact. The study focused on smoking reduction using nicotine replacement therapies such as gum or patches. It showed that smokers who reduced their cigarette intake by 73 percent only received a 30 percent reduce in carcinogens because of compensatory smoking. Another study indicated that a reduction of 62 percent in tobacco consumption was associated with only a 27 percent reduction in lung cancer risk.

Source: Medlinx.com

MANY RESUME SMOKING AFTER LUNG OP

The first study to look at smoking relapse among people 'forced' to quit the habit due to impending lung cancer surgery has found that many start smoking again within 12 months of the operation. Around 1,500 people in Ireland are newly diagnosed with lung cancer every year and up to 90% of these cases are caused by cigarette smoking. A team of US researchers followed the progress of 154 patients - all smokers - who were being treated for early stage lung cancer. All underwent surgery in an attempt to remove the cancer.

"These patients were lucky. Their cancer was discovered largely by accident when they were being examined for other medial conditions, and so was potentially curable by surgery. More than two-thirds of lung cancer is diagnosed at later stages in people with symptoms and treatment is much less successful", explained lead researcher, Dr Mark Walker of the University of Washington.

The study found that 43% of the patients had smoked at some point after their surgery, while 37% were smoking regularly 12 months after the operation. Of those who started smoking again, 60% had resumed the habit within two months of their operation. "These patients are all addicted, so you cannot assume they will easily change their behaviour simply because they have dodged this particular bullet. Their choices are driven by insidious cravings for nicotine", Dr Walker said. The researchers found that those who were the last to give up cigarettes prior to surgery - some on the same day as their operation - and who saw smoking as a pleasurable activity that they would have difficulty giving up, were the first to resume the habit.

"These results suggest that patients who wait until cancer surgery to quit smoking need assistance from the medical community to help them stay away from cigarettes and that this intervention should begin as soon as possible after treatment", Dr Walker said. Details of these findings are published in the journal, *Cancer Epidemiology Biomarkers & Prevention*.

Source: Irishnews.com



INHALED CORTICOSTEROIDS ADMINISTERED WITHIN 90 DAYS OF DISCHARGE REDUCE MORTALITY RATE IN COPD PATIENTS

Administration of inhaled cortico-steroids (ICS) within 90 days of hospital discharge is effective in reducing mortality in chronic obstructive pulmonary disease (COPD) patients, especially among those aged 35 to 64 years, according to a recent study published in the journal *Chest*.

The research, consisting of both a cohort study (analyzed using Cox proportional hazard models) and a nested case-control analysis (analyzed using conditional logistic regression), compared mortality rates in COPD patients who received ICS within 90 days of hospital discharge with mortality rates in patients who did not receive ICS. Patients were pooled from the Manitoba (Canada) Population Health Research Repository and included all patients aged ≥ 35 years who had been admitted to the hospital between April 1, 1996, and March 31, 2000, and had been discharged with a primary diagnosis of COPD. Follow-up

was 1 year or until death. Patients who died =90 days after hospital discharge were excluded. Patients (N=4,987) were divided into 2 groups: aged 35 to 64 years (n=965) and aged =65 years (n=4,022).

In the group of patients aged 35 to 64 years, 369 patients (mean age, 56.3±6.9 years) received ICS within 90 days of discharge, and 596 patients (mean age, 54.5±8.1 years) did not receive ICS. The mortality rate between 90 and 365 days was 3.3% among patients who received ICS and 6% among patients who did not receive ICS, representing a 53% reduction in mortality.

In the group of patients aged =65 years, 1,629 patients (mean age, 76.9±6.8 years) received ICS, and 2,393 patients (mean age, 77.7±7.1 years) did not receive ICS. The mortality rate in patients aged =65 years was reduced 25% through the use of ICS. Exclusion of patients with a previous diagnosis of asthma or previous ICS use did not affect the findings.

In the cohort analysis, patients were classified as either ICS users or nonusers based on drug dispensation records =90 days after hospital discharge. Significant differences were noted between groups in terms of receipt of ICS: 79.5% of users filled a prescription for ICS between 90 and 365 days after discharge compared with 12.0% of nonusers. Substantial differences also were noted in regard to refills between 90 and 365 days after discharge: approximately 40% to 45% of users received additional ICS compared with 5% to 10% of nonusers.

Also of significance were the time frames in which ICS were used: 0 to 30 days, 30 to 60 days, 60 to 90 days, and >90 days before death. The receipt of ICS <30 days before death demonstrated the greatest mortality reductions in both COPD deaths (adjusted OR=0.61; 95% CI, 0.41–0.91) and cardiovascular deaths (adjusted OR=0.54; 95% CI, 0.34–0.86).

Compared with bronchodilators, ICS reduced the risk of death by 23% (95% CI, 6%–37%), with a significant 38% reduction in cardiovascular deaths (95% CI, 11%–57%), but no significant reduction in COPD mortality was observed. Overall mortality reduction with ICS was similar to that observed in patients who had received neither bronchodilators nor inhaled steroids. SOURCE: *Chest*. 2006;130:640–646.

