

**Evidence Analysis Library: Chronic Obstructive Pulmonary Disease
Macronutrients**

**Does the macronutrient composition (% distribution) of the diet have an effect on outcomes in adults with COPD?
What are the macronutrient needs (kcal; grams or per kg) of adults with COPD?**

List of Excluded Articles (N=118)

Article	Reason for Exclusion ¹
Acreman S. Nutrition in palliative care. <i>Br J Community Nurs.</i> 2009;14(10):427-431. Accession Number: 105328635.	Review article; not COPD (all diseases).
Ahmadi A, Haghghat N, Hakimrabet M and Tolide-ie H. Nutritional evaluation in chronic obstructive pulmonary disease patients. <i>Pak J Biol Sci.</i> 2012;15(10):501-5. PMID: 24187906.	Not relevant to research question; did not report the effect of energy or macronutrient intakes on outcomes of interest (compared intakes to RDI).
Ahnfeldt-Mollerup P, Hey H, Johansen C, Kristensen S, Brix Lindskov J, Jensahnfeldt-Mollerupen C. The effect of protein supplementation on quality of life, physical function, and muscle strength in patients with chronic obstructive pulmonary disease. <i>Eur J Phys Rehabil Med</i> 2015; 51:447-56. PMID 25426541.	Not relevant to research question; Energy and macronutrient intakes were NS different between groups at end of intervention.
Akner G, Larsson K. Undernutrition state in patients with chronic obstructive pulmonary disease. A critical appraisal on diagnostics and treatment. <i>Respir Med.</i> 2016 Aug;117:81-91. Epub 2016 May 30. Review. PMID: 27492517	Review article; hand searched for relevant primary research.
Andersson M, Slinde F, Grönberg AM, Svantesson U, Janson C, Emtner M. Physical activity level and its clinical correlates in chronic obstructive pulmonary disease: a cross-sectional study. <i>Respir Res.</i> 2013 Nov 15;14:128. PMID: 24237876	No outcomes of interest reported; evaluated clinical characteristics and physical activity levels in subjects with COPD.
Anker SD, Laviano A, Filippatos G, John M, Paccagnella A, Ponikowski P, Schols AM; ESPEN. ESPEN Guidelines on Parenteral Nutrition: on cardiology and pneumology. <i>Clin Nutr.</i> 2009 Aug;28(4):455-60. Epub 2009 Jun 9. PMID: 19515464.	Not a research study; ESPEN guidelines for parenteral nutrition.
Arvidsson D, Slinde F, Nordenson A, Larsson S and Hulthen L. Validity of the ActiReg system in assessing energy requirement in chronic obstructive pulmonary disease patients. <i>Clin Nutr.</i> 2006;25(1):68-74. PMID: 1623905	Not relevant to research question; Validation of ActiReg system for assessing energy requirements.
Baker R, Fraser RC, Stone M, Lambert P, Stevenson K and Shiels C. Randomised controlled trial of the impact of guidelines, prioritized review criteria and feedback on implementation of recommendations for angina and asthma. <i>Br J Gen Pract.</i> 2003;53(489):284-91. PMID: 12879828.	Lung condition that is not COPD; asthma (without COPD) and angina population.
Baldi S, Aquilani R, Pinna GD, Poggi P, De Martini A, Bruschi C. Fat-free mass change after nutritional rehabilitation in weight losing COPD: role of insulin, C-reactive protein and tissue hypoxia. <i>Int J Chron Obstruct Pulmon Dis.</i> 2010 Feb 18; 5:29-39. PMID: 20368909.	Not relevant to research question; evaluated essential amino acid supplementation on outcomes. Energy and macronutrient intake between groups was not evaluated.
Battaglia S, Spatafora M, Paglino G, Pedone C, Corsonello A, Scichilone N, Antonelli-Incalzi R, Bellia V. Ageing and COPD affect different domains of nutritional status: the ECCE study. <i>Eur Respir J.</i> 2011 Jun;37(6):1340-5. Epub 2010 Nov 11. PMID: 21071469.	Not relevant to research question; evaluated how malnutrition or aging score differently on the MNA.
Biolo G, Cederholm T and Muscaritoli M. Muscle contractile and metabolic dysfunction is a common feature of sarcopenia of aging and chronic diseases: from sarcopenic obesity to cachexia. <i>Clin Nutr.</i> 2014;33(5):737-48. PMID: 24785098.	Population with various chronic diseases; not all COPD patients.
Boeselt T, Spielmanns M, Nell C, Storre JH, Windisch W, Magerhans L, Beutel B, Kenn K, Greulich T, Alter P, Vogelmeier C, Koczulla AR. Validity and Usability of Physical Activity Monitoring in Patients with Chronic Obstructive Pulmonary Disease (COPD). <i>PLoS One.</i> 2016 Jun 15;11(6):e0157229. PMID: 27305105	Not relevant to research question; validation of methods to measure physical activity and EE.
Broekhuizen R, Creutzberg EC, Weling-Scheepers CA, Wouters EF and Schols AM. Optimizing oral nutritional drink supplementation in patients with chronic obstructive pulmonary disease. <i>Br J Nutr.</i> 2005;93(6):965-71. PMID: 16022768.	Not relevant to research question; macronutrient intakes were not reported. Evaluates volume of the ONS only.
Broekhuizen R, Wouters EF, Creutzberg EC, Schols AM. Raised CRP levels mark metabolic and functional impairment in advanced COPD. <i>Thorax.</i> 2006 Jan;61(1):17-22. Epub 2005 Jul 29. PMID: 16055618.	Not relevant to research question; Determined if CRP could be used as a biomarker for impaired function, energy metabolism, or symptoms in COPD.
