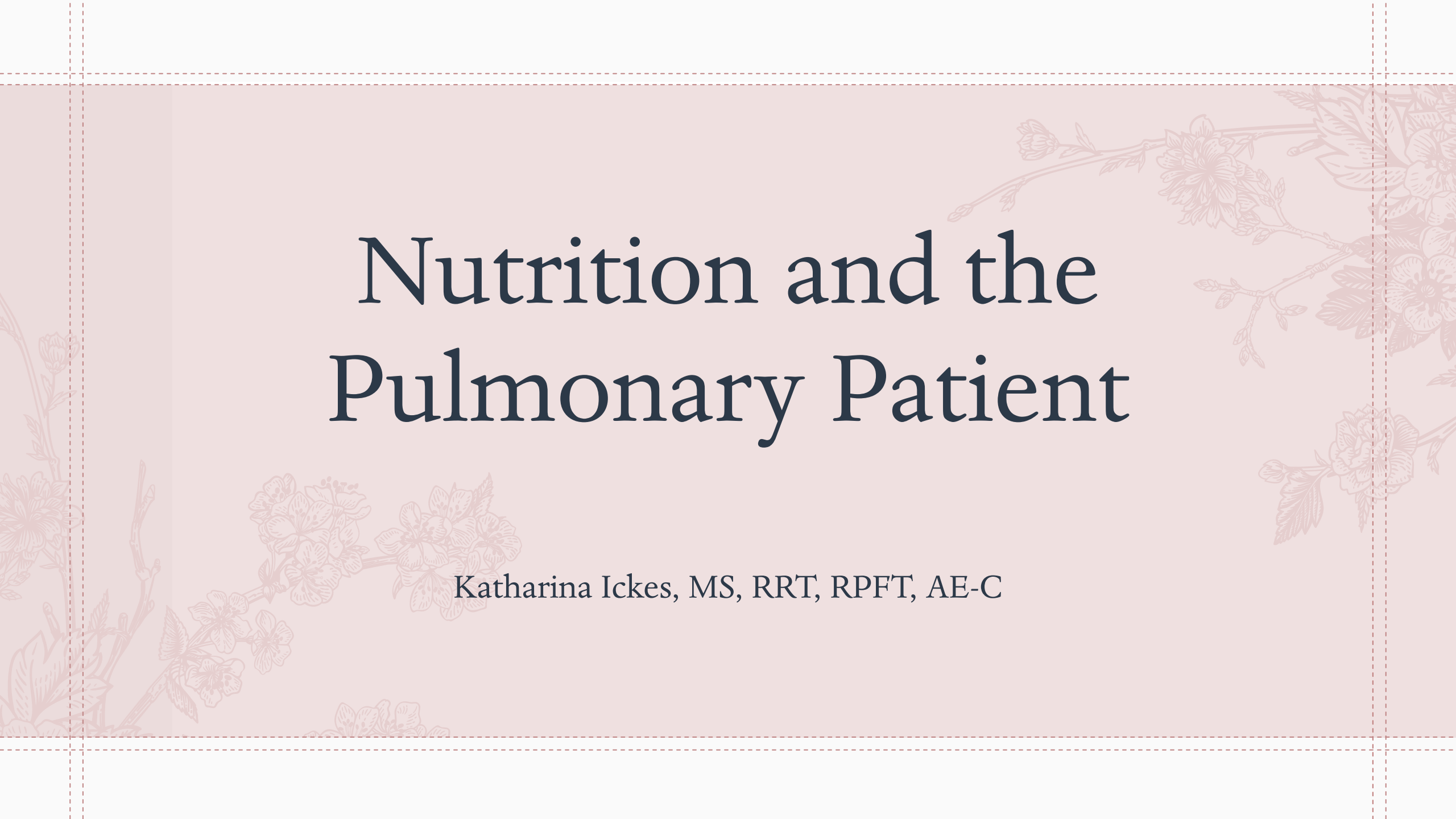


A decorative border featuring delicate line drawings of flowers and leaves, primarily in the top right and bottom left corners, framing the central text area.

