

# The Global Fruit & Veg Newsletter



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## F&V benefits: new data

### Edito

#### Lesser known benefits from fruits and vegetables: new data and research findings!

Benefits from regular consumption of fruits and vegetables (F&V) in the prevention of many chronic diseases are now well documented. This new Global Fruit and Veg newsletter focuses on some lesser known health F&V benefits.

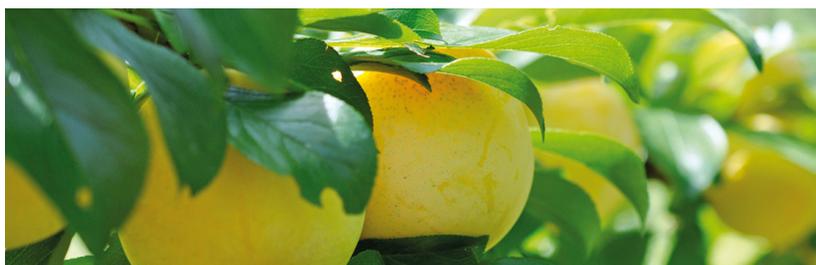
First, Neville and Woodside investigated the relationship between F&V consumption and muscular power and strength in adolescents. These authors studied 2000 adolescents aged 12-15 years who participated in the 2000 Young Hearts (YH) Project. Their study showed that muscular power is significantly greater in boys and girls who ate high quantities of F&V compared to those who ate less, after adjustment for confounding factors. Previous studies had shown similar results but in adult populations. The mechanisms that underlie the effects of F&V on muscles remain to be determined. These may include high antioxidant levels that protect against oxidative stress and muscle cell inflammation, greater alkalinity that combats excess acidosis, nitrates that influence mitochondrial efficacy in muscle cells, etc.

Another original topic is addressed by Eslamian and colleagues at Teheran University: the impact of a F&V-rich diet on sperm quality, notably asthenospermia (reduced spermatozoid motility and vitality). These authors studied associations between eating habits and asthenospermia. Their case-control study included 342 men between 20 and 40 years of age including 107 men with asthenospermia. Two nutritional models appeared: the «prudent pattern» (rich in fruits, vegetables, fish, poultry, whole grains, low fat milk, vegetable oils) and the classic «western pattern» (rich in red meat, sugars, sodas, hydrogenated fat, snacks...). Their results are clear: participants with the highest scores for the «prudent pattern» showed a 54% reduction in the risk of asthenospermia compared to those in the lowest tertile.

Finally, Steenbruggen et al. investigated the impact of nutrition on unexplained fatigue in children. Their interventional study included a hundred children aged 2-18 years, with unexplained fatigue. For 3 months, the intervention group adopted a diet rich in green vegetables, beef, whole milk and butter whereas the control group did not change their habits. Children from the intervention group showed a significant reduction in their need for sleep. Moreover, a significant reduction in cognitive fatigue was associated with the consumption of green vegetables, whereas sleep needs were further reduced in children with a daily consumption of whole milk. Possible explanations? Antioxidant-rich vegetables, high melatonin concentration in milk, impact on immunity... Time will no doubt tell.

Enjoy your reading!

Dr Thierry GIBAU  
Endocrinologist, nutritionist - France



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Acknowledgement to  
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November 2006: J. Pomerleau, L. Blanchette, J. Brug, T. Nicklas, T. Baranowski (Increase children F&V consumption)  
December 2006: KD. Cashman, T. Steer, G. Goldberg, MN. Horcajada, V. Coxam (F&V and bones)  
January 2007: L. Damiens, E. Bere, DR. Herman, N. Darmon (F&V accessibility)  
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March 2007: T. Lobstein, B. Rabin, J. Kröger, K. Van der Horst (Obesity)

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# Can eating fruit and vegetables improve muscle strength and power during adolescence?

