

NUTRITION AND ASTHMA

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- asthma - the result of interaction genetic + environmental factors
- increasing prevalence - result of changes in environmental factors (westernization)
- Diet - role in asthma

Role of diet in asthma

1. a food allergen can cause asthma
2. role of breast-feeding for prevention of asthma later in life
3. a low intake of antioxidative diet - a risk factor
 - (- cations such as Na, K and Mg)
 - (- omega-3 and omega-6 fatty acids)

- USA (1980) 6-8% of infants and 1.5% of adults are allergic to food
- skin tests - negative + history - not helpful.
- symptoms - gradually hours or days after ingestion
- Sensitivity - ingestion of small quantities , inhalation of food allergens , in cooking fumes
- Children -sensitive to foods > adults

- Food allergy can cause both immediate and delayed patterns of asthma.
- Immediate food reaction (Type-I allergy mediated by Ig-E) : acute asthma
- Delayed patterns of food allergy (Non-Ig-E-mediated) : chronic asthma

Common foods causing asthma

- milk
- eggs
- Fish
- Peanuts
- soy
- yeast
- Cheese
- wheat
- rice
- chocolates

Eggs

- Oral + non oral route
- the major allergens **in egg white** - ovalbumin, ovomucoid, and ovotransferrin

Milk

- กีน หรือ สูดดม

Wheat

- Wheat is most rich in gluten, with the other grains containing a lesser mixture of gluten and gliadin .
- กิน oats, rice, rye, barley หรือ corn แทน

Peanuts

- Peanuts are one of the most allergenic foods and death

Fish

- Avoid all fish species
- Though fish oils have beneficial role in asthma

Sulfites and sulfating agents

Common food sources are

- dried fruits and vegetables
- potatoes (some packaged and prepared)
- wine, beer, bottled lemon or lime juice,
- pickled foods

- there is no definite and reliable tests to diagnose food allergy.
- demonstration of the relief of symptoms on removal of a given food item and recurrence of symptoms on its reintroduction

oxidative-antioxidative imbalance

- The oxidants (cigarette smoke and air-pollution / generated through inflammatory process - allergen and viral infection)
- endogenous antioxidant defense system - depends on adequate nutritional antioxidants
- Reactive oxygen species- contract airway smooth Muscles+ stimulate histamine release from mast cells + mucus secretion

Antioxidants

- vitamin-A/ β carotene
 - vitamin-C
 - vitamin-E
 - selenium
-
- which may prevent oxidative injury.

Vitamin-C

Lower plasma and leukocyte concentration of vitamin-C :

- a high prevalence of asthma
- increased respiratory symptoms
- reduced pulmonary functions
- increased airway responsiveness

- Supplementation : decrease asthma severity and frequency, exercise induced bronchospasm + airway responsiveness to methacholine

- Vit C 100 mg /day : ↑ FEV1 10-50 ml
- Source- citrus fruits , red and yellow pepper



Vit C

- free radical scavenger present in intracellular and extracellular lung fluids
- a general antihistamine effect
- inhibits the prostaglandins production
- vitamin-C reduces the duration of episodes and the severity of symptoms of the common cold

Vitamin-E

- High vitamin-E intake reduced asthma incidence.

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- 1.a membrane stabilizer and defence against oxidant induced membrane injury
- 2.suppress neutrophil migration and inhibits Ig-E production
- 3.influence T-helper cell development

Vitamin-A and b-Carotene

- the development, maintainance, differentiation, and regeneration of lung epithelial cells
- antioxidant action

Vitamin-B complex

- vitamin-B6 deficiency : in many asthma
- asthma inhalers interfere with the absorption of vitamin-B6
- vitamin-B6 supplement lessen the asthma attacks

Flavones and Flavanoids

- Found in fruits and red wine

Fruits and Vegetables

- a high fruit intake –reduce risk of asthma, decline in FEV1
- a high intake of fruits (≥ 1 /week) : FEV1 80-100 ml higher than a low intake

- Fruits and vegetables are better than vitamins pills.
- Fruits increase lung functions more than vegetable.
(Fruits are high in vitamin-C)

Fast Food

- frequent consumption of **hamburger** showed a dose dependent association with asthma symptoms
- In an Indian study, **pasta, noodles** and the like fast foods and **meat** increases the risk of asthma/wheeze among children

Minerals

Selenium

- Selenium deficiency may greatly increase the risk of asthma

Selenium functions

- cofactor for the antioxidant enzyme glutathione peroxidase to reduce the synthesis and release of leukotriene B4
- along with vitamin-C, attenuate the activation of nuclear factor kappa- β , a transcription factor that upregulates inflammatory cytokines associated with the asthmatic immune response

Magnesium

- smooth muscle relaxation and mast cell stabilization.
- Bronchodilatation when IV in acute severe asthma.
- strong evidence of protection by dietary magnesium against asthma
- Milk and other dairy products, whole grains, nuts, leafy green vegetables

Sodium


- increase salt intake - worsening asthma
- sodium restriction in three double blind clinical trials- improvements in FEV1+ symptoms
- Dietary sodium cause bronchoconstriction through potentiation of the electrogenic sodium pump in the membrane of the airway smooth muscles

Trace Minerals

- Copper and zinc have role in antioxidant defense as cofactor in superoxide dismutase.
- Zinc is an essential trace mineral for immune mechanisms
- Manganese has been found deficient in bronchial biopsies of asthmatic patients, indicating manganese repletion could help

Fatty acid
(omega-3, omega-6)