MEMORY IMPROVES AFTER SLEEP APNEA THERAPY *Patients With Sleep Apnea See Cognitive Boost After 3 Months of CPAP*

Patients with obstructive sleep apnea (OSA) may improve their memory by using continuous positive airway pressure (CPAP). A new study published in the December issue of *CHEST*, the peer-reviewed journal of the American College of Chest Physicians (ACCP), shows that the majority of patients with OSA, who were memory-impaired prior to treatment, demonstrated normal memory performance after 3 months of optimal CPAP use. The study also showed that memory improvement varied based on CPAP adherence. Patients who used CPAP for at least 6 hours a night were nearly eight times as likely to demonstrate normal memory abilities compared with patients who used CPAP for 2 or fewer hours a night.

"Patients with OSA often complain of daily forgetfulness, eg, losing their keys, forgetting phone numbers, or forgetting to complete daily tasks," said senior study author Mark S. Aloia, PhD, National Jewish Medical and Research Center in Denver, CO, who conducted his research while at Brown University Medical School, Providence, RI. "Where memory is concerned, we may have the ability to reverse some of the impairments by providing effective and consistent use of CPAP treatment."

Dr. Aloia and colleagues examined the degree to which varying levels of CPAP adherence improved memory in 58 memory-impaired patients with clinically diagnosed OSA. All patients underwent cognitive evaluation involving verbal memory testing prior to initiation of CPAP and at a 3-month follow-up visit. Patients were prescribed CPAP machines, and adherence was covertly monitored using internal microprocessors within each device. After treatment, patients were divided into three groups based on their 3-month CPAP adherence: (1) poor users (n=14), patients who averaged fewer than 2 hours/night of CPAP use; (2) moderate users (n=25), patients who averaged 2 to 6 hours/night of CPAP use; and (3) optimal users (n=19), patients who averaged more than 6 hours/night of CPAP use.

At baseline, all patients were found equally impaired in verbal memory, with the average verbal memory score being approximately 2 SD below the mean for all participants. Following 3 months of CPAP treatment, 21 percent of poor users, 44 percent of moderate users, and 68 percent of optimal users demonstrated normal memory performance. Compared with poor users, optimal users of CPAP were nearly eight times as likely to demonstrate normal memory abilities. Overall, the average verbal memory score for all patients improved approximately 1 SD.

"Moderate use of CPAP may help, but it might not allow patients to reach their full potential recovery where memory is concerned, especially if memory is impaired at baseline," said Dr. Aloia. "For patients with OSA, the more regularly and consistently they use CPAP, the better off they will be." Dr. Aloia believes that getting patients to use CPAP at least 6 hours a night could be a challenge for physicians. "Our findings also suggest that this optimal level of CPAP adherence is uncommon following 3 months of treatment," said Dr. Aloia. "We need to find ways of encouraging patients to use their treatment all night, every night in order to optimize treatment response."

"CPAP has proven to be an effective treatment for patients with OSA, yet adherence to treatment remains poor," said Mark J. Rosen, MD, FCCP, President of the American College of Chest Physicians. "Physicians should educate their patients with OSA about the importance of using CPAP consistently and discuss ways to overcome obstacles to adherence."

Source: American College of Chest Physicians

OZONE-GENERATING AIR PURIFIERS

Despite the incredible claims of manufacturers, these products are not recommended by the American Lung Association. There are dozens of ozone-generating (negative ionizer) air purifying products available on the market these

days. These devices purport to purify and clean the air by generating ozone (O₃) gas, which is supposed to remove odors, dust, allergens, viruses, mold, bacteria and other airborne pollutants and irritants in the air. Needless to say, manufacturers target people with asthma, allergies and chronic lung diseases in attempts to lure them into buying these products. Despite the incredible claims of air-purification manufacturers, however, these products are neither endorsed nor recommended by the American Lung Association (ALA). That organization has posted a page on the Internet about ozone generators, declaring that the ALA does not recommend the use of these products.

Ozone is an invisible gas produced in the atmosphere when oxygen (O₂) is disassociated into O₁, for instance, by lightning or a waterfall. It then combines with a molecule of oxygen and becomes O₃. One manufacturer claims: "In nature, this process leaves the air clean and fresh smelling." Ozone is also an air pollutant produced when sunlight combines with hydrocarbons and nitrogen dioxide as a result of fuel combustion.

Consumer Reports examined ozone generators in 1992 and concluded that tabletop and room unit ozone generators are not effective in improving indoor air quality. Then in 1995, the Federal Trade Commission (FTC) prohibited ozone generator manufacturers from using certain unsubstantiated marketing claims such as the claim that ozone is effective in cleaning indoor air, does not create harmful by-products and provides relief from asthma, allergies and other specific conditions.