Cai B, Zhu Y, Ma Yi, Xu Z, Zao Yi, Wang J, Lin Y, Comer GM. Effect of supplementing a high-fat, low-carbohydrate enteral formula in COPD patients. <i>Nutrition.</i> 2003 Mar;19(3):229-32. PMID: 12620524	Secondary criteria: published prior to 2005.

Article	Reason for Exclusion ¹
Casaburi R. Activity monitoring in assessing activities of daily living. <i>COPD</i> . 2007 Sep;4(3):251-5. Review. PMID: 17729069	Review article.
Castro AA, Porto EF, Iamonti VC, de Souza GF, Nascimento OA, Jardim JR. Oxygen and ventilatory output during several activities of daily living performed by COPD patients stratified according to disease severity. <i>PLoS One</i> . 2013 Nov 20;8(11):e79727. PMID: 24278164.	Not relevant to research question; study sought to characterize ADLs with the highest oxygen and ventilatory output to provide baseline data for further work on a tool for ADLs and energy conservation.
Cavalheri V, Hill K, Donaria L, Camillo CA, Pitta F. Maximum voluntary ventilation is more strongly associated with energy expenditure during simple activities of daily living than measures of airflow obstruction or respiratory muscle strength in patients with COPD. <i>Chron Respir Dis</i> . 2012;9(4):239-40. PMID: 23129801	Not relevant to research question; evaluated maximum voluntary ventilation as a surrogate marker for EE from indirect calorimetry in COPD.
Cazzola M, Segreti A, Stirpe E, Appodia M, Senis L, Matera MG. Energy expenditure and impact of bronchodilators in COPD patients. <i>Respir Med</i> . 2010 Oct;104(10):1490-4. Epub 2010 May 14. PMID: 20471237	Not relevant to research question; studied effects of drugs (tiotropium, formoterol) and effect on EE and exercise in COPD patients.
Chambaneau A, Filaire M, Jubert L, Bremond M, Filaire E. Nutritional Intake, Physical Activity and Quality of Life in COPD Patients. <i>Int J Sports Med</i> . 2016 Aug;37(9):730-7. PMID: 27286177.	Not relevant to research question; descriptive study comparing intake of nutrients and physical activity according to FFMI in COPD patients.
Collins PF, Stratton RJ and Elia M. Nutritional support in chronic obstructive pulmonary disease (COPD): A randomised trial. <i>Clin Nutr</i> (Edinburgh, Scotland). 2014;33:S65-S65. Accession Number:CN-01073829.	Not in English language (Danish).
Constantin D, Menon MK, Houchen-Wolloff L, Morgan MD, Singh SJ, Greenhaff P, Steiner MC. Skeletal muscle molecular responses to resistance training and dietary supplementation in COPD. <i>Thorax</i> . 2013 Jul;68(7):625-33. PMID: 23535211	Not relevant to research question; evaluated effect of protein-CHO supplementation on outcomes. Macronutrient intake not reported.
Creutzberg EC, Schols AM, Weling-Scheepers CA, Buurman WA and Wouters EF. Characterization of nonresponse to high caloric oral nutritional therapy in depleted patients with chronic obstructive pulmonary disease. <i>Am J Respir Crit Care Med</i> . 2000;161(3 Pt 1):745-52. PMID: 10712317	Not relevant to research question; sought to characterize independent variables which contribute to less weight gain in COPD patients with supplementation of 500-750 kcals. Secondary criteria: published prior to 2005.
Creutzberg EC, Wouters EF, Mostert R, Weling-Scheepers CA and Schols AM. Efficacy of nutritional supplementation therapy in depleted patients with chronic obstructive pulmonary disease. <i>Nutrition</i> . 2003;19(2):120-7. PMID: 12591542	Secondary criteria: published prior to 2005.
Creutzberg EC, Wouters EF, Vanderhoven-Augustin IM, Dentener MA and Schols AM. Disturbances in leptin metabolism are related to energy imbalance during acute exacerbations of chronic obstructive pulmonary disease. <i>Am J Respir Crit Care Med</i> . 2000;162(4 Pt 1):1239-45. PMID: 11029324.	Not relevant to research question; evaluated energy balance in relation to leptin and tumor necrosis factor receptors. Secondary criteria: published prior to 2005.
Crisafulli E, Beneventi C, Bortolotti V, Kidonias N, Fabbri LM, Chetta A, Clini EM. Energy expenditure at rest and during walking in patients with chronic respiratory failure: a prospective two-phase case-control study. <i>PLoS One</i> . 2011; 6(8):e23770. PMID: 21909356	Not relevant to research question; evaluated methods of measuring EE.
Csanky E, Ruhl R, Scholtz B, Vasko A, Takacs L and Hempel WM. Lipid metabolite levels of prostaglandin D2 and eicosapentaenoic acid recovered from bronchoalveolar lavage fluid correlate with lung function of chronic obstructive pulmonary disease patients and controls. <i>Electrophoresis</i> . 2009; 30(7):1228-34. PMID: 19294692	Not relevant to research question; evaluated use of alternate biomarkers from bronchial washings to correlate lung function.
Daga MK, Khan NA, Malhotra V, Kumar S, Mawari G and Hira HS. Study of body composition, lung function, and quality of life following use of anabolic steroids in patients with chronic obstructive pulmonary disease. <i>Nutr Clin Pract</i> . 2014;29(2):238-45. PMID: 24552826.	Not relevant to research question; evaluated high protein diet alone or with anabolic steroids on COPD outcomes. Energy and macronutrient intakes were not reported.
