NATURAL MEDICINE JOURNAL
RESEARCH GUIDE
SPONSORED BY INTEGRATIVE THERAPEUTICS®

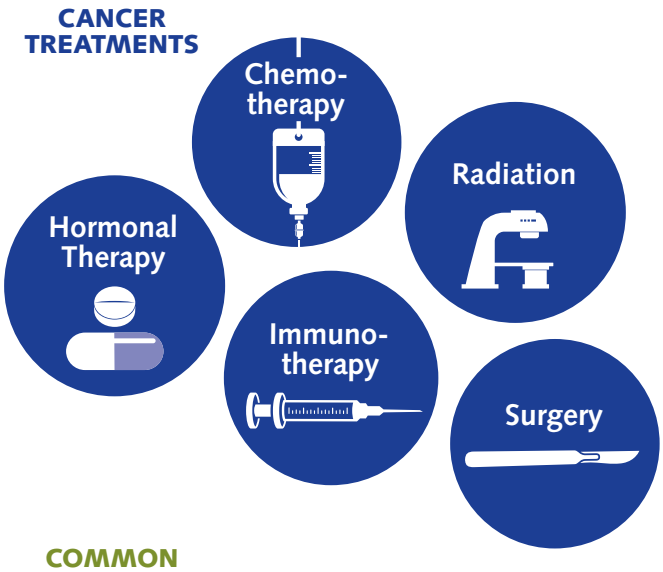
ADDRESSING THE SPECIAL NEEDS OF **CANCER SURVIVORS** IN CLINICAL PRACTICE

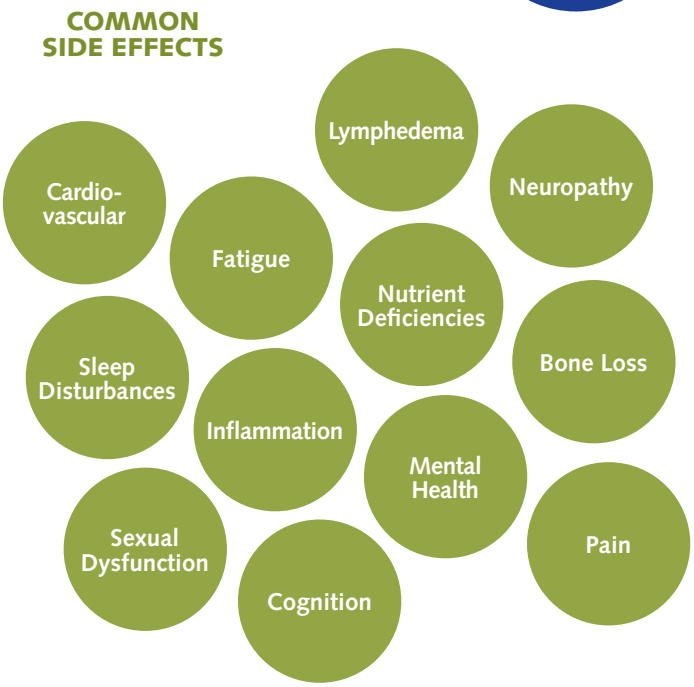
Author: Tina Kaczor, ND, FABNO

Introduction

It's highly likely that most integrative health practitioners, regardless of their clinical focus, are seeing cancer survivors in their practice. According to the National Cancer Institute (NCI), as of January 2019, there were approximately 17 million cancer survivors in the United States, and that number is projected to swell to more than 22 million by 2030.[1]

The majority of cancer survivors have received some type of treatment including chemotherapy, radiation, surgery, hormonal interventions, and/or immunotherapy. All of these treatments come with some degree of short- and/or long-term health effects.[2]





While these treatments can save lives, the side effects are diverse and can negatively impact the patient's quality of life on a variety of levels (Table 1).

While treatment side effects can include everything from anemia to hair loss to urinary incontinence,[3] this guide will focus on nutrient gaps, immunity, brain function, sleep, and fatigue.