Nonetheless, e-Bay's Internet auction site contains hundreds of listings for ozone-generating air purifiers. Prices range from under \$100 to over \$4,800.

Some Simple Questions

The following question was sent to about 15 merchants found on the Web: "Will this product improve my asthma?" All of them responded, and none of them indicated that their product would not be useful. In fact, three of them claimed their product would definitely help improve my asthma. One wrote he could not offer medical advice. The others essentially indicated that their air purifier helps asthma. Those who did said they have feedback from customers who claimed that it helped their asthma.

There is little legitimate research to recommend the use of ozone-generating air purifiers. In fact, some evidence indicates that ozone-generating air purifiers can actually do more harm than good. This is especially true for people with asthma and chronic lung disease, older adults and children. Even in relatively small amounts, ozone is a harmful product that can cause chest pain, cough, shortness of breath and throat irritation.

The Food and Drug Administration (FDA) recommends that ionizer air purifiers not emit more than .05 parts per million (ppm) of ozone. Many manufacturers of air purifiers declare their product generates O₃ below that .05 ppm level. But the amount of O₃ generated by these products can vary according to certain factors.

Just opening a door or window will allow some fresh air to enter. That air usually contains from .02 to .05 ppm of ozone. Closing the door or window and running an ozone generator will then add to the initial O₃ level. Besides being suspended in air, the ozone gets absorbed into the walls, carpet and furniture. If the room is poorly ventilated, the ozone level gradually increases and may eventually exceed safe limits.

Simply closing doors and windows to a room at night could result in an unsafe ozone level developing during sleep. At the same time, some machines do not continuously emit precise amounts of ozone. For some products, you can set the control knob on minimal, medium or high.

The Distance Factor

The amount of ozone to which a person is exposed is directly proportional to the distance that person is from the O₃ generating device. That is, the closer to the ozone generator, the higher the ozone level. Imagine if a parent sets an ozone-generating device next to a child's bed to ensure the youngster will get as much fresh air as possible. The parent might then also close the door and windows so that the room will not be contaminated with dirty air from outside.

The amount of ozone produced by ozone-generating air purifiers is actually too low to kill mold and other organic airborne pollutants. It takes an ozone level in a range five to 10 times higher than the safe public standard allows to reduce airborne concentrations and inhibit the growth of some biological organisms.

Ozone-generator manufacturers recommend that their devices be temporarily set at a high level for a few hours to "shock" an unoccupied room. There are other small details to consider. Ozone may not affect contaminants imbedded in porous material. Ozone can also react with other chemicals in a room and produce other potentially dangerous chemicals like aldehydes and formic acid. Ozone can also adversely affect plants and damage rubber, electrical wire coating, fabrics and artwork.

Ozone-generating air purifiers should probably not be sold to the public until they are equipped with an accurate and reliable ozone-measuring monitor that shuts the unit off when the O₃ level becomes unsafe. The fact that many people are needlessly still buying expensive purifiers for their homes indicates a failure of the medical community to effectively educate people about them.

Respiratory and allergy organizations should take a unified public stance about the use of ozone generators and other room air purifiers. These organizations could campaign jointly to help educate the public about the safety and effectiveness of these air cleaning devices.

Source: www.advancweb.com



PATIENTS IN TRIALS OFTEN FORGET RISKS

Many critically ill patients who consent to participate in a clinical trial soon forget the risks and purpose of the trial, a small Swiss study finds. The findings suggest that obtaining informed consent from patients should be a process that's revisited a number of times, rather than just once at the start of a trial.

Patients need to be given information repeatedly during a trial, the study authors wrote in the Dec. 7 issue of Critical Care.

The study of 44 intensive care unit (ICU) patients at the University Hospital of Geneva who agreed to take part in a clinical trial on inflammatory responses found that two-thirds of the patients no longer remembered the purpose or risks of the trial 10 days after they'd given their informed consent. Before they agreed to take part in the trial, the patients were given a 20-minute presentation about the trial, its purpose and its risks. They were also given a leaflet to read.

Ten days into the trial, 35 of the 44 patients remembered having taken part in the trial. However, only 20 of them remembered the purpose of the trial, and 21 remembered the risks. Only 14 remembered both the purpose and the risks. Those 14 patients did not differ from the other patients, except that they had read the information leaflet or had asked at least one question during the pretrial presentation.

SOURCE: BioMed Central

LIVING NEAR BUSY STREET UPS BREATHING PROBLEMS

The closer people live to a main road, the more likely they are to suffer from respiratory symptoms such as breathlessness and wheezing, a new study from Switzerland shows. "These findings from a general population provide strong confirmation that living near busy streets leads to adverse respiratory health effects," Dr. Lucy Bayer-Oglesby, of the University of Basel, and colleagues write in the American Journal of Epidemiology.