Dal Negro RW, Aquilani R, Bertacco S, Boschi F, Micheletto C and Tognella S. Comprehensive effects of supplemented essential amino acids in patients with severe COPD and sarcopenia. <i>Monaldi Arch Chest Dis = Archivio Monaldi per le malattie del torace / Fondazione clinica del lavoro, IRCCS [and] Istituto di clinica fisiologica e malattie apparato respiratorio, Università di Napoli, Secondo ateneo</i> . 2010;73(1):25-33. PMID: 20499791.	Not relevant to research question; evaluated effect of oral supplementation of essential amino acids on outcomes in subjects with severe COPD. Total energy and macronutrient intake were not reported.
Dal Negro RW, Testa A, Aquilani R, Tognella S, Pasini E, Barbieri A, Boschi F. Essential amino acid supplementation in patients with severe COPD: a step towards home rehabilitation. <i>Monaldi Arch Chest Dis</i> . 2012 Jun;77(2):67-75. PMID: 23193843.	Not relevant to research question; evaluated effect of essential amino acid supplementation on outcomes. Energy and macronutrient intakes were NS different between groups after intervention.
de Batlle J, Sauleda J, Balcells E, Gómez FP, Méndez M, Rodríguez E, Barreiro E, Ferrer JJ, Romieu I, Gea J, Antó JM, Garcia-Aymerich J; PAC-COPD Study Group. Association between Omega3 and Omega6 fatty acid intakes and serum	Not relevant to research question. Evaluated omega-3 fatty acid intake and markers of inflammation in COPD.

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inflammatory markers in COPD. <i>J Nutr Biochem.</i> 2012;23(7):817-21. PMID: 21889886.	
de Batlle J, Romieu I, Antó JM, Mendez M, Rodríguez E, Balcells E, Ferrer A, Gea J, Rodríguez-Roisin R, Garcia-Aymerich J; PAC-COPD Study Group. Dietary habits of firstly admitted Spanish COPD patients. <i>Respir Med.</i> 2009;103(12):1904-10. PMID: 19564102.	Not relevant to research question; descriptive study evaluating composition of diet but no relation to outcomes assessed.
DeBellis HF and Fetterman JW. Enteral Nutrition in the Chronic Obstructive Pulmonary Disease (COPD) Patient. <i>J Pharm Prac.</i> 2012;25(6):583-585. Accession Number: 104396220.	Review article.
Deutz NE, Matheson EM, Matarese LE, Luo M, Baggs GE, Nelson JL, Hegazi RA, Tappenden KA, Ziegler TR; NOURISH Study Group. Readmission and mortality in malnourished, older, hospitalized adults treated with a specialized oral nutritional supplement: A randomized clinical trial. <i>Clin Nutr.</i> 2016 Feb;35(1):18-26. PMID: 26797412.	Population included COPD but data were not reported separately for COPD subjects.
Dhillon SS, Sima CA, Kirkham AR, Syed N, Camp PG. Physical Activity Measurement Accuracy in Individuals With Chronic Lung Disease: A Systematic Review With Meta-Analysis of Method Comparison Studies. <i>Arch Phys Med Rehabil.</i> 2015 Nov; 96(11):2079-88.e10. Review. PMID: 26049088	Review article; hand searched for relevant primary research.
Engelen MP, Wouters EF, Deutz NE, Menheere PP and Schols AM. Factors contributing to alterations in skeletal muscle and plasma amino acid profiles in patients with chronic obstructive pulmonary disease. <i>Am J Clin Nutr.</i> 2000;72(6):1480-7. PMID: 11101475.	Not relevant to research question; examined differences in plasma levels of amino acids between subtypes of COPD. Secondary criteria: published prior to 2005.
Engelen MP, De Castro CL, Rutten EP, Wouters EF, Schols AM and Deutz NE. Enhanced anabolic response to milk protein sip feeding in elderly subjects with COPD is associated with a reduced splanchnic extraction of multiple amino acids. <i>Clin Nutr.</i> 2012;31(5):616-24. PMID: 22682082	Less than 10 subjects per study group.
Engelen MP, Rutten EP, De Castro CL, Wouters EF, Schols AM and Deutz NE. Casein protein results in higher prandial and exercise induced whole body protein anabolism than whey protein in chronic obstructive pulmonary disease. <i>Metabolism.</i> 2012;61(9):1289-300. PMID: 22512824	Less than 10 subjects per study group.
Engelen MP, Rutten EP, De Castro CL, Wouters EF, Schols AM and Deutz NE. Supplementation of soy protein with branched-chain amino acids alters protein metabolism in healthy elderly and even more in patients with chronic obstructive pulmonary disease. <i>Am J Clin Nutr.</i> 2007;85(2):431-9. PMID: 17284740.	Less than 10 subjects per study group.
Engelen MPK, Rutten EPA, De Castro CLN, Wouters EFM, Schols AMW and Deutz NEP. Altered interorgan response to feeding in patients with chronic obstructive pulmonary disease. <i>Am J Clin Nutr.</i> 2005;82(2):366-372. Accession Number: 106534721.	Less than 10 subjects per study group.
Ferreira IM, Brooks D, Lacasse Y and Goldstein RS. Nutritional support for individuals with COPD: a meta-analysis. <i>Chest.</i> 2000;117(3):672-678. Accession Number: CN-00276177.	Review article; secondary criteria: Published prior to 2005.
Farooqi N, Nordstrom L, Lundgren R, Sandstrom T and Haglin L. Changes in body weight and physical performance after receiving dietary advice in patients with chronic obstructive pulmonary disease (COPD): 1-year follow-up. <i>Arch Gerontol Geriatr.</i> 2011;53(1):70-5. PMID: 20619471.	Not relevant to research question; intervention was dietary advice, not macronutrient composition.
Farooqi N, Slinde F, Carlsson M, Haglin L and Sandstrom T. Predicting energy requirement with pedometer-determined physical-activity level in women with chronic obstructive pulmonary disease. <i>Int J Chron Obstruct Pulmon Dis.</i> 2015; 10:1129-37. PMID: 26109854.	Not relevant to research question; Evaluated methods of measuring EE.