Nutrition and the Pulmonary Patient

Katharina Ickes, MS, RRT, RPFT, AE-C

Objectives

Review energy sources in food

Describe how pulmonary patients utilize food differently

Identify how diet modification can improve respiratory symptoms

List examples of how nutrition can affect pulmonary function measurements



Nutrients

- ♦ Carbohydrates
- ♦ Proteins
- ♦ Fats
- ♦ Vitamins & Minerals

Carbohydrates



Calories from glucose that fuels muscle or is stored as fat.



O₂ combines with glucose in the cells to release ATP (adenosine triphosphate).



ATP is used during exercise.



60% daily calories should be from carbohydrates in fruits, vegetables, breads and grains (50% in children).

Fats

Fat is stored energy that is burned during low level activity (reading/sleeping) and at high level (long training runs).

Necessary to build brain and nerve tissue.

Protects organs and helps to absorb vitamins.

The body requires fat consumption.

Not as much as most of us eat!

Total fat intake for adults should be 20-35% of total daily calories, focusing on healthy unsaturated fats

(30-35% in children)

Understanding Dietary Fats

Saturated Fats and Cholesterol

Saturated fats, mostly from animal products, are solid at room temperature and raise LDL cholesterol levels. Should be no more than 5-6% of the daily caloric intake.

Benefits of Monounsaturated Fats

Monounsaturated fats, found in olive oil and avocados, help lower bad cholesterol and support heart health.

Trans Fats' Health Risks

Trans fats in processed foods raise LDL and lower HDL cholesterol, significantly increasing the risk of heart disease.

Polyunsaturated Fats

Unsaturated fats, including mono- and polyunsaturated types, are essential for maintaining overall heart health.



CLINICAL PRACTICE GUIDELINE

2026 ACC/AHA/AACVPR/ABC/ACPM/ ADA/AGS/APhA/ASPC/NLA/PCNA Guideline on the Management of Dyslipidemia

A Report of the American College of Cardiology/American Heart Association
Joint Committee on Clinical Practice Guidelines

Developed in Collaboration With and Endorsed by the American Association of Cardiovascular and
Pulmonary Rehabilitation, Association of Black Cardiologists, American College of Preventive
Medicine, American Diabetes Association, American Geriatrics Society, American Pharmacists
Association, American Society for Preventive Cardiology, National Lipid Association, and
Preventive Cardiovascular Nurses Association

**Recommendation for Dietary Management of
LDL-C Disorders**
**Referenced studies that support the recommendation
are summarized in the Evidence Table.**

COR	LOE	RECOMMENDATION
1	B-R	1. In adults and children with or without ASCVD, a diet emphasizing intake of fruits, vegetables, nuts, legumes, whole grains, and fiber, while replacing saturated and trans fats with dietary monounsaturated and polyunsaturated fats, is recommended to decrease LDL-C levels and reduce ASCVD risk. ¹⁻⁴

Nutrition Labels Are Important!

Nutrition Facts	
About 11 servings per container	
Serving size 3 oz (86g/about 9 pieces)	
Amount per serving	
Calories	130
% Daily Value*	
Total Fat 8g	10%
Saturated Fat 1.5g	7%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 450mg	19%
Total Carbohydrate 14g	5%
Dietary Fiber 1g	4%
Total Sugars less than 1g	
Includes 0g Added Sugars	0%
Protein 2g	
Vitamin D 0mcg	0%
Calcium 0mg	0%
Iron 0.6mg	4%
Potassium 320mg	6%
The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.	
INGREDIENTS: POTATOES, VEGETABLE OIL, BLEND (SOYBEAN AND COTTONSEED), UT, YELLOW CORN FLOUR, DEXTROSE, SODIUM ACID PHOSPHATE (TO ADJUST NATURAL COLOR), DEHYDRATED ONION, SODIUM ACID SULFATE, NATURAL FLAVOR.	
DISTRIBUTED BY RAFT REIMZ FOODS COMPANY, PITTSBURGH, PA 15222	



Scan here or call
1-800-892-2401
for more food
information.