While outdoor air pollution -- especially tiny particles that can be breathed deep into the lungs--is known to be hazardous to people's health, to date no researchers have looked at how proximity to main roads affects respiratory symptoms in a general population, Bayer-Oglesby and her team note. To investigate, they looked at data from a two-part study of air pollution and lung disease. It involved 9,651 randomly selected men and women aged 18 to 60 who enrolled in the study in 1991, 8,047 of whom re-enrolled for the second phase of the study in 2002.

People's risk of having attacks of breathlessness increased by 13% for every 500-meter segments of main street located within 200 meters of their home. The risk of such attacks among people who had never smoked fell by 12% for each additional 100 meters between their homes and a main street. Individuals whose homes were within 20 meters of a busy road were 15% more likely to regularly have phlegm in their breathing passages, while they were 34% more likely to have wheezing with breathing problems. The effects of traffic on respiratory health were stronger for men and for people who had never smoked. The effects of living near main streets were weaker in 2002 than in 1991, which may have been due to stricter requirements on auto emissions, the researchers note.

"Living close to main streets or in a dense street network increases the risks for certain respiratory symptoms in adults, particularly for asthma-related symptoms such as attacks of

breathlessness and wheezing and for bronchitic symptoms such as regular cough and phlegm," they conclude.

Source: American Journal of Epidemiology

NEW ALZHEIMER'S BREAKTHROUGH

Most days, you'll find Frances Goldstein at her easel. "I like to paint ... a lot," she says. Jacobo, her husband of 45 years, loves watching her mind at work. Frances has Alzheimer's disease -- diagnosed eight years ago at age 56. "For the first nine months, I couldn't tell her the word Alzheimer's because I was afraid, you know, that she might go into tremendous shock," he says. Instead, Frances fought back. For three years, she's been in a study testing a drug that could change her prognosis.

Nearly 5 million Americans are living with Alzheimer's disease. Drugs on the market can treat the symptoms, but not one goes after what causes it. Now, researchers are on the brink of a huge breakthrough with a drug that targets the cause and could stop the disease in its tracks. "This drug is attacking the cause of Alzheimer's disease," Paul Aisen, M.D., an Alzheimer's specialist at Georgetown University in Washington, tells Ivanhoe. "If it works, it will change the course of the disease and that will represent a real breakthrough."

he drug -- called Alzhemed -- attacks amyloid peptide, the molecule that causes Alzheimer's. In mice, the drug clears the molecule from the brain. Dr. Aisen says, "I think it is tremendously significant."

An early study shows Alzhemed stabilized the disease in nearly half of patients. Now, more than 1,000 are being followed. "If the phase three study confirms that the drug is effective, we will have a way of slowing the progression of Alzheimer's disease for the first time," Dr. Aisen says. To date, more than 600 patients have completed one year of treatment on the medication. The study is scheduled to be complete in January 2007. More than 70 centers across the United States and Canada are taking part. Side effects of the drug have been minimal and primarily include mild gastrointestinal symptoms.

Frances takes Alzhemed twice a day. Jacobo says, "I don't know where we would be if it wasn't for this. We have no idea. I know what she does now. If we can stay the way we are, we would be forever grateful." With hope in hand, Frances continues to make every day and every painting count.

Source: Ivanhoe Broadcast News, Inc.

STUDY LINKS HEARTBURN DRUGS, BROKEN HIP

Taking such popular heartburn drugs as Nexium, Prevacid or Prilosec for a year or more can raise the risk of a broken hip markedly in people over 50, a large study in Britain found.

The study raises questions about the safety of some of the most widely used and heavily promoted prescription drugs on the market, taken by millions of people. The researchers speculated that when the drugs reduce acid in the stomach, they also make it more difficult for the body to absorb bone-building calcium. That can lead to weaker bones and fractures.

Hip fractures in the elderly often lead to life-threatening complications. As a result, doctors should make sure patients have good reason to stay on heartburn drugs long term, said

study co-author Dr. Yu-Xiao Yang of the University of Pennsylvania School of Medicine. "The general perception is they are relatively harmless," Yang said. "They often are used without a clear or justified indication for the treatment."

Some people find relief from heartburn with over-the-counter antacids such as Tums, Rolaids and Maalox. But for others, those medicines do not work well. Moreover, heartburn can be more than a source of discomfort. People with chronic heartburn can develop painful ulcers in the esophagus, and in rare cases, some can end up with damage that can lead to esophageal cancer.

Dr. Sandra Dial of McGill University in Montreal, who was not involved in the study but has done similar research, said patients should discuss the risks and benefits with their doctors and taper off their use of these medicines if they can. Nexium, Prevacid and Prilosec are members of a class of drugs known as proton pump inhibitors. The study found a similar but smaller risk of hip fractures for another class of acid-fighting drugs called H2 blockers. Those drugs include Tagamet and Pepcid.