Farooqi N, Slinde F, Haglin L and Sandstrom T. Assessment of energy intake in women with chronic obstructive pulmonary disease: a doubly labeled water method study. <i>J Nutr Health Aging.</i> 2015;19(5):518-24. PMID: 25923480.	Not relevant to research question; compared 7-day food records to DLW to determine methods to assess energy intake.
Farooqi N, Slinde F, Håglin L, Sandström T. Validation of SenseWear Armband and ActiHeart monitors for assessments of daily energy expenditure in free-living women with chronic obstructive pulmonary disease. <i>Physiol Rep.</i> 2013 Nov;1(6): e00150. dPMID: 24400152.	Not relevant to research question; evaluated methods of measuring EE.
Forli L, Bjortuft O, Vatn M, Kofstad J and Boe J. A study of intensified dietary support in underweight candidates for lung transplantation. <i>Ann Nutr Metab.</i> 2001;45(4):159-68. PMID: 11463999.	Data for COPD subjects were not reported separately from population. Secondary criteria: published prior to 2005.
Førli L, Pedersen JI, Bjortuft O, Vatn M and Boe J. Dietary support to underweight patients with end-stage pulmonary disease assessed for lung transplantation. <i>Respiration.</i> 2001;68(1):51-57. Accession Number:CN-00326825.	Data for COPD subjects were not reported separately from population. Secondary criteria: published prior to 2005.

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Forli L, Pedersen JI, Bjortuft, Vatn M, Kofstad J and Boe J. Serum amino acids in relation to nutritional status, lung function and energy intake in patients with advanced pulmonary disease. <i>Respir Med.</i> 2000;94(9):868-74. PMID: 11001078.	Not relevant to research question; evaluated correlations between serum amino acids, FFM, and lung function. Secondary criteria: published prior to 2005.
Førli L, Moum T, Bjørtuft O, Vatn M and Boe J. The influence of underweight and dietary support on well-being in lung transplant candidates. <i>Respir Med.</i> 2006;100(7):1239-1246. Accession Number:CN-00575935.	Population included COPD (candidates for lung transplantation) but data were not reported separately for COPD subjects.
Foy CG, Wickley KL, Adair N, Lang W, Miller ME, Rejeski WJ, Woodard CM, Berry MJ. The Reconditioning Exercise and Chronic Obstructive Pulmonary Disease Trial II (REACT II): rationale and study design for a clinical trial of physical activity among individuals with chronic obstructive pulmonary disease. <i>Contemp Clin Trials.</i> 2006 Apr;27(2):135-46. Epub 2006 Feb 2. PMID: 16458075	Not a research study; study design only.
Fulton AS, Hill AM, Williams MT, Howe PR, Frith PA, Wood LG, Garg ML, Coates AM. Feasibility of ω-3 fatty acid supplementation as an adjunct therapy for people with chronic obstructive pulmonary disease: study protocol for a randomized controlled trial. <i>Trials.</i> 2013 Apr 24;14: 107. PMID: 23782589	Not relevant to research question; feasibility study of omega-3 supplementation.
Gariballa S and Forster S. Associations between underlying disease and nutritional status following acute illness in older people. <i>Clin Nutr.</i> 2007;26(4):466-73. PMID: 17383777.	Population included COPD but data were not reported separately for COPD subjects.
Gariballa S, Forster S and Powers H. Riboflavin status in acutely ill patients and response to dietary supplements. <i>J Parenter Enteral Nutr.</i> 2009;33(6):656-61. PMID: 19644132.	Not relevant to research question; determined the riboflavin response to dietary supplements during acute illness.
Glickman-Simon R and Ehrlich A. Omega-3 Supplementation and Cardiovascular Disease, Acupuncture and Chronic Obstructive Pulmonary Disease (COPD), Myofascial Physical Therapy and Interstitial Cystitis, and Yoga and Chronic Pain. <i>Explore.</i> 2013;9(1):54-57. Accession Number: 104415193.	Not a research study; published updated study summary.
Godoy I, Campana AO, Geraldo RR, Padovani CR and Paiva SA. Cytokines and dietary energy restriction in stable chronic obstructive pulmonary disease patients. <i>Eur Respir J.</i> 2003;22(6):920-5. PMID: 14680079.	Not relevant to research question; investigated if stable COPD patients present alterations of inflammatory mediators after 48 hours of dietary energy restriction. Secondary criteria: published prior to 2005.
Görek Dilektali, Ulubay G, Bayraktar N, Eminsoy I, Oner Eyüboğlu F. The effects of cachexia and related components on pulmonary functions in patients with COPD. <i>Tuberk Toraks</i> 2009; 57:298-305. PMID 19787469. Gorek et al, 2009; 19787469.	Not relevant to research question; energy and macronutrient intake were not reported.
Goris AH, Vermeeren MA, Wouters EF, Schols AM and Westerterp KR. Energy balance in depleted ambulatory patients with chronic obstructive pulmonary disease: the effect of physical activity and oral nutritional supplementation. <i>Br J Nutr.</i> 2003;89(5):725-31. PMID: 12720592.	Less than 10 subjects in control group. Secondary criteria: published prior to 2005.
Gronberg AM, Slinde F, Engstrom CP, Hulthen L and Larsson S. Dietary problems in patients with severe chronic obstructive pulmonary disease. <i>J Hum Nutr Diet.</i> 2005;18(6):445-52. PMID: 16351703.	Not relevant to research question; investigated dietary problems in patients with severe COPD.