- Omega36: fish oil , canola and flaxseed oils
- Omega-6: soybean, corn, safflower, and sunflower oils

- Inflammatory cells begins with the release of arachidonic acid from membrane phospholipid by phospholipase enzymes
- subsequent metabolism by cyclooxygenase or lipoxygenase enzymes  prostaglandin or leukotriene products



Fatty Acids

- omega-3 fatty acids in fish oil
- omega-3 fatty acids-inhibiting arachidonic acid metabolism

omega-3

- omega-3 is a substrate for the less active prostanoids (e.g. thromoxane A₃) and LT (LTB₅)
 - to reduce airway inflammation, airway Hyperresponsiveness
- ☐ fish oil, fish, shellfish and leafy vegetables

Fish oil

-  inflammatory respiratory diseases
- preserve normal airway resistance
-  allergic sensitization

omega-6

- derivatives of arachidonic acid (omega-6) are leukotriene B4 (LTB4) and LTC4, D4, E4 and PGE2
 - LTB4 - potent neutrophil chemoattractant
 - LTC4, D4, E4 – Potent bronchoconstriction
 - PGE2- promote lymphocyte response + Ig-E
- ☐ vegetable fats such as margarine

Amino Acids

- cystine, methionine, glycine and glutamic acid- to glutathione metabolism
- increase in the proportion of **protein from animal** sources **rise in asthma prevalence**

Breast feeding

- WHO : For the first 4-6 months breast feeding significantly decreases the risk of asthma and other allergic diseases among children

Role of Maternal Diet

- maternal dietary avoidance is unlikely to reduce the risk of atopy in the child
- maternal oily fish intake during pregnancy may protect offsprings from asthma

- promotion of Lactobacillus and other gut micro-organisms protect against the development of atopic disease.
- Breast feeding promotes gut colonization with bifi dobacterium + reduces chances of atopy and/or asthma

Dietary supplementation with probiotics

- In a double blind, randomized, placebo controlled trial
- lactobacillus (given prenatally to mothers and then postnatally for 6 months to their infants) resulted in 50% reduction in the rate of atopic eczema at the age of two years (ยังไม่แน่นอน)

COPD

- Cigarette smoke, a major risk factor for COPD, is a significant source of oxidants; smokers have been found to have decreased levels of plasma ascorbate, p-carotene, and vitamin E
- antioxidant intake could modulate the lung damage induced by oxidative stress .

- Fresh fruits and vegetables contain vitamin C (e.g., broccoli, spinach, tomatoes, and citrus fruits)
- carotenoids (e.g., carrots, tomatoes, grapefruit, beans, broccoli, oranges, and mangos)

- vitamin E are oil products such as mayonnaise, vegetable and seed oils (corn, safflower, and soybean), butter, and eggs.
- Flavonoids are in fruits and vegetables (apples, lemons, oranges, potatoes, and cauliflower) and tea

- Selenium is found in grain, meat, seafood

Recommended Dietary Allowance requirements

- 60 mg/day for vitamin C
(100 mg/day for smokers)
- 800-1,000 retinol equivalents /day
- 55-70 u.g/day for selenium

Magnesium

- In a study conducted among 2,633 adults aged 18-70 years reported that a 100- mg/day higher magnesium intake was associated with a higher FEV1

Antioxidants

- 10 cross-sectional studies conducted in adults reported that vitamin C intake had a protective effect against decline in lung function
- In a study of 1,502 lifelong smokers and 1,357 current smokers aged 18-69 years, FEV1 was < 78 ml among subjects who drank no fruit juice or who ate fresh fruit < once /week during the winter

- In a cross-sectional study that included 1,860 adults aged 45-75 years, higher plasma vitamin C levels were associated with higher pulmonary function.

- an increase of 1 mg/day in vitamin E intake was related to increases of 42 ml in FEV, and 54 ml in forced vital capacity

- 2 studies confirmed the positive association between FEV₁ and antioxidant nutrients, particularly vitamin E, vitamin C, and some carotenoids

- long-term vitamin C intake is significantly related to lung function.
- A real association between fresh fruit consumption and lung function

Fish oil

- In a cross sectional analysis of data from the Atherosclerosis Risk in Communities (ARIC) Study, which was conducted among 9,000 male smokers aged 45-64 years, results suggested that dietary fish intake had a protective effect on COPD risk.

- Among 6,346 male smokers aged 45-68 years, after adjustment for cigarettes per day, age, height, and daily caloric intake, these authors found FEV₁ to be higher among subjects with a high dietary fish intake than among those with a low fish intake.

SUMMARY

- the impact of nutrition on obstructive lung disease is most evident for **antioxidant vitamins, particularly vitamin C** and, to a lesser extent, vitamin E.

- vitamin C supplementation : a short-term protective effect on airway responsiveness and pulmonary function.
- to be proven a protective effect on the evolution of chronic asthma.

- *omega-3* fatty acids have a protective effect against airway hyperreactivity and lung function decrements(uncertain)
- fresh fruit may reduce risk of airway limitation(uncertain)

- higher levels of oxidative stress, such as cigarette smokers: benefit from dietary supplementation(antioxidant intake)

- magnesium infusion may have a place in the acute treatment of asthma, but it does not seem to have long-term benefits

COPD

Daily intake of vitamin C

- 60 mg/day among nonsmokers
- 100 mg/day among smokers

Effective method

- increase their daily consumption of fresh fruits and vegetables
- to stop smoking cigarettes
- to minimize their environmental and occupational exposure to pollutants and other agents