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Adolescence is a period of rapid growth and development, characterised by major changes in body size, including increased muscle development. Increasing fruit and vegetable (FV) consumption during childhood is widely encouraged as part of a healthy diet. Epidemiological evidence suggests that FV consumption and/or intakes of nutrients associated with a FV-rich diet may play a role in improving muscle strength and power<sup>(1-3)</sup>. However, the evidence is still inconclusive and the majority of studies to date have been conducted in older adults. The importance of FV intake for muscle function during adolescence has rarely been examined. We therefore carried out a cross-sectional study to examine the association between FV consumption and muscle strength and power in an adolescent population.

## The Northern Ireland (NI) Young Hearts Project

The results are based on data collected from approximately 2000 boys and girls, aged 12 and 15 years, who participated in The Young Hearts (YH) 2000 Project (1999 – 2001). YH2000 is the second in a series of large cross-sectional studies carried out in NI schoolchildren, the primary aim being to examine the status of modifiable coronary risk factors during adolescence<sup>4</sup>. During the study, dietary intake, including total FV consumption, was assessed using a 7-d diet history. Grip strength and maximal vertical jump power (as proxy measures of muscle strength and power, respectively) were measured with a hand-held dynamometer and Jump-MD meter, respectively. Associations between FV intake and muscle strength and power were examined using linear regression analyses.

## Higher FV consumption was positively associated with muscle power

The study revealed that muscle power was significantly higher in boys and girls who consumed high intakes of FV (>237.71 g/d and >267.57 g/d respectively) versus low intakes (<135.09 g/d and <147.43 g/d, respectively), after adjusting for confounding

factors including age, BMI (z score), pubertal status, energy intake, physical activity and socio-economic status. No such associations were evident between increased FV consumption and muscle strength in either boys or girls. Similar associations were observed when FV were analysed separately.

## Comparison with previous studies

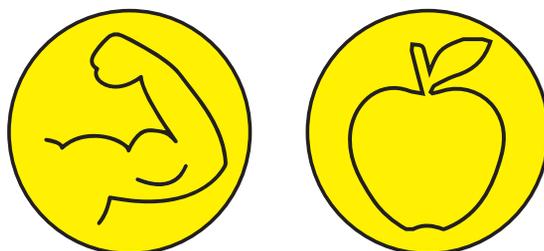
Associations between FV intake and muscle strength and power have been observed previously, although the evidence mainly comes from cross-sectional studies in older adults. These studies found that low serum carotenoid status, which may reflect low FV intake, was associated with poor muscle strength and other measures of physical performance<sup>(1-3)</sup>.

## Through what mechanism does FV act on muscle?

A number of possible mechanisms have been suggested for the association between FV and muscle. The high antioxidant content of FV may offer protection against oxidative stress and inflammation within muscle cells. The alkaline salts present within FV may also act as a buffer against excess acid. Another potential mechanism, worthy of further investigation, is the influence of nitrates present within FV which may help improve muscle contraction by improving mitochondrial efficiency within the muscle cells<sup>5</sup>.

## In summary:

- Increasing FV consumption during adolescence should be encouraged as a potential means of improving muscle power
- In this cohort of adolescents, there was no independent association between increased FV consumption and muscle strength
- Intervention studies are required to determine whether muscle strength and power during adolescence can be improved through increased FV consumption



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# Dietary patterns and Asthenozoospermia risk

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Infertility affected 10–15% of all reproductive-aged couples, and male factors contribute to almost 50% of cases of infertility<sup>1</sup>. Throughout the past decades, there has been much discussion about the changes in semen quality<sup>2-4</sup>.

Previous studies show that high intake of antioxidants, fruits, vegetables, poultry, seafoods, skim milk, shellfish, lettuce, tomatoes, apricots, and peaches, as well as low intake of sweets and processed meat, especially foods containing high amounts of saturated fat, were reported to have favorable association with sperm quality<sup>5-12</sup>.

Our study evaluated the associations between dietary patterns and asthenozoospermia risks in a case-control study in Iranian men, to increase understanding of the role of dietary patterns in the etiology of asthenozoospermia\*.

## 342 men aged between 20 and 40 years interviewed

In total, 107 asthenozoospermia cases and 235 control cases were interviewed through the infertility clinics in Tehran, Iran, from January 2012 to November 2013. Usual dietary intakes were collected using a semi quantitative food frequency questionnaire and semen quality data were analyzed according to the fifth edition of the World Health Organization (WHO) guidelines. Dietary patterns were derived using factor analysis. The first tertile served as the reference category for regression analyses.