Hallin R, Koivisto-Hursti UK, Lindberg E and Janson C. Nutritional status, dietary energy intake and the risk of exacerbations in patients with chronic obstructive pulmonary disease (COPD). <i>Respir Med.</i> 2006;100(3):561-7. PMID: 16019198.	Not relevant to research question; reported energy intake and percentage of requirements of groups divided into BMI categories. Did not evaluate energy intake related to outcomes of interest.
Hill K, Dolmage TE, Woon L, Goldstein R, Brooks D. Measurement properties of the SenseWear armband in adults with chronic obstructive pulmonary disease. <i>Thorax.</i> 2010 Jun;65(6):486-91. PMID: 20522844	Not relevant to research question; evaluated SenseWear armband.
Hill K, Dolmage TE, Woon L, Coutts D, Goldstein R, Brooks D. Defining the relationship between average daily energy expenditure and field-based walking tests and aerobic reserve in COPD. <i>Chest.</i> 2012 Feb;141(2):406-412. PMID: 21835907	Not relevant to research question; determined which tests of exercise capacity relate to average daily EE in patients with COPD.
Humphreys K, Cross G, Frith P and Cafarella P. Nutritional status and dietary intake of outpatients with chronic obstructive pulmonary disease. <i>Nutr & Diet.</i> 2008;65(2):168-174. PMID: 105645287.	Not relevant to research question; description of nutritionally depleted COPD patients.
Itoh T, Nagaya N, Yoshikawa M, Fukuoka A, Takenaka H, Shimizu Y, Haruta Y, Oya H, Yamagishi M, Hosoda H, Kangawa K, Kimura H. Elevated plasma ghrelin level in underweight patients with chronic obstructive pulmonary disease. <i>Am J Respir Crit Care Med.</i> 2004 Oct 15;170(8):879-82. Epub 2004 Jul 21. PMID: 15271696	Not relevant to research question; evaluated plasma ghrelin and association with clinical parameters in COPD patients. Secondary criteria: published prior to 2005.
Jonker R, Deutz NE, Erbland ML, Anderson PJ and Engelen MP. Hydrolyzed casein and whey protein meals comparably stimulate net whole-body protein synthesis in COPD patients with nutritional depletion without an additional effect of leucine co-ingestion. <i>Clin Nutr.</i> 2014;33(2):211-20. PMID: 23886411.	Not relevant to research question; examined protein synthesis response to whey protein meals and leucine.

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Jonker R, Deutz NE, Erbland ML, Anderson PJ, Engelen MP. Effectiveness of essential amino acid supplementation in stimulating whole body net protein anabolism is comparable between COPD patients and healthy older adults. <i>Metabolism</i> . 2017 Apr; 69:120-129. PMID: 28285641.	Not relevant to research question; evaluated effect of essential amino acid supplementation on protein anabolism.
Jonker R, Engelen MPKJ and Deutz NEP. Role of specific dietary amino acids in clinical conditions. <i>Br J Nutr</i> . 2012;108(S2): S139-48. Accession Number: 104396378..	Review article.
Kanao K, Shiraishi M, Higashimoto Y, Maeda K, Sugiya R, Okajima S, Chiba Y, Yamagata T, Terada K, Fukuda K, Tohda Y. Factors associated with the effect of pulmonary rehabilitation on physical activity in patients with chronic obstructive pulmonary disease. <i>Geriatr Gerontol Int</i> . 2017 Jan;17(1):17-23. PMID: 26634413.	Not relevant to research question; studied factors associated with the effect of pulmonary rehabilitation on physical activity.
Kao CC, Hsu JW, Bandi V, Hanania NA, Kheradmand F and Jahoor F. Glucose and pyruvate metabolism in severe chronic obstructive pulmonary disease. <i>J Appl Physiol</i> (1985). 2012;112(1):42-7. PMID: 22016370.	Less than 10 subjects per control group.
Khan NA, Kumar N, Daga MK. Effect of Dietary Supplementation on Body Composition, Pulmonary Function and Health-Related Quality of Life in Patients with Stable COPD. <i>Tanaffos</i> . 2016;15(4):225-235. PMID: 28469679.	Not relevant to research question; evaluated effect of dietary supplementation on outcomes. Did not evaluate total energy and macronutrient intake on outcomes.
Kim S, Ryu YJ, Chang J, Lee JH. Association of Dietary Protein Intake With Lung Function and Exacerbation in COPD: Dietary Low Protein Intake and Airflow Limitation; the Korea National Health and Nutrition Examination Survey in 2007-2012. <i>CHEST</i> , Volume 152, Issue 4, A785.	Not a research study; presentation only.
Kubo H, Honda N, Tsuji F, Iwanaga T, Muraki M and Tohda Y. Effects of dietary supplements on the Fischer ratio before and after pulmonary rehabilitation. <i>Asia Pac J Clin Nutr</i> . 2006;15(4):551-5. PMID: 17077074.	Less than 10 subjects per study group.
Laviolette L, Lands LC, Daultbaev N, Saey D, Milot J, Provencher S, LeBlanc P, Maltais F. Combined effect of dietary supplementation with pressurized whey and exercise training in chronic obstructive pulmonary disease: a randomized, controlled, double-blind pilot study. <i>J Med Food</i> . 2010 Jun;13(3): 589-98. PMID: 20521985.	Not relevant to research question; evaluated use of protein supplements on exercise. Contribution of total energy and macronutrient composition of diet was not evaluated.
Luo Y, Xu WG, Dong HJ, Yang L, Tao YX and Tang QY. Glutamine for immunomodification and metabolic support in patients with chronic obstructive pulmonary disease. <i>Chinese J Clin Rehabil</i> . 2005;9(31):234-236. Accession Number: CN-00557461.	Not relevant to research question; evaluated effect of glutamine supplementation on outcomes. Energy and protein intake did not differ between the two groups.
