

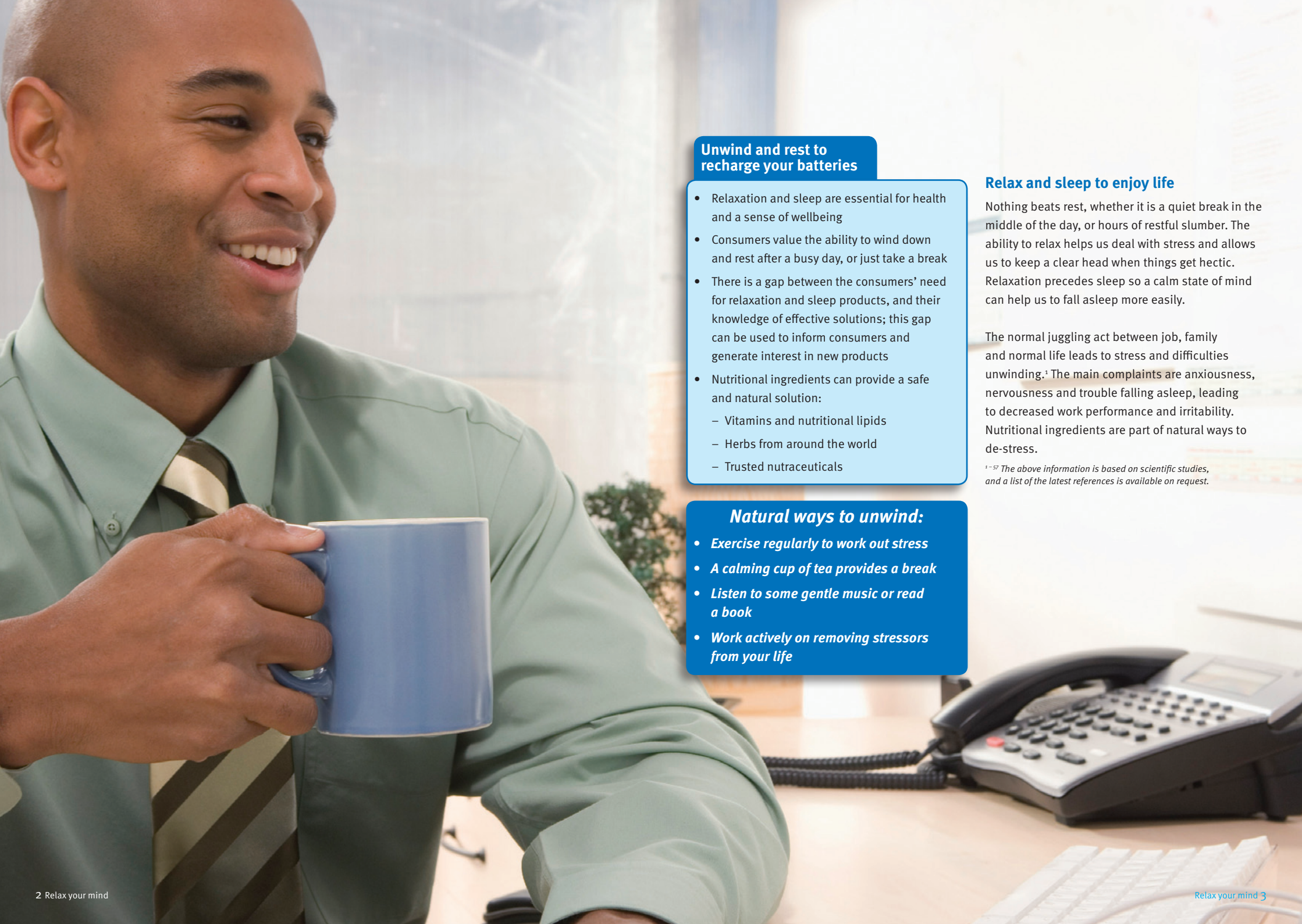


Relax your mind

Health benefit solutions

HEALTH • NUTRITION • MATERIALS





Unwind and rest to recharge your batteries

- Relaxation and sleep are essential for health and a sense of wellbeing
- Consumers value the ability to wind down and rest after a busy day, or just take a break
- There is a gap between the consumers' need for relaxation and sleep products, and their knowledge of effective solutions; this gap can be used to inform consumers and generate interest in new products
- Nutritional ingredients can provide a safe and natural solution:
 - Vitamins and nutritional lipids
 - Herbs from around the world
 - Trusted nutraceuticals

Natural ways to unwind:

- *Exercise regularly to work out stress*
- *A calming cup of tea provides a break*
- *Listen to some gentle music or read a book*
- *Work actively on removing stressors from your life*

Relax and sleep to enjoy life

Nothing beats rest, whether it is a quiet break in the middle of the day, or hours of restful slumber. The ability to relax helps us deal with stress and allows us to keep a clear head when things get hectic. Relaxation precedes sleep so a calm state of mind can help us to fall asleep more easily.