Nutrition Facts	
Serving Size	1 Pastry (52g)
Servings Per Container	8
Amount Per Serving	
Calories 210	Calories from Fat 50
% Daily Value*	
Total Fat 6g	9%
Saturated Fat 2g	10%
Trans Fat 0g	
Polyunsaturated Fat 2g	
Monounsaturated Fat 1g	
Cholesterol 0mg	0%
Sodium 190mg	8%
Total Carbohydrate 37g	12%
Dietary Fiber less than 1g	3%
Sugars 14g	
Protein 2g	
Vitamin A 10% • Vitamin C 0% • Calcium 0% • Iron 10%	
Thiamin 10% • Riboflavin 10% • Niacin 10% • Vitamin B ₆ 10%	
*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:	
	Calories: 2,000 2,500
Total Fat	Less than 65g 80g
Saturated Fat	Less than 20g 25g
Cholesterol	Less than 300mg 300mg
Sodium	Less than 2,400mg 2,400mg
Total Carbohydrate	300g 375g
Dietary Fiber	25g 30g
Calories per gram: Fat 9 • Carbohydrate 4 • Protein 4	
INGREDIENTS: ENRICHED FLOUR (WHEAT FLOUR, NIACIN, REDUCED IRON, VITAMIN B ₁ [THIAMIN MONONITRATE], VITAMIN B ₂ [RIBOFLAVIN], FOLIC ACID), CORN SYRUP, HIGH FRUCTOSE CORN SYRUP, DEXTROSE, SOYBEAN AND PALM OIL (WITH TBHQ FOR FRESHNESS), CRACKER MEAL, CONTAINS TWO PERCENT OR LESS OF WHEAT STARCH, SALT, DRIED STRAWBERRIES, DRIED PEARS, DRIED APPLES, LEAVENING (BAKING SODA, SODIUM ACID PYROPHOSPHATE, MONOCALCIUM PHOSPHATE), CITRIC ACID, CARAMEL COLOR, SOY LECITHIN, XANTHAN GUM, MODIFIED WHEAT STARCH, VITAMIN A PALMITATE, RED 40, NIACINAMIDE, REDUCED IRON, VITAMIN B ₆ (PYRIDOXINE HYDROCHLORIDE), YELLOW 6, VITAMIN B ₂ (RIBOFLAVIN), VITAMIN B ₁ (THIAMIN HYDROCHLORIDE).	
CONTAINS WHEAT AND SOY INGREDIENTS.	
Distributed by Kellogg Sales Co., Battle Creek, MI 49016 USA	

Nutrition Facts	
Serving Size 1 Cup (227g)	
Servings Per Package 4	
Amount/serving	
Calories 130	Fat Cal. 0
%DV*	
Total Fat 0g	0%
Sat. Fat 0g	0%
Trans Fat 0g	
Cholest. 10mg	3%
Potassium 220mg	6%
Sodium 65mg	3%
Total Carb. 17g	6%
Dietary Fiber <1g	3%
Sugars 14g	
Protein 14g	28%
Vitamin A 0% • Vitamin C 0%	
Calcium 15% • Iron 0%	
*Percent Daily Values (DV) are based on a 2,000 calorie diet.	

Nutrition Facts	
Serving Size 1 bar (50g)	
Servings Per Container 15	
Amount Per Serving	
Calories 230	Calories from Fat 120
% Daily Value*	
Total Fat 14g	22%
Saturated Fat 3.5g	18%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 150mg	6%
Total Carbohydrate 22g	7%
Dietary Fiber 7g	28%
Sugars 10g	
Protein 11g	18%
Vitamin A 0% • Vitamin C 0%	
Calcium 4% • Iron 8%	
*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:	
	Calories: 2,000 2,500
Total Fat	Less than 65g 80g
Sat Fat	Less than 20g 25g
Cholesterol	Less than 300mg 300mg
Sodium	Less than 2,400mg 2,400mg
Total Carbohydrate	300g 375g
Dietary Fiber	25g 30g
Protein	50g 65g

Proteins

- ♦ Essential for building and repairing muscles and synthesizing hormones.
- ♦ Digested into amino acids to rebuild muscle.
- ♦ Keeps you feeling full to avoid overeating.
- ♦ 15% of daily total calories should be from lean proteins (30% for children).
 - ♦ Fish
 - ♦ Poultry
 - ♦ Beans/legumes