The study, published in Wednesday's Journal of the American Medical Association, looked at medical records of more than 145,000 patients in England, where a large electronic database of records is available for research. The average age of the patients was 77. The patients who used proton pump inhibitors for more than a year had a 44 percent higher risk of hip fracture than nonusers. The longer the patients took the drugs, the higher their risk. The biggest risk was seen in people who took high doses of the drugs for more than a year. That group had a 2 1/2 times greater risk of hip fractures than nonusers.

Yang said that for every 1,262 elderly patients treated with the drugs for more than a year, there would be one additional hip fracture a year attributable to the drugs. For every 336 elderly patients treated for more than a year with high doses, there would be one extra hip fracture a year attributable to the drugs.

Dr. Doug Levine of AstraZeneca PLC, which makes Nexium and Prilosec, said the study does not prove that proton pump inhibitors cause hip fractures. It merely suggests a potential association, he said. Doctors need to monitor their patients for proper dosage and watch how long they take the drugs, Levine said.

Julia Ellwanger, a spokeswoman for TAP Pharmaceutical Products Inc., which markets Prevacid, said proton pump inhibitors' safety has been well-established by rigorous studies, and the new study does not prove or disprove a connection to hip fractures.

Dr. Alan Buchman of Northwestern University, who was not involved in the research, said the study should not change medical practice, since doctors already should be monitoring the bone density of elderly people taking the drugs and recommending calcium-rich diets to all patients. "Most people are not taking enough calcium to start with," he said. He also wondered if a similar result would have been found in a sunny climate, because vitamin D from sunshine helps with calcium

absorption. Also, Buchman said it not known whether the acid-fighting drugs prevent esophageal cancer. He said the risk of esophageal cancer has been exaggerated in the marketing of these drugs. "I think the risk has been overplayed and scared the community," Buchman said.

Heartburn medicines are heavily advertised in "Ask your doctor about ..." commercials in this country, particularly during the evening news. Nexium is the third biggest selling drug in the world, behind the cholesterol medicine Lipitor and blood thinner Plavix, with global sales totaling \$5.7 billion last year, according to IMS Health, which tracks drug sales.

Yang and his co-authors disclosed in the paper that they have worked as consultants and received speaking fees from companies making acid-fighting drugs. The study was funded by the National Institutes of Health and the American Gastroenterological Association/GlaxoSmithKline Glaxo Institute for Digestive Health.

Men in the study had a higher drug-associated risk of hip fracture than women, possibly because women may be more aware of osteoporosis and may get more calcium in their diets, Yang said. He plans more research on whether calcium-rich diets or calcium supplements can prevent the problem.

Source: jama.ama-assn.org



LITTLE THINGS CAN LIFT YOUR SPIRITS. Smells and comfort matter, more so if you are sick or exhausted.

With 5 pets and 2 smokers, my house is NOT springtime fresh.. So at least once a day, I atomize a mixture of equal parts water and white vinegar into the air. The vinegar smell fades after 15 mins. or so, leaving the air noticeably fresher; but in the meantime I am reminded of deviled eggs and potato salad and picnics.

For all-day scent-ual pleasure, I simmer 2 or 3 culinary cinnamon sticks in a big pot of water, and burn a Granny Smith Yankee candle. This is one of the few scented candles I can stand, and smells very true to its name. Apple pie, anyone?

After a recent hospital stay of 3+ weeks, I bought a 2" thick king-sized Memory Foam mattress topper and 2 twin sized washable zip-on covers. By cutting the foam in half, I now have 2 comfortable take-along mattress toppers.

Since I have trouble sleeping in the hospital, DH bought me an MP3 player and downloaded lots of 60s and 70s music. Better than a sleeping pill - I went to sleep smiling! Good, good, good, good vibrations. There are also lots of books available for the MP3, including free ones downloadable from libraries, for when your mind is alert, but even a paperback seems too heavy.

We put different types of bird feeders outside all the windows we sit by. They keep both the cats and us amused on cold or gloomy days.

There was a heated discussion earlier of salt lamps on the list, so I looked at them online. They are so pretty I may get one for my computer desk, whether or not they "work" as advertised. Warm light and natural looking things can lift and soothe the spirits, ionized air or not.

To clear mucus, I much prefer blowing up 20" balloons to using the spirometer. Party time?

Life is full of vexation, grief, worry, and pain; but also full of little comforts and pleasures. Look at everything you do and everything around you to see how you can make it pleasanter and more comfortable for yourself and your family.

Source: Rosemarie, EFFORTS member



SALAD DOUBTS

Preventing and controlling pathogens on produce

Spinach's healthy reputation suffered a severe blow this fall. On Sept. 13, the Centers for Disease Control and Prevention in Atlanta learned that the raw leafy green was the prime suspect in a spate of virulent *Escherichia coli* infections. The next day, the Food and Drug Administration advised consumers not to eat any bagged fresh spinach. Two weeks later, the FDA announced that it had traced the tainted greens to one California company that bags spinach under several brand names. Fresh spinach from other suppliers soon began reappearing on store shelves and dinner plates. The outbreak's toll, according to the CDC: 3 deaths and more than 200 people sickened in 26 states and 1 Canadian province.