TABLE 1 Common Side Effects of Certain Cancer Types

Side Effect	Breast	Colon	Head/ Neck	Lung	Prostate
Bone/ musculoskeletal Health	●		●		●
Bowel/bladder Dysfunction		●			●
Cardiotoxicity/ Cardiovascular	●	●		●	
Cognitive Dysfunction	●	●	●	●	●
Fatigue	●	●	●	●	●
Impaired Lung Function			●	●	
Infertility	●				
Lymphedema	●		●		
Mental Health	●	●	●	●	●
Neuropathy	●	●	●	●	
Pain	●	●	●	●	●
Premature Menopause	●				
Sexual Dysfunction	●	●			●

Source: Gegechkori N, Haines L, Lin JJ. Long-term and latent side effects of specific cancer types. *Med Clin North Am*. 2017;101(6):1053-1073

The Multivitamin Mineral Quandary

Patients in the United States have been taking multivitamin-mineral (MVM) supplements since the 1940s and the National Institutes of Health estimates that today more than 30% of Americans take MVMs making up about 40% of all dietary supplement sales.[4] Why so popular? Because they can confer specific health benefits.

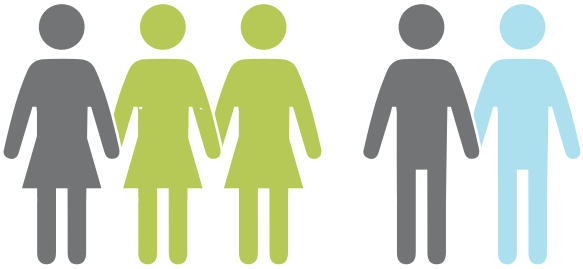
According to a 2018 Delphi Consensus Panel Report of 14 international experts in nutritional science and healthcare, an agreement was reached for the following statements:[5]

- MVMs should contain at least the micronutrients that are commonly under-consumed relative to their recommended intakes.
- For some micronutrients, higher intakes may provide added health benefits.
- Achieving micronutrient intake levels that are consistent with established reference values should be an explicit public health goal.
- Taking a daily MVM is one way to provide recommended amounts of many micronutrients that are necessary to support specific metabolic pathways, cells, organs, or other physiological systems.
- The use of a daily MVM reduces the prevalence of inadequate intakes of micronutrients.
- Long-term use of MVMs is safe in healthy adults.
- MVM use in populations with inadequate intakes or increased needs of micronutrients provides benefits to apparently healthy individuals including children, pregnant women, and older adults.

This is consistent with other research concluding that the use of MVMs can help fill nutrient gaps and may also reduce the risk of illnesses such as cancer and heart disease.[6] What the Delphi Consensus Panel did not do is address the special needs of cancer survivors.

As it turns out, from a cancer survivor's perspective, what's not in MVMs is just as important as what's in them. That's because some ingredients have been shown to possibly increase the risk of cancer including synthetic beta-carotene, copper, and some forms of vitamin E.

It was in the 1990s when the Beta-Carotene Cancer Prevention (ATBC) study and Beta-Carotene and Retinol Efficacy Trial (CARET) suggested that lung cancer risk and all-cause mortality increased significantly



1 IN 3 WOMEN AND 1 IN 2 MEN WILL DEVELOP CANCER IN THEIR LIFETIME

Source: National Cancer Institute

in smokers who took high dose beta-carotene.[7,8] Later analysis found this may be due to chemical metabolites induced by beta-carotene, not the beta-carotene itself. A 2013 look back analysis of the ATBC study compared men who took beta-carotene versus those who did not and found those who took beta-carotene had higher levels of xenobiotic metabolites.[9] They were also more likely to have dysregulated glycemic control. The implication of this is that high-dose beta carotene encourages the production of harmful metabolites from cigarettes.