Vitamins & Minerals

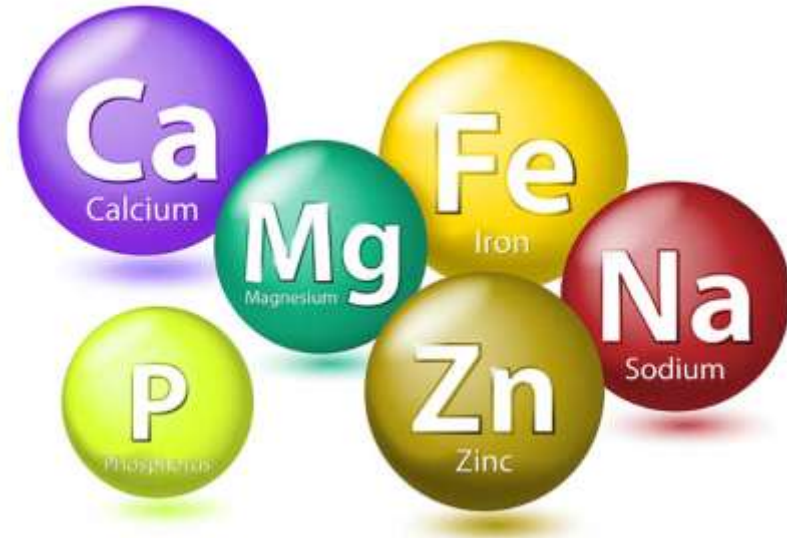
Vitamins

- ♦ Catalysts that regulate chemical reactions in the body
- ♦ Most are obtained from the diet
- ♦ Not a source of energy



Minerals

- ♦ Elements obtained from food that combines in the body to regulate body processes
- ♦ Not a source of energy



Why Nutrition Is Important for a Pulmonary Patient

- ♦ Severe dyspnea means the patient makes a conscious effort to breathe.
- ♦ Extra effort can increase the REE up to 15%.
 - ♦ Resting Energy Expenditure (REE) is the number of calories your body uses over a 24-hour period to maintain fundamental physiological processes while you are awake but resting comfortably.
 - ♦ This typically accounts for 60-75% of total daily energy expenditure.
- ♦ COPD patients can use 10x as many calories breathing compared to a healthy person.



Metabolic Changes in COPD

- ♦ In severe COPD, weight progressively drops.
 - ♦ More calories are burned.
 - ♦ Rate of infections increase.
 - ♦ A vicious cycle is created with decreased food intake and increased fatigue.
 - ♦ Low BMI is associated with poor prognosis.
 - ♦ Malnutrition risk ($\text{BMI} < 20 \text{ kg/m}^2$) is a common concern.

Contributions for Weight Loss

- ♦ Dyspnea interfering with chewing and swallowing.
- ♦ Chronic mouth breathing leading to unsatisfactory food taste.
- ♦ Chronic mucus production and cough.
- ♦ Fatigue, headache and confusion from hypercapnia.
- ♦ Anorexia and depression.
- ♦ Medication side effects.

ATS Recommendations

- ♦ Start caloric supplements.
 - ♦ BMI < 21
 - ♦ Involuntary weight loss of more than 10% in the last 6 months
 - ♦ Involuntary weight loss of more than 5% in the last month
 - ♦ Depletion in lean body mass

Metabolism

The conversion of carbohydrates, fats and proteins to energy and CO₂ in the cells.

RQ is the ratio of CO₂ produced to O₂ consumed, minus the energy expenditure.