Federal and state officials have found the implicated bacterial strain in cow feces, water, and wild pigs at sites near the four suspected spinach farms in California, but they still don't know how the pathogen got to the greens. Officials continue investigating the incident, says Patti Roberts, a spokeswoman for the California Department of Health Services.

The spinach outbreak joins a growing list of health-related incidents tied to vegetables and fruits. According to the CDC, there's been an increase in such outbreaks in the past few decades. The rise in produce-related illnesses can be linked to several factors. With people becoming savvier about their health, fresh-produce consumption has grown, notes Robert B. Gravani, a food scientist at Cornell University. During this time, however, more-dangerous microbial strains have emerged, he adds. For example, the unusually virulent *E. coli* O157:H7 was first isolated in 1982, after an outbreak tied to contaminated hamburgers. A strain of that same bacterium was responsible for the spinach illnesses.

The food-distribution system also plays a role. "The production of fresh produce is much more centralized than it used to be, and [produce] gets distributed very widely and rapidly. Therefore, one contaminated field may lead to a multistate outbreak that affects a large number of people," says Maria T. Brandl, a microbiologist with the U.S. Department of Agriculture's Agricultural Research Service in Albany, Calif.

Finally, detection strategies have improved, notes Larry R. Beuchat, a food microbiologist at the University of Georgia in Griffin. He suspects that many outbreaks of illness of unknown provenance that occurred 20 or 30 years ago "would today, with the technology available, be confirmed or at least linked to particular types of [contaminated] produce."

Preventing such contamination, from the farm to the dinner table, is the key to food safety, say many researchers. But farmers can't stop all contamination, and once tainted, many fruits and vegetables are difficult to clean. So, for the

rare times when unwanted microbes make their way onto a farmer's crop, researchers are exploring new strategies and technologies to destroy these pathogens and to keep produce—and its consumers—healthy.

On the farm

A typical vegetable's journey to market is full of potential contamination sources. Water that contains pathogens can come into contact with crops both during irrigation and in subsequent washing of harvested produce or its storage in ice. Animal feces can reach produce if domesticated or wild animals roam in the fields. Workers and equipment, such as bins or knives, can taint produce during the harvest or in later production steps. To reduce the risk of contamination, the FDA in 1998 published recommendations for good agricultural practices (GAPs). This set of guidelines addresses issues that farmers must consider at various stages of the growing and harvesting process. For example, before applying manure to the fields, farmers must compost or treat it to remove pathogens.

"I honestly believe that if everyone was diligent about it, applying the principles of GAPs would ... go a very long way to preventing outbreaks," says Trevor V. Suslow, a plant pathologist and food-safety specialist at the University of California, Davis.

While "prevention is the best strategy we have," says Gravani, "it's not a simple task." The guidelines don't specify a single approach on how to achieve all the recommended practices because there's huge diversity among farming operations. "Every farm is different, and every situation is different," says Gravani. The appropriate strategies, he adds, depend upon "the environmental conditions that beset you as a farmer."

For example, a farm's size, location, and even the time of year influence whether it accesses groundwater from wells or surface water from a river or creek, notes Suslow. Water from any of these sources can be dirtied by runoff from a dairy farm or other contaminated land surfaces, but strategies to maintain good water quality will differ according to the water's source. The needs of the crop also affect irrigation practices. Underground-drip irrigation minimizes contamination risks because the water, which may carry pathogens, isn't applied directly to the edible portions of most plants that will be eaten raw. But drip irrigation isn't suitable for all crops and environments. If growers use spray irrigation, which showers edible portions of many plants, they must take other measures to combat contamination. "That's why the guidelines are just that—principles of food safety," says Suslow. "It's incumbent on everybody to understand what it is exactly that they are doing ... and what the risk factors are."

In response to the spinach debacle, a few organizations, such as the Western Growers, an agricultural trade association in Irvine, Calif., have called for mandatory compliance with guidelines for spinach and leafy greens. Much of the "controversy and anguish" on implementing mandatory guidelines, however, is "How do you set criteria in a way that is meaningful?" Suslow says. "You can't just mandate, 'You will have a deep well, and you're only going to use drip irrigation.'"

Chemical cleaners

Researchers have been searching for decontamination technologies that can back up preventive practices. An ideal treatment wouldn't damage fruit and vegetables as it kills pathogens and wouldn't leave a residue "that would cause any concern," Beuchat says. The treatment should also be inexpensive. In terms of effectiveness, a 99.999 percent reduction of pathogens "is what we are shooting for," says Richard H. Linton, a food microbiologist at Purdue University in West Lafayette, Ind.

