Strenuous Physical Exertion [1]

Strenuous physical exertion

In order to excel, top athletes need to exert themselves to the full on a regular basis, not only in competitions but also, maybe even primarily, during the preceding training period. And many amateur athletes nowadays try to emulate the pros by engaging in high-intensity training multiple times a week. This can lead to different types of stress responses in the body, similar to those associated with danger and flight: increased heart and breath rates, increased production of certain hormones and cytokines, muscle tension, increased oxygen uptake and higher brain activity. A short-term effect of these processes is a boost to the immune system.

Bodily functions that are not involved in immediate survival, such as the digestive, excretory and reproductive systems, are suppressed. The outcome of all this is an increase in gut permeability, which can lead to gut complaints. In case of persistent stress, suppression of the immune system will also set in, which can make people more prone to infection, especially respiratory tract infections (RTIs).

Strenuous physical exertion and microbiota management

Generally speaking, regular exercise and sports activities are beneficial for our microbiota and help to promote diversity. However, strenuous and prolonged exertion can have the opposite effect. Long-term suppression of gut perfusion (ischaemia) is the most common cause of nausea, vomiting, abdominal pain and (bloody) diarrhoea. It also causes damage to the mucosa, increased gut permeability and promotes the release of free radicals and reactive oxygen molecules. These can damage epithelial cells and impact the diversity of the microbiota.

This indicates that physical exertion can affect the microbiota. The reverse has also been demonstrated: studies with mice have shown that the microbiota affects exercise performance. The extent to which this applies to human beings has not yet been adequately researched, but it stands to reason that a balanced microbiota would also benefit exercise performance in human beings.

Strenuous physical exertion and probiotics

Probiotics can be effective at different levels. This can be at the level of microbial interaction in the gut lumen, at the level of the gut barrier and at the level of the immune system. All of these levels
play a role in strenuous physical exertion. The potential effects of probiotics include improvement of the gut’s barrier function, influencing cytokine levels, antibacterial effects, upregulation of antimicrobial peptides or antioxidants, and T-cell regulation. Therefore, it is conceivable that probiotics as a supplement could contribute to healthy gut function, especially in athletes with a history of gut problems.

The beneficial effect of probiotics in strenuous physical exertion has been demonstrated in a number of studies. In an RCT, in which the Ecologic® Performance formula developed by Winclove was used, focusing on various effects of strenuous physical exertion a significant difference in gut permeability was shown between the probiotics group and the placebo group, as well as a positive trend in respect of oxidative stress.

In an RCT in which a group of marathoners were given a probiotic with a single bacterial strain, it was shown that gut complaints were shorter-lived (2.9 vs 4.3 days) than in the control group who were given no probiotic. A decrease in the number of respiratory tract infections (RTI) was also shown. A similar effect was seen in an RCT in Australia with active athletes (cycle racers) and with rugby players. Various other studies also show a positive correlation between the use of probiotics and performance, especially in endurance athletes.

To date, there has only been one study that focused specifically on the effect of a probiotic on athletic performance. In this study, runners were given a daily probiotic containing different strains (Lactobacilli, Bifidobacteria and Streptococci) for a period of 4 weeks. A significant improvement was seen in the duration until fatigue under very hot conditions compared to the group who were given no probiotic.

**Strain selection for the Ecologic® Performance formulation**

The scientific studies with probiotics in athletes that have been conducted all used different strains, were focused on different sports and had different intervention durations – and produced variable results. We know that each probiotic strain has its own specific properties. Aiming for maximum efficacy, Winclove opted to develop a multispecies formula. The bacterial strains in the formula were selected based on three properties that are important for the ability to sustain exertion: antioxidant potency, strengthening of the gut barrier and anti-inflammatory properties. This has resulted in the indication-specific formulation **Ecologic® Performance**, containing:

- *Bifidobacterium bifidum* W23,
- *Bifidobacterium lactis* W51,
- *Enterococcus faecium* W54,
- *Lactobacillus acidophilus* W22,
- *Lactobacillus brevis* W63,
- *Lactococcus lactis* W58

**Ecologic® Performance for enhanced resilience against intense or prolonged stress**

The Ecologic® Performance formula has been tested in an RCT with 23 subjects. Over a period of 14 weeks, 11 subjects were given the probiotic formula and 12 subjects were given a placebo. All
subjects underwent a strenuous cycle ergometer test, one at the start of the intervention cycle and one after 14 weeks. Following the test, faecal and blood samples were collected to identify indicators of gut barrier function (zonulin, a protein that modulates tight junction permeability), oxidative stress (carbonyl concentration as a measure of protein oxidation) and inflammation (TNFα). Compared to the control group, faecal zonulin values had decreased significantly in the probiotics group. A positive correlation was found for TNFα and exertion-induced protein oxidization in the blood. In conclusion, it can be said that the data found in this study support the hypothesis that Ecologic® Performance can improve gut barrier function, as well as redox homeostasis as indicated by the carbonyl concentration, and low-grade inflammation under persistent exertion-induced stress. This can have a practical impact on the susceptibility of athletes to inflammation, infections and allergies.

A recently published study focused on possible additional explanations for the effects of the Ecologic® Performance formula. The subjects in this 12-week RCT were 33 well-trained athletes, 12 of whom were given Ecologic® Performance and 16 of whom were given a placebo. It showed a significant difference in exertion-induced tryptophan breakdown between the probiotics group (no reduction) and the placebo group (11% reduction, p=0.02). One major role of tryptophan concerns the synthesis of energy carrier and coenzyme nicotinamide adenine dinucleotide (NAD) and its reduced form NADH. This process is part of the so-called kynurenine pathway. It has been shown that this can be an important factor in the risk of developing infections. The number of athletes who contracted one or more RTIs during the 12-week intervention period was, in fact, 2.2 times lower in the probiotics group than in the placebo group (p=0.016). The study also found a correlation between contracting an RTI and increased tryptophan breakdown. In conclusion, this study demonstrated that athletes did not exhibit training-related tryptophan breakdown and were less susceptible to RTIs as a result of the use of the bacterial combination described in the formula.

The research formulation Ecologic® is not sold as a consumer product. However our worldwide business partners offer the formulation Ecologic® Performance as their own branded product. Thus the specific bacterial composition can be found in different products around the world.

References


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