The normal juggling act between job, family and normal life leads to stress and difficulties unwinding.¹ The main complaints are anxiousness, nervousness and trouble falling asleep, leading to decreased work performance and irritability. Nutritional ingredients are part of natural ways to de-stress.

¹ - 57 The above information is based on scientific studies, and a list of the latest references is available on request.

The sleep and relaxation markets

Products for sleep and relaxation are two distinct concepts, although they are linked. When people want to relax, they are looking to change their mood to a more agreeable state of mind, a bit like changing gears. Sleep on the other hand is a vital physiological process that requires a long break in consciousness. Relaxation can help people sleep, however it is valuable to individuals who just want to take a break and find a quiet interlude to reset their thoughts. Products need to be carefully formulated and marketed to ensure that relaxation products allow people to wind down while keeping them in a wakeful state.

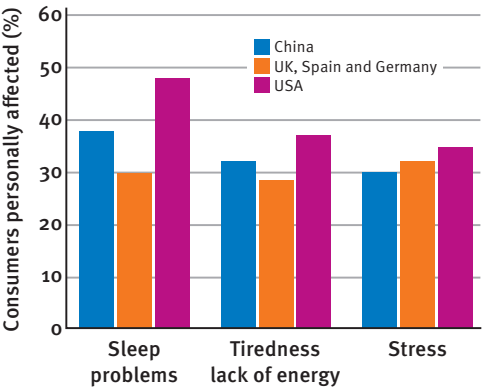
Globally, many consumers appreciate relaxation and sleep products to help them acheive balance in their lives

Relaxation is a counterpart to tension and stress in our busy world. In a consumer study, one in five consumers in 15 countries surveyed around the world felt noticeably tense all or most of the time.² Relaxation products provide a counterpoint to popular energy drinks, and are increasing in popularity. Along with sleep products, they form part of the cognition category that is expected to grow 12 % at least until 2014.³ Baby-boomers may be obvious targets for relaxation products, however marketers should consider people in younger stages of life as well.³

Many people throughout the world are affected by poor sleep, and insomnia incidence is particularly high in Europe, the Americas and Australasia.⁴ Even though Americans recognize that getting enough sleep and managing stress levels are important as part of a healthy lifestyle, a large proportion of American adults lie awake at night due to stress.⁵ In China, around 2/3 of adult shoppers report that they have concerns with getting enough sleep.⁶ There is a need for safe and effective products to provide a healthy alternative to often-maligned and over-prescribed sleep aids.

Consumers report that they are not familiar enough with the science behind sleep and relaxation; education is a strategy that can be leveraged to promote new products.

Percentage of consumers extremely or very concerned about relaxation and sleep
(Source: HealthFocus 2010 global trend data)

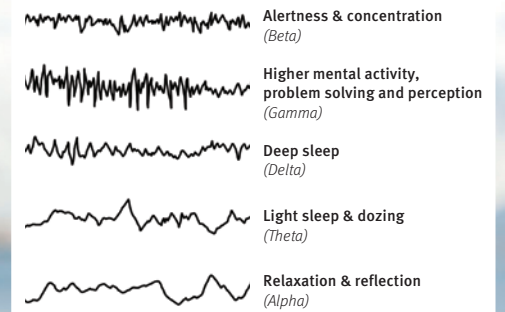




The Science behind Sleep and Relaxation

Relaxation and sleep both contribute to our quality of life by allowing our minds and bodies to rest and recuperate. Giving the body a chance to unwind, and getting a good night's sleep, both counteract stress and may help prevent chronic diseases.⁷

Brain waves mark our state of consciousness from active thought through quiet relaxation to deep sleep. An electroencephalogram (EEG) allows scientists to measure brain waves that can be used to determine the state of relaxation and sleep quality. By recording brain wave activity, we are able to objectively measure levels of alertness and relaxation.