Growers and processors today usually use chlorine as a sanitizer, adding it to the water in which they wash produce. The main role of chlorine is to prevent a contaminated piece of produce from spreading pathogens to other pieces during washing. The rule of thumb for chlorine, says Suslow, is that an effective concentration will kill 99.999 percent of the microorganisms in the water and 90 to 99 percent of the microbes on produce surfaces. Excessive chlorine damages produce and poses health and environmental concerns. Highly concentrated chlorine solutions can give off gases harmful to workers, and discharging large amounts of the chemical into waterways can affect aquatic life. The Environmental Protection Agency limits chlorine concentrations to 200 parts per million for the water used to clean produce that won't later be rinsed in fresh water.

Some researchers are looking for alternative chemical sanitizers. In an upcoming *Journal of Food Protection*, food microbiologist Alejandro Castillo of Texas A&M University in College Station and his coworkers in Mexico report on a spray that contains 2 percent lactic acid, a chemical used to sanitize carcasses in the meat industry. The researchers first contaminated cantaloupes and bell peppers with either *E. coli* O157:H7 or *Salmonella typhimurium* and then sprayed the lactic acid solution onto the produce for 15 seconds. The treatment reduced the bacterial populations on the cantaloupes by close to 99.9 percent and by slightly more on the smooth-surfaced bell peppers. Linton has been conducting studies with chlorine dioxide gas, the sanitizer that was used to treat anthrax-tainted mail in 2001. In lab tests, his team placed the produce in a desktop-size chamber and then pumped in the gas. The group has tested the gas on apples, green peppers, cantaloupes, strawberries, tomatoes, sprouts, and lettuce. "We find that it's extremely effective for most products," Linton says. For example, in a 2003 study, the researchers reported that treatment with chlorine dioxide gas at a concentration of 7.2 milligrams per liter for 10 minutes removed more than 99.999 percent of *E. coli* O157:H7 from apples' skins. The produce industry would prefer a process that takes no longer than 15 minutes, he says.

Like the chlorine solutions currently used in industry, chlorine dioxide gas kills microorganisms by oxidizing them. But for leafy greens, some concentrations oxidize cut surfaces, turning them white or brown. Linton plans to explore whether modifications of the technique can make it applicable to the greens. The chemical residues that remain on the produce after the gas treatment are within the range considered safe in

drinking water, he says. The team is in the process of seeking FDA approval for the treatment, after which the researchers can test whether it alters the taste of produce.

The group has recently developed a 7-meter-long, 2-m-high, commercial-scale device. A conveyer belt moves the produce through three chambers. The first chamber rinses the food with water to remove dirt. The second chamber exposes the food to chlorine dioxide, and the third gives the food a final water rinse. "It's pretty easy to do things in a lab," Linton says. "Now, we want to subject 500 strawberries in a real-life [commercial] processing situation."

Baths and beams

Some scientists are looking beyond chemical sanitizers for decontamination options. Bassam A. Annous, a microbiologist with the USDA's Agricultural Research Service in Wyndmoor, Pa., has developed a pasteurization technique for cantaloupes. It reduces salmonella populations on cantaloupe surfaces by 99.999 percent. Annous and his colleagues built a commercial-scale tank that can process up to 360 melons per hour. A conveyer grabs a melon and immerses it in water heated to 76°C, which is hot enough to kill bacteria. In 3 minutes, the conveyer propels the submerged melon across the tank and out the other end. The researchers immediately seal each melon in a bag and then cool it in ice water. They are developing a cooling method that would work better on an assembly line. The brief heat treatment isn't detrimental to the flesh of cantaloupes because they have thick rinds, Annous says. The edible portion of the fruit begins about 5 millimeters below the rind. In the *March Journal of Food Science*, his team calculated that for the first millimeter below the surface, the heat rises rapidly enough to kill microbes. But the flesh of the fruit 10 mm below the surface stays below 36°C. That's cool enough to preserve the fruit's quality, says Annous. In tests so far, fresh-cut pieces of pasteurized cantaloupes maintained their color, odor, and vitamin C content. Annous says that he hopes that his group will soon team with industry to test the technique in production facilities.

Some researchers propose that irradiation, a technique that the USDA approved for poultry in 1992 and for meats in 1999 (SN: 1/15/00, p. 40: Available to subscribers at <http://www.sciencenews.org/articles/20000115/note15.asp>), may be useful to decontaminate some produce. Castillo and his colleagues at Texas A&M University have treated cantaloupes and tomatoes with an irradiation method that uses electron beams. Meat producers that irradiate their products employ either electron beams or gamma rays. In the *March Journal of Food Protection*, Castillo and his team describe irradiation of fresh-cut tomato cubes infected with one of two strains of salmonella. The treatment reduced populations of one strain by 99 percent and the other by 90 percent. The group hasn't yet conducted taste tests of the tomatoes. Castillo says that he's currently trying the technique on spinach. Like other treatments, irradiation isn't appropriate for every type of produce. Castillo says that the method damages the texture of grapes and some other fruits and vegetables. Moreover, "some foods will lose nutritional power—for example, some vitamins are affected by irradiation," Castillo says. He adds that fruits and vegetables need to be tested

individually to see how each one fares under the treatment. Irradiation also requires expensive equipment. Growers would have to send produce to regional centers for treatment, Castillo says, because it is unlikely that a single plant could afford the machinery.