Copper is another concerning nutrient for cancer survivors. In 2013 *in vivo* research found that chronic copper exposure via water accelerated tumor growth.[10] The authors of a 2018 meta-analysis involving 3,026 cases with 9,439 controls concluded that high serum copper levels were associated with an increased risk of lung cancer.[11]

Finally, supplemental vitamin E as dl-alpha-tocopherol merits caution with some cancer survivors. Similar to beta-carotene, male smokers could be at higher risk of increased mortality when taking dl-alpha-tocopherol vitamin E supplements.[12] Also, a 2011 follow-up report of the 2009 SELECT trial involving 35,533 males from 427 study sites in the United States, Canada, and Puerto Rico found that dl-alpha-tocopherol vitamin E supplementation continued to be associated with a significantly increased risk of prostate cancer among healthy men.[13,14]

Given these data, it is prudent to look for an MVM that does not contain these supplemented ingredients.

Optimizing Cellular Health

By focusing on immune recovery, controlling inflammation, redox regulation, and cell signaling, cellular health following cancer treatment may be restored. This strategy influences cellular proliferation, cell repair, and

apoptosis, helping to optimize healing while reducing the risk of cancer recurrence.

Cancer treatments, especially chemotherapy and radiation, can significantly impair immunity long after the treatment has ended. A 2016 clinical trial involving breast cancer survivors found that B-, T-, and Natural Killer (NK) cells were significantly reduced 2 weeks after treatment and even at 9 months post-chemotherapy, B- and $CD4^+$ T cells were significantly depleted.[15] A 2009 study found that 12 months after treatment there was significant impairment in certain immune parameters, specifically IL-2 with chemotherapy and IL-4 with radiation.[16] In that study, in general, immune recovery of lymphocyte proliferation and NK cell activity was poor following cancer treatment.

That's why people who have had cancer treatment are at higher risk of getting an infection. In addition, cancer itself, poor nutrition, or other health issues can also lead to a weakening of the body's defense systems.[17]

Clinicians can utilize targeted nutrients and herbs such as curcumin, glutathione, green tea, isoquercetin, and resveratrol to help restore immunity.

The anti-inflammatory effects of curcumin are well known. *In vitro, in vivo,* and human trials also show that compounds found in curcumin have anticancer effects.[18] A 2014 randomized, double-blind, placebo-controlled trial demonstrated that curcumin suppressed systemic inflammation and improved overall quality of life in cancer survivors.[19]

As the master antioxidant, glutathione helps protect cells from damage caused by lipid peroxides, reactive oxygen and nitrogen species, and xenobiotics and also helps control cell differentiation, proliferation, apoptosis, and immune function.[20] A 2014 randomized controlled trial demonstrated that oral glutathione increased NK activity.[21] When taken during chemotherapy or radiation, glutathione has the theoretical potential of increasing cancer cell resistance to treatment so it should only be used post-chemotherapy to help restore immunity.[22]

Green tea has anti-tumor properties and can modulate immunity by activating various types of T-cells and altering T-cell cytokine production.[23] In addition to its potent antioxidant activity, green tea contains polyphenols that have been shown to favorably influence enzymes that metabolize estrogens, some of which are known causal factors in hormone-dependent cancers.[24]

Often referred to as "chemobrain," chemotherapy-related cognitive impairment can negatively impact quality of life and can become debilitating for some cancer survivors.