Brain activities and brain wave type

- The brain is active at all times of the day and night
- Thought processes create electrical energy in the brain
- The characteristic patterns found when brain energy is measured reflect levels of brain activity

Ingredients to relax the mind

Relaxation

Relaxation can be defined as a feeling of refreshing tranquility and an absence of tension or worry. The most important brain waves involved in relaxation are the alpha and beta waves. Beta waves signify alertness, active, busy or anxious thinking and active concentration. Alpha-waves are associated with physical and mental relaxation and meditation—the quiet reflection achieved when we take a calming break. Stress is associated with a reduction in alpha-waves during wakefulness.⁸

In response to stress, our bodies produce hormones to help us with our “fight or flight” response. Cortisol, adrenaline and noradrenaline are the main hormones responsible for classical symptoms of stress: increased heart rate and blood pressure, and a decreased sensitivity to pain. These hormones prepare the body to physically respond to stress, but may be counter-productive in modern life. Some negative consequences of the hormones’ actions include insulin resistance and a suppressed immune system, both related to chronic disease risk.⁹ Gamma-aminobutyric acid (GABA) is the chief inhibitory neurotransmitter in the central nervous system, which means that it reduces brain stimulation. Specific sites on brain cells are sensitive to GABA. When GABA binds to the sites, the brain cells’ actions are decreased and this results in a relaxing effect. Certain nutrients can help manage these specialized mood chemicals.

Sleep

Sleep is a vital physiological process with restorative functions.¹⁰ During deep sleep, growth hormone is secreted stimulating growth, particularly in children, and regeneration in the body.¹¹ Deep sleep allows the brain to process and consolidate new information into the memory. In children and adolescents, poor sleep can negatively influence functioning and development.¹² High-quality sleep occurs when the time to sleep, otherwise known as sleep latency, is short, and a portion of the night is spent in deep sleep.¹³

- *Neurotransmitters, chemical signals in the brain, and hormones, messenger molecules in the body, guide our level of relaxation and sleep cycles*
- *Simple relaxation exercises like listening to music reduce levels of stress hormones*
- *The need for sleep is highest in newborns, and decreases as people get older*

Brain wave activity can tell us much about the quality of our sleep. Sleep onset occurs when the brain exhibits theta-waves, marking reduced consciousness. Delta-waves occur during the most restful deep sleep, which mainly occurs during the first half of the night.¹⁴ Rapid eye movement sleep, which also occurs during normal sleep, is characterized by a mix of alpha, beta and asynchronous waves.¹⁵

Our sleep is also guided by hormones that dictate our circadian rhythm. Melatonin levels rise when light levels decrease, causing drowsiness and lowering body temperature, reaching a peak in the middle of the night.¹⁶

Vitamins and Nutritional Lipids

B vitamins and vitamin D

A healthy brain is one that is provided with all the nutrition it needs. The B vitamins are essential for diverse roles throughout the body and most are needed for energy metabolism and cell repair and growth. Sleep is restorative and this is reflected in increased secretion of growth hormones particularly during slow-wave sleep.¹¹ It is important to have adequate levels of vitamins to provide the body with the tools it needs to restore itself during sleep.

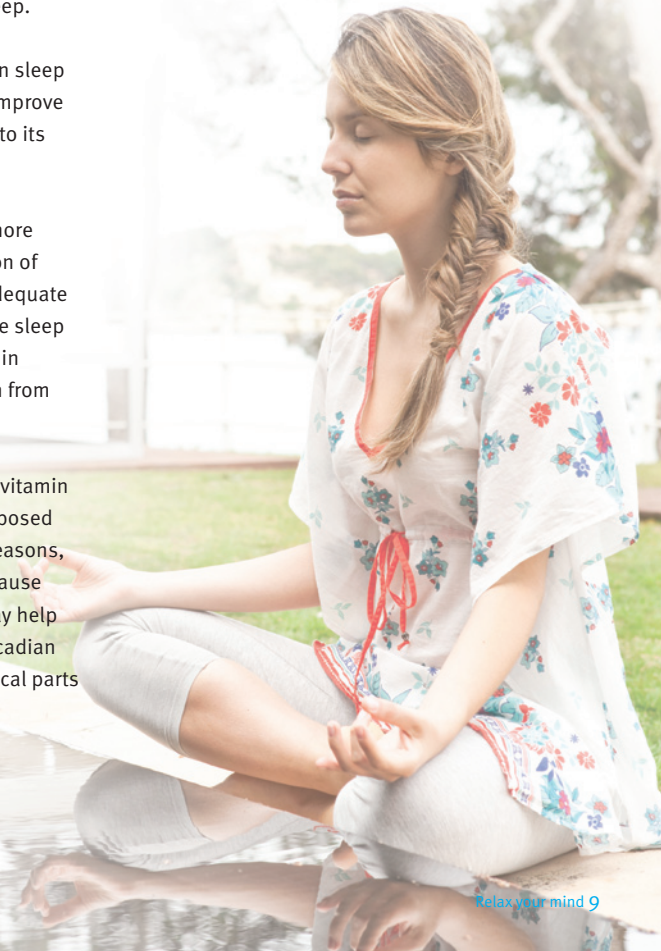
Some vitamins have more specific effects on sleep and relaxation. Vitamin B12 was shown to improve sleep quality in shift workers, possibly due to its effects on the circadian rhythm.^{17,18}

