



SleepWell

Nourish your night

**Do you have
the guts to
sleep well?**

Wide awake, everywhere from America to Zambia

We humans spend up to one third of our life sleeping. On average, that amounts to a considerable 26 years. More surprisingly perhaps, **we spend seven years trying to get to sleep.**

Sleep is a basic human need, like eating and drinking, and is a hugely important factor in living a long, healthy and productive life.

Sleeping well is essential to our wellbeing and quality of life. It allows our body to recover naturally from stress, and to repair itself ready for the day ahead¹. A good night's sleep helps you to stay alert, active and feeling at your best.

However, figures show that many of us don't sleep well. In fact, sleep deprivation is a genuine global problem, affecting the quality of life for 20-30% of the world's population².

¹RAND, 2017.
²CBS, 2018.

The health and economic costs of poor sleep

Sleep deprivation is a serious issue. Because not enough sleep or poor-quality sleep can lead to all manner of health issues in both the short and longer term¹.

Next-day negative effects can include lack of energy, clumsiness, impaired attention span and memory recall¹.

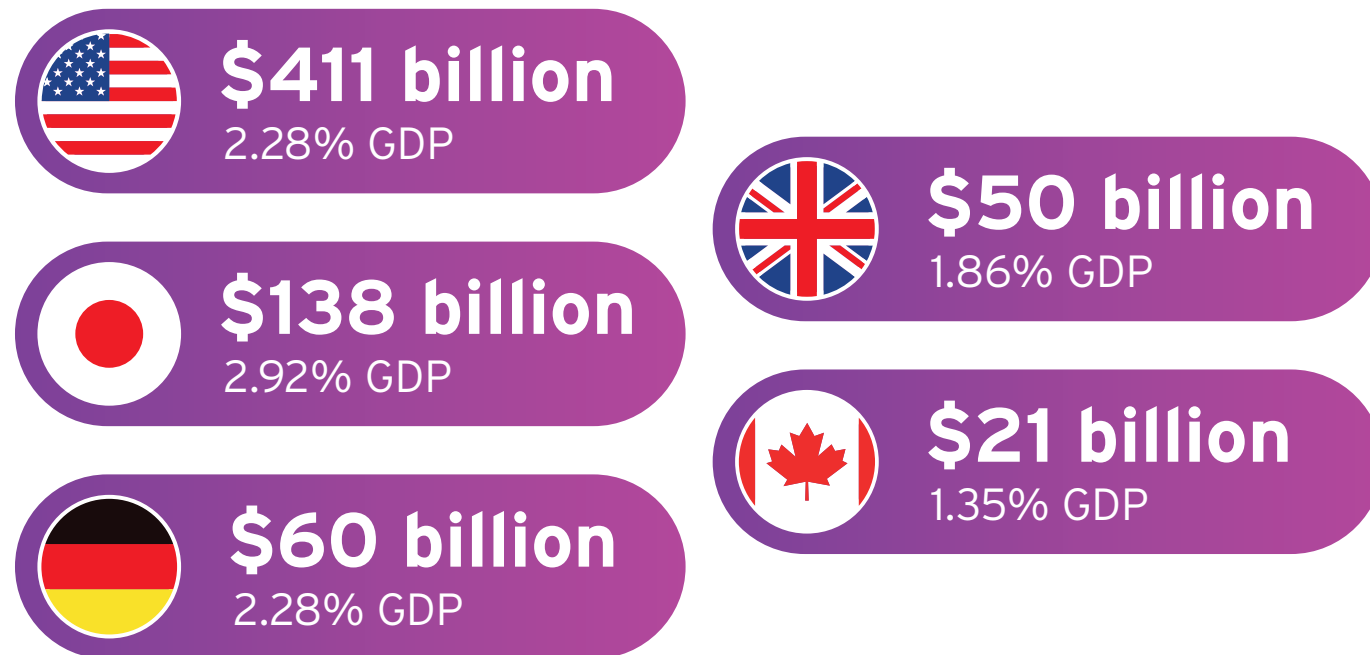
Further down the line, sleep deprivation has been associated with many serious health problems, such as stress, anxiety, depression, obesity, diabetes, weakened immune system and lower life expectancy².