In vitro and *in vivo* research has shown that the flavonoid quercetin has anti-tumor effects by promoting apoptosis, altering cell cycle progression, and inhibiting cell proliferation, angiogenesis, and metastasis.[25] Isoquercetin has also exhibited anti-cancer activity and superior bioavailability leading to increased efficacy compared to other forms of quercetin.[26]

Resveratrol is a polyphenol that has anti-cancer properties. *In vitro, in vivo* and some human clinical trials have confirmed that resveratrol is anti-inflammatory, inhibits oxidative stress, decreases cancer cell survival, and promotes apoptosis.[27]

Boosting Brain Function

It is estimated that 75% of patients receiving chemotherapy experience cognitive impairment associated with memory, language, and processing, and can suffer from those deficits long after treatment has been completed.[28] A 2014 clinical trial found that people treated for colon cancer were 3 to 5 times more likely to experience impaired cognitive function after treatment compared to healthy controls.[29]

Often referred to as "chemobrain," chemotherapy-related cognitive impairment can negatively impact quality of life and can become debilitating for some cancer survivors. It's important to note that other forms of cancer treatment such as hormone therapy, radiation, and surgery may also increase the risk of cognitive impairment.

While there are no natural substances studied for the treatment of chemobrain specifically, there are many nutrients that have been shown to help improve brain function. Here the focus is on acetyl-L-carnitine, citicoline, curcumin, and Lion's mane.

Acetyl-L-carnitine has been shown to both protect and enhance brain function. Preclinical research demonstrates that acetyl-L-carnitine can decrease oxidative

stress, increase energy status, and prevent cell death in cases of brain injury, and can also improve cognitive function including memory.[30] A 2007 randomized controlled trial showed that L-carnitine improved cognitive function in centenarians while also improving mental and physical fatigue.[31]

The nutrient citicoline has been shown to increase neuroplasticity and inhibit apoptosis of brain cells. A 2013 clinical trial showed that citicoline was neuroprotective during hypoxia and ischemia in patients with mild vascular cognitive impairment.[32] In a 2012 published clinical trial involving healthy women age 40 to 60, citicoline improved attentional performance and ameliorated attentional deficits.[33]

The anti-inflammatory effects of curcumin are also exerted in the brain and may be one mechanism by which it improves cognition in both healthy and unhealthy individuals. A 2018 clinical trial demonstrated that curcumin, specifically Theracurmin®, improved memory and attention in non-demented adults, and a 2019 systematic review showed that curcumin had both physiological and behavioral brain function improvements in individuals with Alzheimer's.[34,35]

Lion's mane (*Hericium erinaceus*) is a mushroom extract that also shows promise in helping to prevent and reverse cognitive decline. A 2009 double-blind, placebo-controlled trial featuring women with mild cognitive impairment showed that Lion's mane significantly improved cognitive function.[36] A 2020 clinical trial studying individuals with early Alzheimer's disease also demonstrated significant improvements in cognitive function with Lion's mane compared to placebo.[37]

Supporting Sound Sleep

According to the NCI, it is estimated that one-third to one-half of people with cancer have difficulty sleeping, which can be due to the illness itself, psychological stress, pain, and/or cancer treatments.[38] Sleep issues can include problems with sleep latency, daytime sleepiness, nocturnal arousal, anxiety, or depression and can significantly worsen quality of life.[39]

Many natural substances are effective at improving these sleep issues with melatonin receiving the most scientific attention.

A 2013 meta-analysis of 19 studies concluded that melatonin safely decreases sleep onset latency, increases total


Lion's mane

sleep quantity, and improves overall sleep quality.[40] A 2014 clinical trial involving post-breast cancer surgery patients found that melatonin significantly increased sleep efficiency and total sleep time compared to placebo.[41] Combining magnesium with melatonin can also help with sleep issues. A 2019 trial found that magnesium, melatonin, B6, and B12 significantly improved insomnia symptoms regardless of the cause.[42]

Melatonin is also a potent antioxidant that has anti-inflammatory effects and positively influences circadian rhythm, which can have broad beneficial health implications beyond sleep.[43]

One clinical challenge with melatonin can come with dosing as the dose can vary from 0.3 mg up to 20 mg in clinical trials. Doses can be modified to the individual patient tolerance while being titrated based on the response.