Back to square one

Among the sanitizers and technologies under review, "there are promising developments," says Beuchat, but "there's still room for improvement." Rather than look to a single treatment, the most effective approach to sanitizing produce may be to combine several strategies that remove and kill pathogens, says Brandl. Moreover, when more is known about how pathogens find their way onto produce, researchers may come up with new methods to prevent contamination. Brandl says that researchers need to determine, for example, the harmful bacteria's preferred locations on plants and their interactions with normal microbial populations that live there. "Once we have sufficient information about critical risk factors," she predicts, "we'll be able to come up with additional, specific guidelines for the safe production of fresh fruits and vegetables." Source: sciencenews.org



SOMETHING TO RELISH

Three foods your arteries can't get enough of: onions, celery, and parsley.

Whether you add them to soups, relish dishes, sandwiches, or salads, improving the health of your arteries may be as simple as munching on these flavor boosters. People who eat more flavonoid-rich veggies like these cut their risk of hardening of the arteries -- especially in the legs -- in half.



MIX UP YOUR FIBER FIX

Man shall not live by whole-wheat bread alone.

To get the full range of heart benefits from fiber, think outside the bread box once in a while. Whole grains are great, but dip into fiber-rich fruits and veggies, as well as nuts and seeds. Fiber from different sources protects your heart in different ways.

How does your heart love fiber? Let us count the ways. It guards against obesity, calms blood pressure, helps keep cholesterol levels normal, and lowers the concentration of homocysteine, all of which can impact cardiovascular disease. And a recent study shows that where you get your fiber affects what it does for you. Here are four key sources:

1. High-fiber cereal is linked with a lower body mass index (BMI) and healthier blood pressure and homocysteine levels.
2. Fruit eaters enjoy a lower waist-to-hip ratio and lower blood pressure, too.
3. People who get their fiber mostly from vegetables reap blood pressure and homocysteine benefits.
4. Nuts, seeds, and dried fruits go hand in hand with a lower BMI, lower waist-to-hip ratio, better glucose concentrations, and lower levels of apolipoprotein (apo) B, a cholesterol marker.

The heart-protective benefits kick in at 25 grams of total fiber a day. Just make sure those grams don't all come from one place. In addition to fruits, veggies, nuts, and seeds, legumes also are a great source.

Get three sources of fiber at once with this crispy-chewy-fruity Apricot-Walnut Cereal Bar recipe from Eating Well.

Apricot-Walnut Cereal Bars

Yield: 16 servings

Active Time: 30 minutes

Total Time: 2 hours (including cooling time)

Crisp and chewy, this bar is a good-for-you alternative to store-bought cereal bars. The secret ingredient, silken tofu, will give your day a protein-packed start. The recipe also works with other fruit-and-nut combinations.

- 3 cups old-fashioned rolled oats
- ½ cup chopped walnuts (about 2 ounces)
- 3 cups unsweetened puffed-grain cereal, such as Kashi
- 2 cups chopped dried apricots
- ¼ cup all-purpose flour
- ½ teaspoon salt
- 12 ounces silken tofu, drained (about 1 1/3 cups)
- 1 large egg
- ½ cup canola oil
- 1 cup honey
- 1 tablespoon vanilla extract
- 2 tablespoons freshly grated lemon zest

1. Preheat oven to 350° F. Coat a large (15 1/4-by-10 1/4-inch) jellyroll-style pan with cooking spray.
2. Spread oats and walnuts on a baking sheet with sides. Bake until fragrant and light golden, 8 to 10 minutes. Transfer to a large bowl and add puffed cereal, dried apricots, flour and salt; stir to combine.
3. Meanwhile, puree tofu, egg, oil, honey, vanilla and lemon zest in a food processor or blender until smooth, scraping down the sides as needed. Make a well in the center of the oat mixture; fold in the tofu mixture until combined. Spread evenly in the prepared pan.
4. Bake until firm in the center and golden brown, 35 to 40 minutes. Let cool completely in the pan on a wire rack before cutting into bars with a sharp knife.

NUTRITION INFORMATION: Per serving: 306 calories; 12 g fat (1 g sat, 5 g mono); 13 mg cholesterol; 46 g carbohydrate; 6 g protein; 4 g fiber; 87 mg sodium.

Nutrition bonus: Fiber (14% daily value).

3 Carbohydrate Servings

MAKE AHEAD TIP: To make ahead: Individually wrap in plastic and keep at room temperature for up to 5 days or freeze for up to 1 month. Thaw at room temperature or remove plastic, wrap in a paper towel and defrost according to your microwave's directions

Source: EatingWell.com



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