The knock-on effects are profound too. Fatigue adversely affects our moods and our relationships, it can mean we don't perform as we should at school or at work, and it can lead to costly mistakes and accidents³.

¹Krause, 2017; ²NSF, Sleepfoundation.org, 2020, NHS, 2018; ³RAND, 2016, Gerhardsson, 2018.

The sleep deficit - in numbers

Across five prominent OECD countries, inadequate sleep is estimated to cost a combined **US\$680 billion a year**, due to lost productivity, medical expenses, sick leave and environmental damage. This equates to an average of **2% of GDP**¹.



¹Source: RAND, 2016.

The demand for sleep aids and remedies is soaring

As sleep becomes one of the hot topics of the age, consumers are becoming more and more aware of how important it is to their health.

A survey conducted by management consultants Bain & Co. revealed that 45% of respondents didn't sleep well for at least half the nights in a given month. And that 70% of people are concerned about consequences of poor sleep quality on their physical health¹.

So unsurprisingly, consumers are searching for effective solutions – ways to help them enjoy uninterrupted, beneficial sleep, night after night. The past few years have witnessed a rapid growth in the sleep aid category.



It's estimated the market for sleep aids and remedies is **growing 30% year on year**² and this figure is expected to rise steadily to **US\$5-9 billion**³.

¹Bain & Co, 2019, research commissioned by RFC (on request, not publicly available).

²Nutrition Business Journal, 2020, ³Mintel, Euromonitor, 2017.

| Consumer Insight

At FrieslandCampina Ingredients, we're leading worldwide research into natural, non-addictive sleep solutions. We have established a dedicated team to create a compelling product range that will appeal to consumers and dovetail with their lifestyles.

We consider sleep as part of the 'golden triangle' of human health. It's the balance of nutritious food, regular exercise and sleeping well that is the key to living a long and healthy life. With decades of experience in developing high-performance nutritional products for adults, infants and elite athletes, we're now turning our attention to products that can help all of us to sleep better.

Research by the Biotis™ team identified that people are looking for natural solutions that fit with their lifestyles and evening routine. Our studies found a clear preference for a night-time shot¹.

Preferred formats



¹Online questionnaire by FCI, Biotis™ team, 2018 (on request, not publicly available).

Biotis™ SleepWell – a holistic approach to sleep

We've created and piloted a unique, natural solution; one that provides a threefold benefit to people who want to improve their sleep.

Falling asleep:

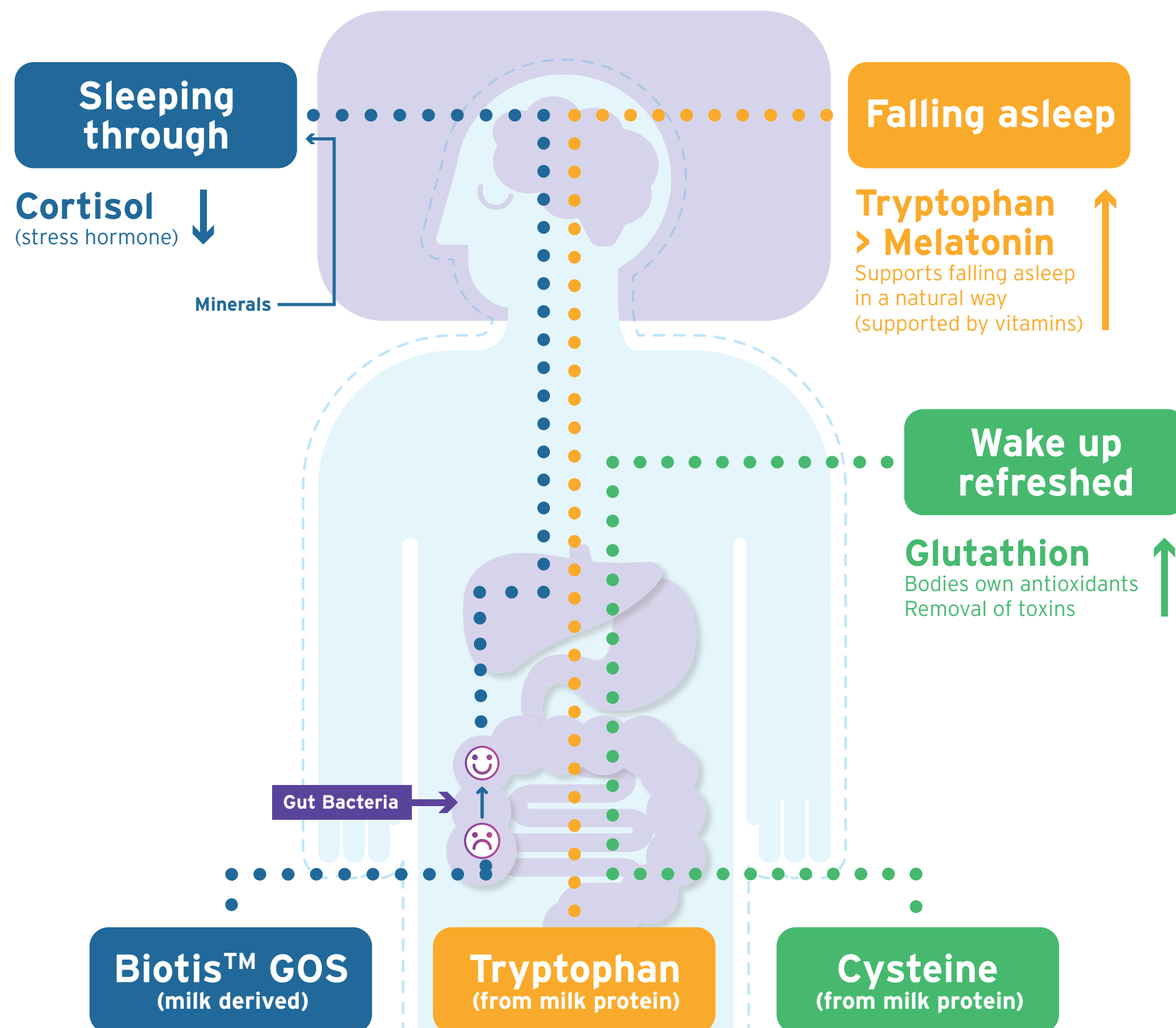
Biotis™ SleepWell is rich in tryptophan, an amino acid derived from milk protein. This is turned first into serotonin and then into melatonin by our body's natural metabolism, which helps us to fall asleep in a natural way¹.

Sleeping through:

Meanwhile, prebiotic^{2*} galacto-oligosaccharides (GOS) stimulate our gut microbiota to produce beneficial metabolites like gamma-amino butyric acid (GABA). This signals the brain to also produce GABA, a neurotransmitter that lowers our stress and helps us to sleep through the night³.

Waking up fresh:

Biotis™ SleepWell also supplies the body with the amino acid cysteine, as well as magnesium and vitamin D. Together these help the liver to produce glutathione, which has been shown to cleanse the body of toxins⁴. This helps us to wake up fresh and ready for action.



¹Sleepfoundation, 2020; ²ISAPP (International Scientific Association for Probiotics and Prebiotics), Gibson et al., 2017; ³Substrates that are selectively utilized by host microorganisms conferring a health benefit; ⁴Saper et al., 2005; ⁵Kaplowitz, N., 1981.

How the gut helps us to sleep well

Experts believe that the gut microbiome can affect our quality of sleep by disturbing our sleep-wake cycle, our circadian rhythm, and the hormones that regulate wakefulness and sleep¹.

A recent study has shown that greater diversity of bacteria in the gut could improve sleep quality at night and alleviate sleepiness during the day².

As world-leading experts in gut health, we've based the formulation of Biotis™ SleepWell on the findings of solid scientific research...

¹Zhang et al., 2017, Benedict et al., 2016, Smith et al., 2019, Poroyko et al., 2016, Thompson et al., 2017;
²Kate E Sprecher et al., 2019.



Gut-brain axis

The evidence indicates that micro-organisms and circadian genes interact with each other via the gut-brain axis, and this could influence the sleep-wake cycle. A prebiotic^{1*} such as Biotis™ GOS could play a role in the support of the gut microbiome, keeping it healthy, and in turn promoting better sleep^{2,3}.