When it comes to anxiety-induced sleep disturbances, L-theanine is an effective nutrient to consider. In a 2013 trial, L-theanine not only helped ease anxiety, it also inhibited blood pressure increases that come with

stressful activities.[44] A 2019 randomized controlled trial found that L-theanine significantly improved sleep scores related to sleep latency, and sleep disturbance, and there was also a reduction in the use of sleep medications compared to placebo.[45]

Magnolia grandiflora is an herb that has anxiolytic properties as well and can help with anxiety-associated insomnia. In particular magnolia can help shorten sleep latency and increase the amount of non-REM sleep.[46]

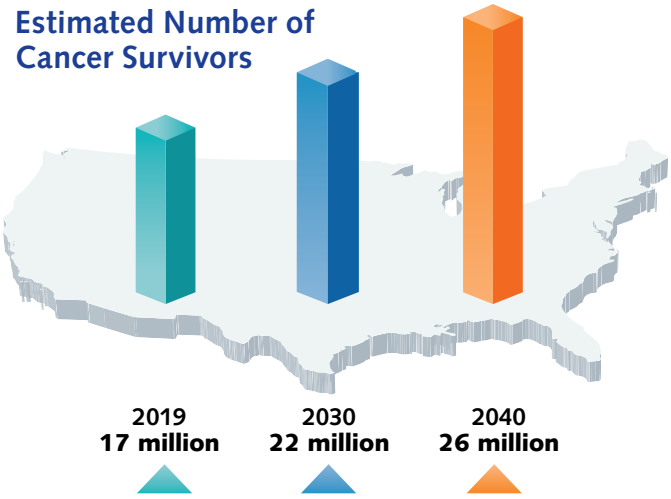
Focusing on Cancer-Related Fatigue

Typically, fatigue can be resolved with rest and sleep but that's not always the case with cancer-related fatigue (CRF), which is considered the most common side effect of cancer treatment according to the NCI. A 2007 analysis found that up to 80% of patients treated with chemotherapy and up to 90% of those treated with radiation reported CRF.[47] However, in addition to cancer treatments, there are other causes of CRF including anemia or other nutrient deficiencies, disrupted sleep, psychological distress, and dysfunction of the hypothalamic-pituitary-adrenal axis. Often there is more than one underlying cause.[48]

In clinical practice, it's worth utilizing some herbs to help combat CRF in survivors. Ginseng is a great place to start. A 2006 trial found that after 12 weeks of taking *Panax ginseng* cancer survivors had subjective improvement in mental and physical functioning scores compared to placebo.[49] Specific to CRF, a 2013 randomized, double-blind trial found that after 8 weeks of treatment with *Panax quinquefolius*, cancer survivors had statistically significant improvement in fatigue scores compared to placebo.[50]

Rhodiola rosea (rhodiola) and *Withania somnifera* (ashwagandha) are other herbal adaptogens worth considering for CRF. While there are no studies specific to CRF with rhodiola, there are studies showing benefit for stress-related fatigue including a 2009 randomized, double-blind clinical trial.[51] A 2018 review concluded that rhodiola can effectively ease symptoms of stress and help reduce the risk of chronic stress and stress-related complications.[52]

As for ashwagandha, there is research specific to CRF. A 2012 trial involving breast cancer survivors found that ashwagandha not only improved symptoms of CRF, it also improved quality of life scores.[53] Ashwagandha, rhodiola, and other herbal adaptogens can increase energy and stamina in addition to improving mood and cognition.[54]



Source: National Cancer Institute

Clinical Conclusion

There are millions of cancer survivors in the United States and that number continues to grow. Many of them have a myriad of needs following treatment and integrative practitioners are uniquely positioned to help survivors with their recovery. An integrative approach that utilizes diet, lifestyle, and targeted dietary supplements will also help reduce the risk of cancer recurrence, a key priority for cancer survivors.[55]

About the Author

Tina Kaczor, ND, FABNO, is editor-in-chief of *Natural Medicine Journal* and the creator of Round Table Cancer Care. She is a naturopathic physician board certified in naturopathic oncology. She received her naturopathic doctorate from National University of Natural Medicine and completed her residency at Cancer Treatment Centers of America. She is also the editor of the *Textbook of Naturopathic Oncology*.