McKeough ZJ, Alison JA, Bayfield, Bye PT. Reduction in resting energy expenditure following lung volume reduction surgery in subjects with chronic obstructive pulmonary disease. <i>Chron Respir Dis</i> . 2004;1(4):197-202. PMID: 16281646.	Not relevant to research question; evaluated effects of LVRS on REE. Secondary criteria: Published prior to 2005.
Menon MK, Constantin D, Houchen-Wolloff L, Singh S. Protein-carbohydrate supplementation does not influence the skeletal muscle functional or molecular response to high intensity resistance training in COPD. <i>Am J Respir Crit Care Med</i> . 2012;185. Accession Number:CN-01107417.	Not relevant to research question; evaluated effect of protein-CHO supplementation compared to placebo on outcomes. Energy and macronutrient intake were not reported.
Mineo D, Ambrogi V, Lauriola V, Pompeo E and Mineo TC. Recovery of body composition improves long-term outcomes after lung volume reduction surgery for emphysema. <i>Eur Respir J</i> . 2010;36(2):408-16. PMID: 20675780.	Not relevant to research question; evaluated effect of BC recovery on outcomes in patients undergoing LVRS.
Mineo TC, Pompeo E, Mineo D, Ambrogi V, Ciarapica D, Polito A. Resting energy expenditure and metabolic changes after lung volume reduction surgery for emphysema. <i>Ann Thorac Surg</i> . 2006 Oct;82(4):1205-11. PMID: 16996909	Not relevant to research question; evaluated effect of LVRS on EE and metabolism.
Nagaya N, Itoh T, Murakami S, Oya H, Uematsu M, Miyatake K, Kangawa K. Treatment of cachexia with ghrelin in patients with COPD. <i>Chest</i> . 2005 Sep;128(3):1187-93. PMID: 16162705	Not relevant to research question; evaluated ghrelin in treating cachexia and functional capacity in patients with COPD.
Ng TP, Niti M, Yap KB and Tan WC. Dietary and supplemental antioxidant and anti-inflammatory nutrient intakes and pulmonary function. <i>Public Health Nutr</i> . 2014;17(9):2081-2086. Accession Number: 109757449.	General population; data were not reported separately for COPD subjects.
Nordenson A, Grönberg AM, Hulthén L, Larsson S, Slinde F. A validated disease specific prediction equation for resting metabolic rate in underweight patients with COPD. <i>Int J Chron Obstruct Pulmon Dis</i> . 2010 Sep 7;5:271-6. Review. PMID: 20856826	Not relevant to research question; validation of predictive equation for EE.
Obase Y, Mouri K, Shimizu H, Ohue Y, Kobashi Y, Kawahara K, Oka M. Nutritional deficits in elderly smokers with respiratory symptoms that do not fulfill the criteria for COPD. <i>Int J Chron Obstruct Pulmon Dis</i> . 2011;6:679-83. PMID: 22259244	Not relevant to research question; descriptive study of nutrient intake in COPD patients vs. controls. Did not associate energy and macronutrient intake with outcomes of interest.

Article	Reason for Exclusion ¹
Pitta F, Takaki MY, Oliveira NH, Sant'anna TJ, Fontana AD, Kovelis D, Camillo CA, Probst VS, Brunetto AF. Relationship between pulmonary function and physical activity in daily life in patients with COPD. <i>Respir Med</i> . 2008 Aug;102(8):1203-7. PMID: 18573647	Not relevant to research question; focus was on physical activity and severity of COPD.
Proud D and Bolton CE. Maintaining nutritional status in COPD patients. <i>Nursing in Practice: The J Today's Pri Care Nurse</i> . 2011(58):14-20. Accession Number: 104842589.	Not a research study.
Rabinovich RA, Louvaris Z, Raste Y, Langer D, Van Remoortel H, Giavedoni S, Burtin C, Regueiro EM, Vogiatzis I, Hopkinson NS, Polkey MI, Wilson FJ, Macnee W, Westerterp KR, Troosters T; PROactive Consortium. Validity of physical activity monitors during daily life in patients with COPD. <i>Eur Respir J</i> . 2013 Nov;42(5):1205-15. Epub 2013 Feb 8. PMID: 23397303	Not relevant to research question; studied validation of physical activity monitors.
Ramires B, de Oliveira E, Pimentel G, McLellan K, Nakato D, Faganello M, Galhardo M, Venâncio L. Resting energy expenditure and carbohydrate oxidation are higher in elderly patients with COPD: a case control study. <i>Nutr J</i> 2012; 11:37. PMID 22672689.	Not relevant to research question; did not report energy or macronutrient intakes.
Ramos FM, Rossato LT, Ramires BR, Pimentel GD, Venâncio LS, Orsatti FL, de Oliveira EP. Comparison of predictive equations of resting energy expenditure in older adults with chronic obstructive pulmonary disease. <i>Rev Port Pneumol</i> (2006). 2017 Jan - Feb;23(1):40-42. PMID: 27771344	Not relevant to research question; evaluated predictive equations to measure EE.
Reed RM, Wise RA, Dobs AS, Lechtzin N, Girgis RE. Elevated HDL cholesterol levels are associated with osteoporosis in lung transplant candidates with chronic obstructive pulmonary disease. <i>Respir Med</i> . 2010 Dec; 104(12):1943-50. PMID: 20801628	Not relevant to research question; focus of paper was on osteoporosis.
Reeves A, White H, Sosnowski K, Tran K, Jones M and Palmer M. Energy and protein intakes of hospitalised patients with acute respiratory failure receiving non-invasive ventilation. <i>Clin Nutr</i> . 2014;33(6):1068-73. PMID: 24321188.	Population included COPD (64%) but data were not reported separately for COPD subjects.