Friendly bacteria

Research shows that GOS may help with the growth of *Lactobacillus* and *Bifidobacteria*⁴ in the gut. Studies suggest that these friendly gut bacteria may reduce stress^{5,6} and anxiety symptoms^{7,8}, which are thought to hamper a good night's sleep.

Neurotransmitters

Amino-acids from whey protein fractions can encourage neurotransmitters, such as serotonin and melatonin, which are associated with the sleep-wake cycle. What's more they can act as building blocks to support processes that help us to recover well during the night so we feel fresh in the morning⁹.

Micronutrients

Not having enough of the right micronutrients in your system can result in poor sleep quality¹⁰⁻¹². The Biotis™ SleepWell formula helps to supplement essential micronutrients such as Magnesium and Vitamin D, which in turn may encourage restful sleep¹³⁻¹⁶.

¹ISAPP (International Scientific Association for Probiotics and Prebiotics), Gibson et al., 2017; ²Substrates that are selectively utilized by host microorganisms conferring a health benefit; ³Poroyko et al., 2016; ⁴Thompson et al., 2017; ⁵Walton et al., 2012; ⁶Thompson et al., 2020; ⁷Schmidt et al., 2015; ⁸Johnstone et al., 2019; ⁹Silk, et al., 2009; ¹⁰Valtonen et al., 2005; ¹¹Institute-of-Medicine, 1998a, ¹²Gao et al., 2018, ¹³Ji, Grandner, & Liu, 2017; ¹⁴Sabir et al., 2018, ¹⁵Gao et al., 2018, ¹⁶Held et al., 2002, ¹⁷Nielsen et al., 2010.

How well do people sleep, with SleepWell?

Biotis™ SleepWell has shown measurable improvements in sleep quality, both in several consumer trials and more recently in clinical trials.

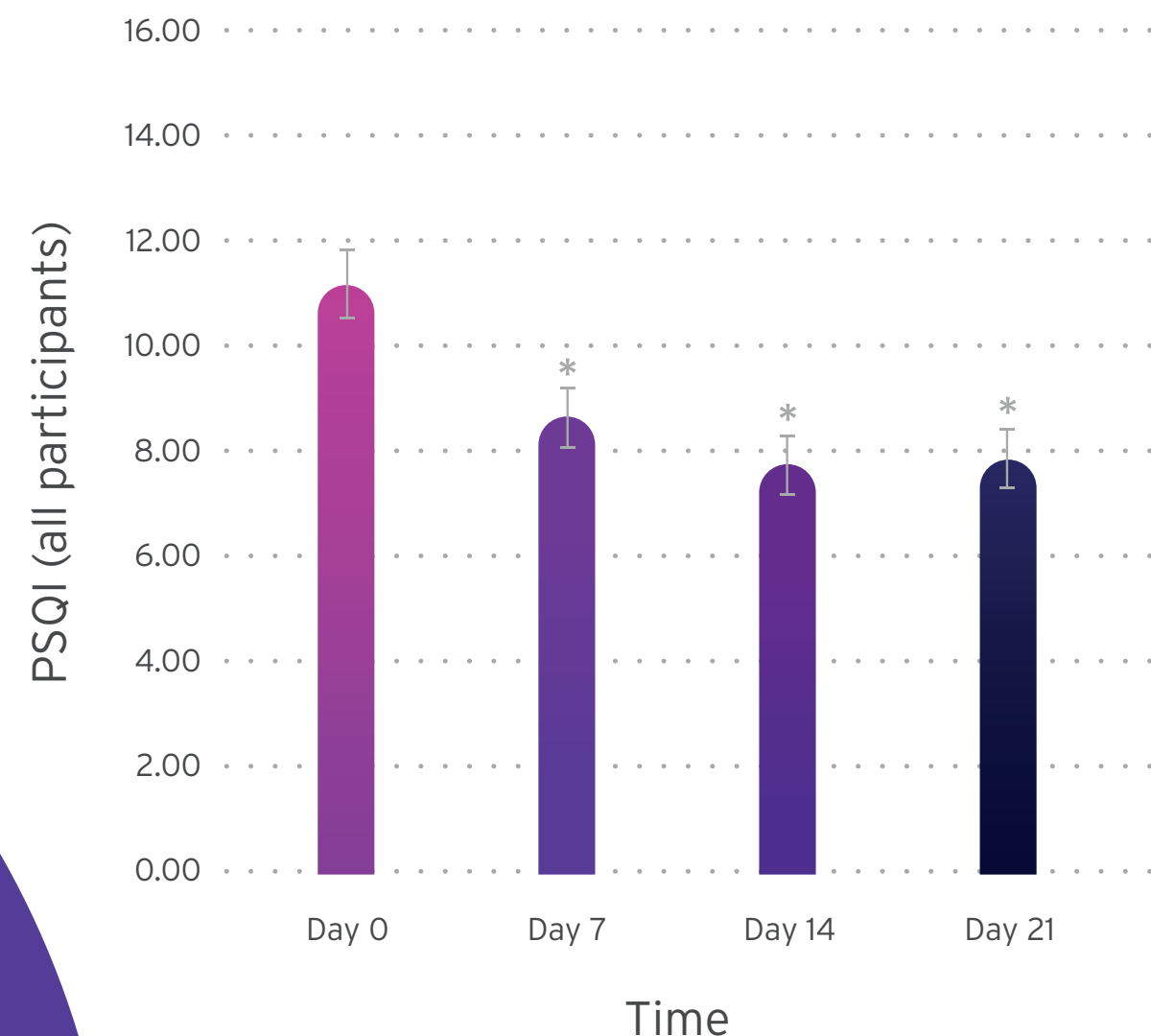
The results of a typical consumer trial are presented on this page, where our team tested the Biotis™ SleepWell formula with 54 participants.