Editor's Note

Integrative Therapeutics® sponsored this research guide. For more information, visit integrativepro.com. All content opinions and statements made in this guide are those of the author and not Integrative Therapeutics®.

The author of this guide does not have any conflicts of interest and has not received any financial gain from the sales of Integrative Therapeutics products.

References

1 National Cancer Institute. Cancer Statistics. 2020, September 25.

2 Miller KD, Nogueira L, Mariotto AB, et al. Cancer treatment and survivorship statistics, 2019. *CA Cancer J Clin.* 2019;69(5):363-385.

3 National Cancer Institute. Side Effects of Cancer Treatment. Accessed 2021, March.

4 National Institutes of Health. Multivitamin/mineral supplements. 2021, March 26.

5 Blumberg J, Cena H, Barr SI, et al. The use of multivitamin/mineral supplements: a modified Delphi Consensus Panel Report. *Clinical Therapeutics.* 2018;40(4):640-657.

6 Blumberg JB, Bailey RL, Sesso HD, Ulrich, CM. The evolving role of multivitamin/multimineral supplement use among adults in the age of personalized nutrition. *Nutrients.* 2018;10(248).

7 Goodman GE, Thornquist MD, Balmes J, et al. Beta-carotene and retinol efficacy trial: evidence of lung cancer and cardiovascular disease mortality during 6-year follow-up after stopping beta-carotene and retinol supplements. *J Natl Cancer Inst.* 2004;96(23):1743-50.

8 Alpha-Tocopherol, Beta Carotene Cancer Prevention Study Group. The Effect of Vitamin E and Beta Carotene on the Incidence of Lung Cancer and Other Cancers in Male Smokers. *N Engl J Med.* 1994;330(15), 1029–1035.

9 Mondul AM, Sampson JN, Moore SC, et al. Metabolomic profile of response to supplementation with beta-carotene in the alpha-tocopheral, beta-carotene cancer prevention study. *Am J Clin Nutr.* 2013;98:488-93.

10 Ishida S, Andreux P, Poitry-Yamate C, et al. Bioavailable copper modulates oxidative phosphorylation and growth of tumors. *PNAS.* 2013;110(48):19507-19512.

11 Zhang X, Yang Q. Association between serum copper levels and lung cancer risk: a meta-analysis. *J Int Med Res.* 2018;46(12):4863-4873.

12 Hemila H, Kaprio J. Modification of the effect of vitamin E supplementation on mortality of male smokers by age and dietary vitamin C. *Am J Epidemiol.* 2009;169(8):946-953.

13 Lippman SM, Klein EA, Goodman PJ, et al. Effect of selenium and vitamin E on risk of prostate cancer and other cancers: the Selenium and Vitamin E Cancer Prevention Trial (SELECT). *JAMA.* 2009;301(1):39-51.

14 Klein EA, Thompson IM, Tangen CM, et al. Vitamin E and the risk of prostate cancer: updated results of the selenium and vitamin E cancer prevention trial (SELECT). *JAMA.* 2011;306(14):1549-1556.

15 Verma R, Foster RE, Horgan K, et al. Lymphocyte depletion and repopulation after chemotherapy for primary breast cancer. *Breast Cancer Research.* 2016;18(10).

16 Kang D, Weaver MT, Park N, et al. Significant impairment in immune recovery following cancer treatment. *Nurs Res.* 2009;58(2):105-114.

17 American Cancer Society. Why people with cancer are more likely to get infections. 2020, March 13.

18 Tomeh MA, Hadianamrei R, Zhao X. A review of curcumin and its derivatives as anticancer agents. *In J Mol Sci.* 2019;20(1033).