Adequate niacin (vitamin B3) levels allow more tryptophan to be available for the production of serotonin and melatonin, so ensuring an adequate intake allows the body to manufacture these sleep cycle hormones. Vitamin B6 is also needed in the production of both niacin and serotonin from tryptophan.¹⁹

Vitamin D is considered to be the sunshine vitamin because it is produced by the skin when exposed to sunlight. As such, it is a marker for the seasons, with lower amounts produced in winter because the sun’s strength is reduced. Vitamin D may help improve mood and influence the body’s circadian rhythms through vitamin D receptors in critical parts of the brain.^{20,21}

Omega-3 LC PUFA

Omega-3 long chain polyunsaturated fatty acids (LC PUFA) are brain-friendly fats that are important constituents of the cell membranes of brain cells, where they help in the volume and release of neurotransmitters such as serotonin, noradrenaline and dopamine.²² LC PUFA supplementation has been shown to help reduce levels of cortisol, the stress hormone, in some preliminary studies.^{23,24}



Minerals

Magnesium

Essential minerals are needed for normal brain functioning because they are functional parts of neurological enzymes. Magnesium is present in every cell in the body because it is needed for energy synthesis. Research indicates that magnesium reduces reactivity to stress and can play an important role in the regulation of sleep and wakefulness.²⁵

Iron

Hemoglobin is a protein that carries oxygen through the body. The mineral iron makes up an essential part of the protein by actually binding to oxygen in the blood. The brain's high metabolic activity means that it has a high demand for oxygen, and this is why iron-deficiency anemia affects cognitive functioning. Common symptoms are feelings of stress and nervousness, which may be relieved when deficiency is corrected.²⁶

Multiple minerals

Micronutrients work in tandem with each other, and formulations that contain a range of essential components may work better than a single treatment. A clinical trial showed that combined zinc, calcium and magnesium supplements reduced perceived stress and nervousness.²⁷

Nutraceuticals for Relaxation

Chamomile

The use of chamomile (closely related species German chamomile *Matricaria recutita* or Roman chamomile *Chamaemelum nobile*) to calm the nerves has been well known since ancient times.²⁸ Recent research has found that some of the active compounds in chamomile have a relaxing effect.^{29,30} A randomized controlled trial found that it reduced symptoms of nervous tension.³¹

Hops

The hops plant (*Humulus lupulus*) was first cultivated in Western Europe and is traditionally used to add a bitter flavor to beer. It is known for its calming and relaxing properties.³² It activates alpha and beta waves, leading to a state of relaxation in combination with other peaceful herbs, such as valerian.³³



Lemon balm

A member of the mint family, the calming properties of lemon balm (*Melissa officinalis*) have been recorded since the middle ages.³⁴ The lemon-scented essential oil from this plant has been studied extensively and may affect mood by various mechanisms, for example it can reduce the activity of an enzyme that breaks down GABA, potentially increasing levels of GABA in the brain and having a calming effect.³⁵ Controlled clinical trials show that measures of restlessness improved in infants and school children, and calmness increased during cognitive testing in healthy subjects.^{36,37}

Passionflower

The passionflower (*Passiflora incarnata*) was first discovered in Peru. In vitro studies show that it has a similar action as other compounds that can stimulate the GABA receptor and decrease brain cell excitability.³⁸ We know from animal studies that it can reduce stress, and it reduced nervousness in recent clinical research.³⁹ Another study showed that it improved sleep quality.⁴⁰

L-Theanine

Having a cup of tea is a calming ritual in various cultures even though tea contains the stimulant caffeine. L-theanine is an amino acid that is commonly found in tea, particularly green tea. It is an interesting compound because it crosses blood-brain barrier dose-dependently, which indicated it may have effects on the brain. Studies have shown that L-theanine increases alpha-wave brain activity, and GABA concentrations in the brain.^{41–43}



Nutraceuticals for Sleep

Lavender

The calming scent of lavender (*Lavandula angustifolia*) has been used in soothing aromatherapy treatments for centuries. Volatile oils produced from essential oils harvested from the blooms just before they unfold are the main medicinal parts containing bio-active compounds. The lavender aroma enhances alpha waves, corresponding to a feeling of calmness and mood improvement.⁴⁴