They each took the formula an hour before they went to bed for 21 days, and reported their experience via a validated sleep quality questionnaire (Pittsburgh Sleep Quality Index¹ or PSQI^{*}).

The results showed that 58% of the test group lowered their PSQI score significantly from 11.20 ± 0.56 to 7.85 ± 0.55 , $p < 0.01$. The lower the PSQI score, the better the sleep quality.

¹Buysse, et al., 1989;

^{*}The PSQI ranges from 0-21. A score of 0 indicates no sleep problems and score of 21 indicates severe sleep problems.



SleepWell Clinical Trial Results

01

Improvement in sleep quality
after 14 days
statistically significant vs placebo¹

03

Stimulates intestinal
Bifidobacteria
Low baseline Bifidobacteria linked
to biggest PSQI improvement¹

02

Lower cortisol
levels in saliva at wake-up¹

04

Increased
**REM sleep
vs. placebo**

Developing your own products powered by Biotis™ SleepWell



Biotis™ SleepWell's unique, natural formula offers the triple benefit of helping people to fall asleep naturally, to sleep through the night and to wake up feeling refreshed. This threefold action of proteins, micronutrients and Biotis™ GOS prebiotic^{1*} means that they are buying a superior, holistic sleep product. It is safe, effective and non-addictive.

We anticipate that the core market for Biotis™ SleepWell will be men and women aged 35-65.

Most people will start to see an improvement in their sleep patterns after just 2-3 days, but the best results are reported after 14 days of consistent use.

The product is designed for daily use one hour before bedtime but it could also be used in 'bursts' of 14 days, as and when sleep patterns become more disrupted.

The Biotis™ Sleepwell formulation is also very flexible in application. Although we've conducted our research and trials using a 'night shot', we work with our customers to develop whatever application is required.

The possibilities – and opportunities – are many.

¹ISAPP (International Scientific Association for Probiotics and Prebiotics), Gibson et al., 2017: *Substrates that are selectively utilized by host microorganisms conferring a health benefit.



SleepWell

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Don't just dream about it ... work with FrieslandCampina Ingredients now to create your unique SleepWell product.

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- Potential consumer benefits are not to be considered as health claims. They should be considered as potential leads that might be developed into health claims complying with the local legal requirements.
- The information contained herein is, to the best of our knowledge, correct. The data outlined and

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