19 Panahi Y, Saadat A, Beiraghdar F, Sahebkar A. Adjuvant therapy with bioavailability-boosted curcuminoids suppresses systemic inflammation and improves quality of life in patients with solid tumors: a randomized double-blind placebo-controlled trial. *Phytother Res.* 2014;(2014).

20 Kennedy L, Sandhu JK, Harper M, Cuperlovic-Culf M. Role of glutathione in cancer: from mechanisms to therapies. *Biomolecules.* 2020;10(1429).

21 Richie JP, Nichenametla S, Neidig W, et al. Randomized controlled trial of oral glutathione supplementation on body stores of glutathione. *Eur J Nutr.* 2015;54(2):251-63.

22 Kennedy L, Sandhu JK, Harper M, Cuperlovic-Culf M. Role of glutathione in cancer: from mechanisms to therapies. *Biomolecules.* 2020;10(1429).

23 Huynh NB. The immunological benefits of green tea (*Camellia sinensis*). *Int J Biol.* 2017;9(1)

24 Fuhrman BJ, Pfeiffer RM, Wu AH, et al. Green tea intake is associated with urinary estrogen profiles in Japanese-American women. *Nutr J.* 2013;13:25.

25 Tang S, Deng, X, Zhou J, et al. Pharmacological basis and new insights of quercetin action in response to ints anti-cancer effects. *Biomed Pharmacother.* 2019;121(2020).

26 Orfali G., Duarte AC, Bonadio V, et al. Review of anticancer mechanisms of isoquercetin. *World J Clin Oncol.* 2016;7(2):189-199.

27 Honari M, Shafabakhsh R, Reiter RJ, et al. Resveratrol is a promising agent for colorectal cancer prevention and treatment: focus on molecular mechanisms. *Cancer Cell Int.* 2019;19:180.

28 Henderson F, Cross AJ, Baraniak A. 'A new normal with chemobrain': experiences of impact of chemotherapy-related cognitive deficits in long-term breast cancer survivors. *Health Psychol Open.* 2019;6(1).

29 Vardy JL, Dhillon HM, Pond GR, et al. Cognitive function and fatigue after diagnosis of colorectal cancer. *Ann Oncol.* 2014;Sept 11.

30 Ferreira G, McKenna MC. L-carnitine and acetyl-L-carnitine roles and neuroprotection in developing brain. *Neurochem Res.* 2017;42(6):1661-1675.

31 Malaguarnera M, Cammalleri L, Gargante MP, et al. L-carnitine treatment reduces severity of physical and mental fatigue and increases cognitive functions in centenarians: a randomized controlled clinical trial. *Am J Clin Nutr.* 2007;86:1738-44.

32 Cotroneo AM, Castagna A, Putignano S, et al. Effectiveness and safety of citicoline in mild vascular cognitive impairment: the IDEALE study. *Clin Interv Aging.* 2013;8:131-137.

33 McGlade E, Locatelli A, Hardy J, et al. Improved attentional performance following citicoline administration in healthy adult women. *Food Nutr Sci.* 2012;3:769-773.

34 Small GW, Siddarth P, Li Z, et al. Memory and brain amyloid and tau effects of a bioavailable form of curcumin in non-demented adults: a double-blind, placebo-controlled 18-month trial. *Am J Geriatr Psychiatry.* 2018;26:3.

35 Voulgaropoulou SD, van Amelsvoort T, Prickaerts J, Vingerhoets C. The effect of curcumin on cognition in Alzheimer's disease and healthy aging: a systematic review of pre-clinical and clinical studies. *Brain Research.* 2019;1725.

36 Mori K, Inatomi S, Ouchi K, et al. Improving effects of the mushroom yamabushitake (Hericium erinaceus) on mild cognitive impairment: a double-blind placebo-controlled clinical trial. *Phytother Res.* 2009;23:367-372.

37 Li I, Chang H, Lin C, et al. Prevention of early alzheimer's disease by erinacine a-enriched *Hericium erinaceus* mycelia pilot double-blind placebo-controlled study. *Front Aging Neurosci.* 2020;12(155).