Samaras N, Samaras D, Chambellan A, Pichard C, Thibault R. Pulmonary rehabilitation: the reference therapy for undernourished patients with chronic obstructive pulmonary disease. <i>Biomed Res Int</i> . 2014;2014:248420. Review. PMID: 24701566	Review article; hand searched for relevant primary research.
Shaheen SO, Sterne JA, Thompson RL, Songhurst CE, Margetts BM and Burney PG. Dietary antioxidants and asthma in adults: population-based case-control study. <i>Am J Respir Crit Care Med</i> . 2001;164(10 Pt 1):1823-8. PMID: 11734430.	Population-based study; not COPD patients. Secondary criteria: published prior to 2005.
Slinde F, Ellegard L, Gronberg AM, Larsson S and Rossander-Hulthen L. Total energy expenditure in underweight patients with severe chronic obstructive pulmonary disease living at home. <i>Clin Nutr</i> . 2003;22(2):159-65. PMID: 12706133.	Secondary criteria: published prior to 2005.
Slinde F, Gronberg AM, Engstrom CR, Rossander-Hulthen L and Larsson S. Individual dietary intervention in patients with COPD during multidisciplinary rehabilitation. <i>Respir Med</i> . 2002;96(5):330-6. PMID: 12113383.	Not relevant to research question; evaluated dietary intervention in pulmonary rehab. Secondary criteria: published prior to 2005.
Slinde F, Gronberg AM, Svantesson U, Hulthen L and Larsson S. Energy expenditure in chronic obstructive pulmonary disease-evaluation of simple measures. <i>Eur J Clin Nutr</i> . 2011;65(12):1309-13. PMID: 21697822.	Not relevant to research question; evaluated methods of measuring EE.
Slinde F, Kvarnhult K, Gronberg AM, Nordenson A, Larsson S and Hulthen L. Energy expenditure in underweight chronic obstructive pulmonary disease patients before and during a physiotherapy programme. <i>Eur J Clin Nutr</i> . 2006;60(7):870-6. PMID: 16452911.	Not relevant to research question; reports energy intake but NS difference in intakes between time periods.
Snider JT, Jena AB, Linthicum MT, Hegazi RA, Partridge JS, LaVallee C, Lakdawalla DN, Wischmeyer PE. Effect of hospital use of oral nutritional supplementation on length of stay, hospital cost, and 30-day readmissions among Medicare patients with COPD. <i>Chest</i> . 2015 Jun;147(6):1477-1484. PMID: 25357165.	Not relevant to research question; evaluated use of an ONS on outcomes. Energy and macronutrient intake were not reported.
Steiner MC, Barton RL, Singh SJ and Morgan MD. Nutritional enhancement of exercise performance in chronic obstructive pulmonary disease: a randomised controlled trial. <i>Thorax</i> . 2003;58(9):745-51. PMID: 12947128.	Secondary criteria: Published prior to 2005.
Sugawara K, Takahashi H, Kasai C, Kiyokawa N, Watanabe T, Fujii S, Kashiwagura T, Honma M, Satake M, Shioya T. Effects of nutritional supplementation combined with low-intensity exercise in malnourished patients with COPD. <i>Respir Med</i> . 2010 Dec;104(12):1883-9. PMID: 20627502	Not relevant to research question; evaluated effects of ONS and/or exercise on outcomes. Energy and macronutrient intakes were reported as percentage of predicted; Unable to determine if results were due to the ONS, exercise or both.

Article	Reason for Exclusion ¹
Sundvall P, Grönberg A, Hulthén L and Slinde F. Energy and nutrient intake in patients with chronic obstructive pulmonary disease hospitalized owing to an acute exacerbation. <i>Scand J Nutrition</i> . 2005;49(3):116-121 6p. Accession Number: 106381558.	Not relevant to research question; energy, protein intake and REE were reported but these were not associated with outcomes of interest.
Tang NL, Chung ML, Elia M, Hui E, Lum CM, Luk JK, Jones MG, Woo J. Total daily energy expenditure in wasted chronic obstructive pulmonary disease patients. <i>Eur J Clin Nutr</i> . 2002 Apr;56(4):282-7. PMID: 11965503.	Less than 10 subjects per study group. Secondary criteria: published prior to 2005.
Thomas DR. Dietary prescription for chronic obstructive pulmonary disease. <i>Clin Geriatr Med</i> . 2002;18(4):835-9, viii. PMID: 12608507.	Review article; Secondary criteria: published prior to 2005.
Thorsdottir I and Gunnarsdottir I. Energy intake must be increased among recently hospitalized patients with chronic obstructive pulmonary disease to improve nutritional status. <i>J Am Diet Assoc</i> . 2002;102(2):247-9. PMID: 11846120.	Secondary criteria: published prior to 2005.
Tkacova R, Pobeha P, Ukropcova B and Ukropec J. Macronutrient preferences in patients with chronic obstructive pulmonary disease and hypoxemia. <i>Nutrition</i> . 2011;27(10):1093-4. PMID: 21470819.	Not a research study; letter to editor reporting study.
van de Bool C, Mattijssen-Verdonschot C, van Melick PP, Spruit MA, Franssen FM, Wouters EF, Schols AM, Rutten EP. Quality of dietary intake in relation to body composition in patients with chronic obstructive pulmonary disease eligible for pulmonary rehabilitation. <i>Eur J Clin Nutr</i> . 2014 Feb;68(2):159-65. PMID: 24327123	Not relevant to research question; descriptive study of quality of dietary intake in relation to BC. Intake is compared between groups with different BC measures (e.g., stratified by FFM). Macronutrients are not used as predictors.
van der Vaart H, Postma DS, Grevink R, Roemer W, ten Hacken N. Bronchodilation improves endurance but not muscular efficiency in chronic obstructive pulmonary disease. <i>Int J Chron Obstruct Pulmon Dis</i> . 2011;6:229-35. PMID: 21660300.	Not relevant to research question; evaluated use of bronchodilators.