One randomized control trial found that lavender aroma improved sleep quality compared to a control treatment, and that it was more likely to be recommended after the trial.⁴⁵ Another trial showed that when it was taken in a capsule, measured sleep duration and quality improved.⁴⁶

Melatonin

Melatonin is a hormone that is part of the natural circadian rhythm: it is either absent or present at very low levels during daytime, and when light starts to dim at nighttime, levels increase. It is produced by the pineal gland in the brain and is responsible for drowsiness as bedtime approaches, and the drop in body temperature that occurs during sleep. Supplements containing melatonin may help people establish appropriate sleep rhythms, especially for people with jetlag, or reduced production associated with aging.^{47,48} The body of clinical research is growing, and a recent human trial showed significantly reduced time to sleep.⁴⁹

Tryptophan

In the body, tryptophan is an amino acid that is used as a precursor for serotonin, which is converted to melatonin. Tryptophan is therefore essential for maintaining normal circadian rhythms. Increasing the level of tryptophan in the diet has been shown to increase levels of tryptophan and serotonin in the brain.⁵¹ This, in turn, increases nighttime sleepiness and reduces sleep latency.⁵¹

Valerian

The root of the valerian plant (*Valeriana officinalis*) has been used to help people relax and sleep since ancient times.⁵² While it is a natural product containing many bioactive components, extracts have been shown to enhance the effect of the neurotransmitter GABA and therefore reducing the excitability of the brain cell.⁵³ Clinical trials show that it has the potential to reduce sleep latency and improve sleep quality.^{54,55} It can also help reduce stress from performing concurrent mental tasks.⁵⁶



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Nutritional solutions for a relaxed mind

Ingredient	Function for relaxation and sleep	Daily dose range*
Vitamins and nutritional lipids		
Quali®-B (Vitamin B1)	Co-enzyme in energy metabolism	1 – 1.5 mg
Quali®-B (Vitamin B2)	Co-enzyme in energy production, antioxidant function	1.3 – 1.8 mg
Quali®-B (Vitamin B3)	Preserves tryptophan levels	14 – 20 mg
Quali®-B (Vitamin B5)	Needed for synthesis of neurotransmitters	10 – 20 mg
Quali®-B (Vitamin B6)	Required for neurotransmitter synthesis	0.6 – 50 mg
Quali®-B (Vitamin B12)	Co-enzyme especially in cells of the nervous system	1.4 – 3 µg
Quali®-D (VitaminD)	Sunshine vitamin	400 – 800 IU (10 – 20 µg)
ROPUFA® or Life'sDHA™ LC omega-3 PUFA	Essential fatty acid; required for cell membranes in brain cells	400 mg EPA & 200 mg DHA
Herbal ingredients		
Chamomile	Traditional anti-stress herb	200 – 400 mg ⁵⁷
Lemon balm (Melissa officinalis)	Traditional anti-stress herb	200 – 400 mg ⁵⁷
Hops (Humulus lupulus)	Activates alpha waves	100 – 400 mg powdered female flowers and cones ^{54, 57}
Nutraceuticals		
Tryptophan	Precursor for melatonin	500 – 2500 mg ⁵⁰
L-Theanine	Amino acid, increases brain GABA levels	50 – 250 mg ⁴¹
Minerals		
Magnesium	Controls nerve transmission	200 mg
Iron	Electron transporter in red blood cells	8 – 20 mg
Zinc	Essential for nervous system activity	7 – 15 mg
Calcium	Electrolyte and required for cell signaling	100 mg

* Allowable levels of nutrients vary depending on national regulations and the final application.
The above information is based on scientific studies, and a list of the latest references is available on request.

How can we Health you?

Relaxation is part of achieving the balance needed to enjoy life to the fullest; the pace everyday modern living is tempered by being able to wind down and take a break.

DSM's broad portfolio of innovative, high-quality and safe nutrients, combined with our consumer insights, market knowledge and application expertise, can help your relaxation and sleep positioned products attract more consumers.

We are the only integrated premix, vitamin and nutraceutical manufacturer capable of creating and delivering tailor-made formulations to you anywhere. Blend in our extensive scientific expertise, technical know-how, global presence and total quality assurance for your peace-of-mind.

Via our global network of blend facilities we create value-adding nutrient combinations custom-made for you. Our Quali®-Blends can offer the right balance of ingredients supporting sleep and relaxation.

DSM can help you get to market faster with appealing relaxation solutions that work.

DSM Nutritional Products

For more information on this Health Benefit Solution by DSM,
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