38 National Cancer Institute. Sleep Disorders—Health Professional Version. 2021;March 11.

39 Belloumi N, Bellaj S, Bachouche I, et al. Comparison of sleep quality before and after chemotherapy in locally advanced nonsmall cell lung cancer patients: a prospective study. *Sleep Disord.* 2020;2020.

40 Ferracioli-Oda E, Qawasmi A, Bloch MH. Meta-analysis: melatonin for the treatment of sleep disorders. *PLoS ONE.* 2013;8(5).

41 Hansen M, Madsen M, Anderson L, et al. Effect of melatonin on cognitive function and sleep in relation to breast cancer surgery: a randomized, double-blind, placebo-controlled trial. *Int J Breast Cancer.* 2014;2014.

42 Djokic G, Vojvodic P, Korcok D, et al. The effects of magnesium, melatonin, vit B complex supplementation in treatment of insomnia. *Maced J Med Sci.* 2019;7(18):3101-3105.

43 Tarocco A, Caroccia N, Morciano G, et al. Melatonin as a master regulator of cell death and inflammation: molecular mechanisms and clinical implications for newborn care. *Cell Death Dis.* 2019;10(317).

44 Yoto A, Motoki M, Murao S, Yokogoshi H. Effects of L-theanine or caffeine intake on changes in blood pressure under physical and psychological stresses. *J Physiol Anthropol.* 2012;31:28.

45 Hidese S, Ogawa S, Ota M, et al. Effects of L-theanine administration on stress-related symptoms and congnitive function in healthy adults: a randomized controlled trial. *Nutrients.* 2019;11:2362.

46 Woodbury A, Yu SP, Wei, L, Garcia P. Neuro-modulating effects of honokiol: a review. *Front Neurol.* 2013;4(130).

47 Hofman M, Ryan JL, Figueroa-Moseley CD, Jean-Pierre P, Morrow GR. Cancer-related fatigue: the scale of the problem. *Oncologist.* 2007;12 Suppl 1:4-10.

48 National Cancer Institute. Fatigue—Patient Version. 2019, May 15.

49 Kim JH, Park CY, Lee SJ. Effects of sun ginseng on subjective quality of life in cancer patients: a double-blind, placebo-controlled pilot trial. *J Clin Pharm Ther.* 2006;31(4):331-334.

50 Barton DL, Liu H, Dakhil SR, et al. Wisconsin ginseng (Panax quinquefolius) to improve cancer-related fatigue: a randomized, double-blind trial, N07C2. *J Natl Cancer Inst.* 2013;105(16):1230-1238.

51 Olsson EM, von Schéele B, Panossian AG. A randomized, double-blind, placebo-controlled, parallel-group study of the standardized extract SHR-5 of the roots of *Rhodiola rosea* in the treatment of subjects with stress-related fatigue. *Planta Med.* 2009;75(2):105-112.

52 Anghelescu I, Edwards D, Seifritz E, Kasper S. Stress management and the role of Rhodiola rosea: a review. *Int J Psychiatry Clin Pract.* 2018;4:242-252.

53 Biswal B, Sulaiman S, Ismail H. Effect of Withania somnifera (ashwagandha) on the development of chemotherapy-induced fatigue and quality of life in breast cancer patients. *Integr Cancer Ther.* 2012;12(4):312-322.

54 Singh N, Bhalla M, de Jager P, Gilca M. An overview on ashwagandha: a Rasayana (rejuvenator) of Ayurveda. *Afr J Tradit Complement Altern Med.* 2011;8(5 Suppl):208-213.

55 Karavasiloglou N, Gestoni G, Wanner M, et al. Health lifestyle is inversely associated with mortality in cancer survivors: results from the third National Health and Nutrition Examination Survey (NHANES III). *PLoS ONE.* 2019; June 26.