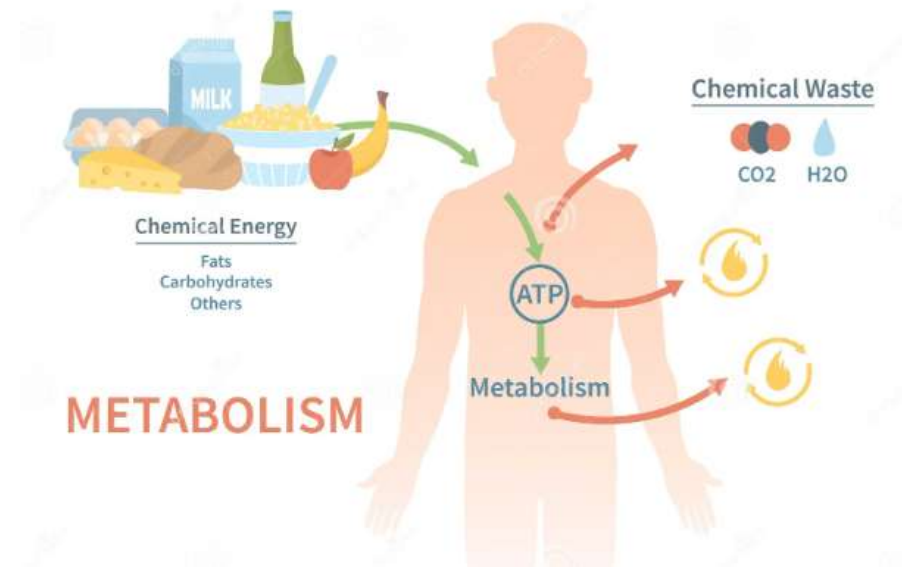
Carbohydrate RQ = 1

the most CO₂ produced

Protein RQ = 0.8

Fat RQ = 0.7

the least CO₂ produced



Diet Modifications With COPD

Consuming carbohydrates will produce the most CO₂ and eating fats will produce the least.

High fat/low carb meals may reduce symptoms but may be contraindicated with coexisting heart conditions.

Eat when energy levels are high, usually in the morning.

Eat several small, nutrient rich meals to avoid breathlessness while eating.

Eat slowly and chew thoroughly to avoid swallowing air.

Choose foods easy to prepare and chew.

Consume sources of calcium and Vitamin C to support bone health.

ICS can reduce bone density.

No proof that dairy thickens or increases phlegm production.

Limit salt

Water retention can increase dyspnea.

Best therapy for fluid retention is limiting salt or using a diuretic, not limiting water intake.

Avoid foods that causes gas or bloating.

Eat while sitting up to ease lung pressure.

Drink liquids at the end of the meal to avoid feeling full while eating.

Eat water packed fruit or fruit with no added sugar.

Soy Consumption, COPD Risk and Respiratory Symptoms

Hirayama studied 278 COPD patients diagnosed in a 4-year period.

Spirometry and a questionnaire were completed regarding demographics, lifestyle and food habits.

Total soy consumption correlated positively with FVC, FEV1, FEV1 / FVC and FEV1% predicted.

Symptoms were inversely associated with high consumption of soy.

- Tofu
- Soybeans
- Natto
- Miso Soup
- Bean Sprouts
- Soy Milk

Relationship Between Fish Consumption and Respiratory Symptoms

Fluge reviewed results of over 4,000 residents in Bergen, Norway with an 80% response rate.

Compared demographics, smoking habits, occupational exposure, fish consumption and self-reported respiratory symptoms.

A higher fish intake showed a decrease in cough at night and chest tightness.

Fluge, O et al, European Respiratory Journal, 1998, 12(2):336-341.

Association with Dietary Fiber and Cough with Phlegm

Butler analyzed the results of phone interviews of middle-age Chinese men and women in Singapore.

Questions included the dietary intake of fiber and new onset of cough with phlegm at baseline and follow-up.

Non-citrus fruit (apples, pears and grapes) were associated with reduced cough with phlegm.

No effect with vegetable intake and respiratory symptoms.

Suggests high fiber diet from fruit and soy may reduce incidence of chronic respiratory symptoms.

Fruit and Vegetable Intake in Children

Air pollution is associated with inflammatory markers and reduced lung function in asthmatic children.

Romieu (2009) studied the effects of air pollution and diets rich in fruits and vegetables.

- 158 asthmatics and 50 non-asthmatics at the Children's Hospital of Mexico

- Every 2 weeks, participants performed spirometry and had nasal lavage

- Questionnaires completed for food intake

Fruit and vegetable intake and adherence to the Mediterranean Diet decreased inflammatory response and increased lung function in asthmatic children

- No effect on diet was observed in healthy children

Food Choices and the Impact of PFT Results

Nitrates

- ♦ Leafy greens (lettuce, spinach) and beets: false high FeNO readings.
- ♦ Caffeine, alcohol, tobacco: false low FeNO readings.
- ♦ Recommendation- refrain from eating a few hours before testing and be aware of lifestyle choices when testing is performed.