Varraso R, Barr RG, Willett WC, Speizer FE and Camargo CA, Jr. Fish intake and risk of chronic obstructive pulmonary disease in 2 large US cohorts. <i>Am J Clin Nutr</i> . 2015;101(2):354-61. PMID: 25646333.	Not relevant to research question; evaluated fish intake and risk of developing COPD.
Varraso R, Jiang R, Barr RG, Willett WC and Camargo CA, Jr. Prospective study of cured meats consumption and risk of chronic obstructive pulmonary disease in men. <i>Amer J Epidemiol</i> . 2007;166(12):1438-1445. Accession Number: 105832903.	Not relevant to research question; evaluated cured meats and risk of developing COPD.
Varraso R, Willett WC and Camargo CA, Jr. Prospective study of dietary fiber and risk of chronic obstructive pulmonary disease among US women and men. <i>Amer J Epidemiol</i> . 2010;171(7):776-784. Accession Number: 105179932.	Not relevant to research question; evaluated dietary fiber and risk of developing COPD.
Velloso M, Jardim JR. Study of energy expenditure during activities of daily living using and not using body position recommended by energy conservation techniques in patients with COPD. <i>Chest</i> . 2006 Jul;130(1):126-32. PMID: 16840392.	Not relevant to research question; evaluated EE during ADLs, comparing whether body positioning and if energy conservation techniques were used.
Vermeeren MA, Wouters EF, Geraerts-Keeris AJ and Schols AM. Nutritional support in patients with chronic obstructive pulmonary disease during hospitalization for an acute exacerbation; a randomized controlled feasibility trial. <i>Clin Nutr</i> . 2004;23(5):1184-92. PMID: 15380912.	Secondary criteria: published prior to 2005.
Vermeeren MA, Wouters EF, Nelissen LH, van Lier A, Hofman Z and Schols AM. Acute effects of different nutritional supplements on symptoms and functional capacity in patients with chronic obstructive pulmonary disease. <i>Am J Clin Nutr</i> . 2001;73(2):295-301. PMID: 11157327.	Does not clearly report the number of subjects in each study arm. Secondary criteria: published prior to 2005.
Walda IC, Tabak C, Smit HA, Räsänen L, Fidanza F, Menotti A, Nissinen A, Feskens EJ, Kromhout D. Diet and 20-year chronic obstructive pulmonary disease mortality in middle-aged men from three European countries. <i>Eur J Clin Nutr</i> . 2002 Jul;56(7):638-43. PMID: 12080403.	Not relevant to research question; population-based study of diet patterns and risk of death from COPD. Secondary criteria: published prior to 2005.
Wang Y, Shen Y, Zuo Q, Zhao L, Wan C, Tian P, Chen L, Wen F. Evaluation of ghrelin level and appetite regulation in patients with acute exacerbations of chronic obstructive pulmonary disease. <i>Int J Chron Obstruct Pulmon Dis</i> . 2014 Aug 14;9:863-70. PMID: 25152618.	Not relevant to research question; evaluated ghrelin levels and appetite in COPD subjects.
Watson L, Margetts B, Howarth P, Dorward M, Thompson R and Little P. The association between diet and chronic obstructive pulmonary disease in subjects selected from general practice. <i>Eur Respir J</i> . 2002;20(2):313-8. PMID: 12212961.	Not relevant to research question; evaluated diet patterns and risk of developing COPD in smokers. Secondary criteria: published prior to 2005.
Watz H, Waschki B, Boehme C, Claussen M, Meyer T, Magnussen H. Extrapulmonary effects of chronic obstructive pulmonary disease on physical activity: a cross-sectional study. <i>Am J Respir Crit Care Med</i> . 2008 Apr 1;177(7):743-51. Epub 2007 Nov 29. PMID: 18048807	Not relevant to research question; Evaluated COPD effects and physical activity.

Article	Reason for Exclusion ¹
Westerterp KR. Physical activity and physical activity induced energy expenditure in humans: measurement, determinants, and effects. <i>Front Physiol.</i> 2013 Apr 26;4:90. PMID: 23637685.	Review article.
Yang YM, Sun TY and Liu XM. The role of serum leptin and tumor necrosis factor-alpha in malnutrition of male chronic obstructive pulmonary disease patients. <i>Chin Med J (Engl)</i> . 2006;119(8):628-33. PMID: 16635406.	Not relevant to research question; evaluated role of serum leptin in the malnutrition of COPD patients.
Yoneda T, Yoshikawa M, Fu A, Tsukaguchi K, Okamoto Y and Takenaka H. Plasma levels of amino acids and hypermetabolism in patients with chronic obstructive pulmonary disease. <i>Nutrition</i> . 2001;17(2):95-9. PMID: 11240335.	Not relevant to research question; evaluated plasma amino acids and correlation with resting vs. predicted EE. Secondary criteria: published prior to 2005.

¹**Abbreviations:** ADL=activities of daily living; BC=body composition; BMI=body mass index; CHO=carbohydrate; COPD=chronic obstructive pulmonary disease; CRP=c-reactive protein; DLW=doubly labeled water; EE=energy expenditure; ESPEN=European Society for Clinical Nutrition and Metabolism; FFM=fat-free mass; FFMI=fat-free mass index; LVRS=lung volume reduction surgery; MNA=Mini Nutrition Assessment; NS=not significant(ly); ONS=oral nutritional supplement; RDI=reference daily intake; REE=resting energy expenditure.