Sulfites

- Used as a preservative and in wine making.
- Common in packaged foods, alcohol and medications.
 - Sulfur dioxide
 - Potassium bisulfite
 - Potassium metabisulfite
 - Sodium metabisulfite
 - Sodium sulfite
- Can cause asthma symptoms.
 - Wheezing to anaphylaxis

Nitrite Ingestion and Lung Damage

Rui found that frequent consumption of cured meats is associated with lower lung function.

Higher ingestion of cured meat was inversely proportional with FEV1 and FEV/FVC.

Associations were not modified by smoking status.

Frequent cured meat consumption was associated with a pattern of obstructive lung disease.

Food and VO₂

- ♦ VO₂ = O₂ Consumption (O₂ Uptake) = the best indicator of workload performance in a CPET.
 - ♦ A higher VO₂ max means that your body is better at taking oxygen from the air and delivering it to your muscles.

Hydration- required for adequate blood volume, thermal regulation, potential hypotension and decreased cardiac output

Carbs- may increase VO₂ (complex carbohydrates fuels cells efficiently)

High Nitrates- beets/spinach may increase VO₂ by improving O₂ efficiency and increasing blood flow

Iron- red meat, fish, eggs & dried fruits may increase VO₂ by increasing blood flow

LAST MEAL

bowl of cereal with milk, two cups of coffee with sugar and water

LAST MEAL

FRUITY PEBBLES, MILK, COFFEE

LAST MEAL

Oatmeal, Mint Tea, Water

LAST MEAL

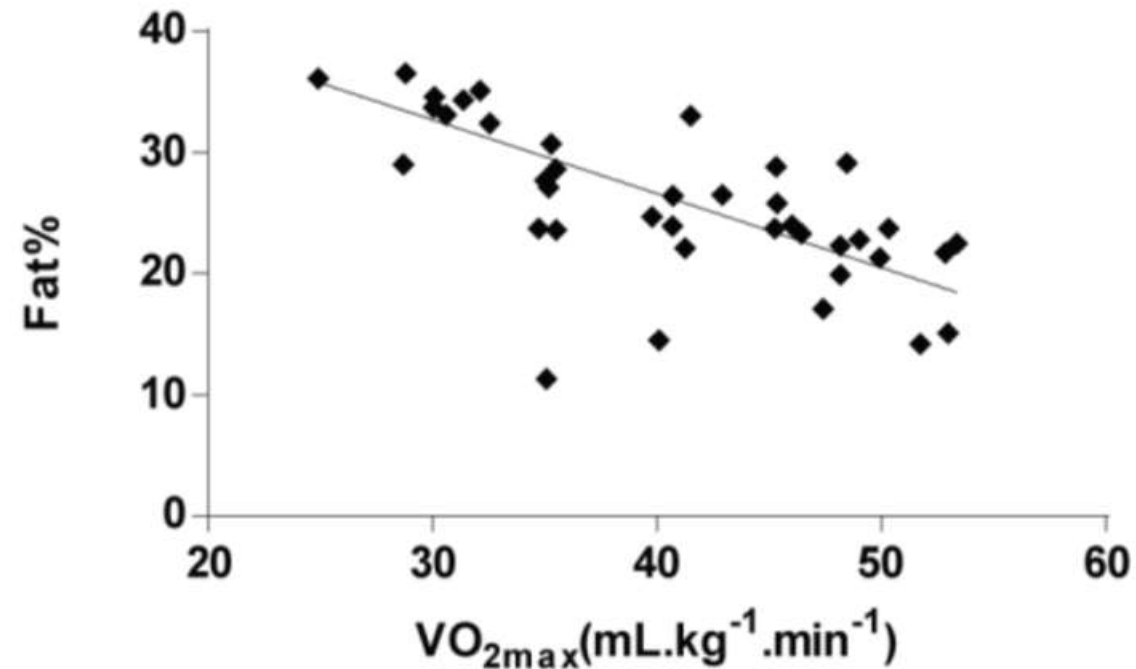
RICE CRACKER CAKES AND WATER

LAST MEAL

1 HR PRIOR: ENGLIS MUFFIN, AVOCADO, GRAPEFRUIT, WATER, ECG



Relationship Between Fat% and VO₂max



every time you
eat or drink
you are either
feeding disease
or fighting it!



Eat Healthy and Thrive.®