In principal component analysis, 2 dietary patterns emerged: a “prudent pattern” and a “Western pattern” (cf Table 1).

## Lower risk of asthenozoospermia for participants of the prudent pattern

Our results revealed that participants in the highest tertile of the prudent pattern scores had 54% lower risk of asthenozoospermia compared to those in the lowest (p for trend: 0.003); after adjustment for potential confounders. In contrast, the Western pattern was positively associated with the risk of asthenozoospermia (highest tertile; odds ratio [OR] 2.86; 95% confidence interval [CI], 1.83–2.97).

Our findings suggest that a diet composed mainly of plant-based foods may be associated with a reduced risk of asthenozoospermia whereas an adherence to a Western pattern is a potential indicator of increased risk.

The current study indicates that efforts to improve diet quality should focus on the diet as a whole, not on single nutrients and foods.

Because epidemiological evidence on this topic is extremely limited, well-designed case control and prospective cohort studies are required to confirm the relationship between dietary patterns and the risk of asthenozoospermia in developing and developed countries.

Table 1:  
components of “prudent pattern” and “western pattern”

“Prudent pattern”	“Western pattern”
Leafy green vegetables, yellow vegetables, other vegetables, tomatoes	Organ meats, red and processed meats
Fish and other seafood	Sugar
Fruits and natural fruit juices	Soft drinks and confectionary
Legumes	Pasta, rice and refined grains
Whole grains	Potatoes
Poultry	French fries and fast foods
Tea and coffee	High-fat dairy products
Low-fat dairy products	Hydrogenated fats
Vegetable oils	Mayonnaise and fatty sauces
	Snacks

\*Asthenozoospermia reduces motility or vitality of spermatozoa and is one of the major causes of infertility or reduced fertility in men.

**Based on:** Eslamian G, Amirjannati N, Rashidkhani B, Sadeghi MR, Baghestani AR, Hekmatdoost A. Adherence to the Western Pattern Is Potentially an Unfavorable Indicator of Asthenozoospermia Risk: A Case-Control Study. *J Am Coll Nutr.* 2015 Mar 12:1-9

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# Could a change in diet revitalize children who suffer from unresolved fatigue?

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## Unresolved fatigue in children

Many children deal with fatigue, which makes them less resilient and causes them to have weaker immune resistance. After infections, anemia, chronic diseases, and psychosocial imbalances are ruled out, there is still a group of patients without a clear cause and for which adequate medical therapy does not exist. A possible explanation for their fatigue is a micro deficiency of minerals and vitamins. Clinical studies show that approximately 20% of children under eight do not eat enough fruit and vegetables and do not reach the minimum level of dairy intake (according to European guidelines: EFSA). We did a non-randomized controlled trial, to clinically evaluate symptoms of fatigue in children for which a nutrient-rich diet was advised.

## Evaluation dietary advice

A group of 98 children (2–18 years old) with unexplained symptoms of fatigue was examined. All children were advised to keep an active lifestyle and were followed up with regular check ups by a pediatrician. Children in the intervention group were asked to follow the dietary advice for three months, whereas the control-group followed their normal diet. The dietary advice consisted of green vegetables, beef, whole milk and full-fat butter. All components were advised in normal, age adequate portion sizes. Symptoms of fatigue were measured using a PedsQL Multidimensional Fatigue Scale, and secondary outcomes were compliant with the diet and BMI.

## The dietary advice effectively decreased symptoms of fatigue

At the start of the study, children in both groups already followed the dietary advice for 29%. This increased to 85% in the intervention group, compared to 32% in the control group. Children, who followed the diet showed a significant decrease in the need to sleep (CI 0.83; 14.86,  $p = 0.03$ ). They slept better through the night and took fewer naps. When analyzing components of the advised diet separately, taking confounders into account, a significantly larger decrease in cognitive fatigue symptoms was seen for green vegetables (CI 2.27; 30.63,  $p = 0.024$ ). Furthermore, a lower need to sleep was seen when whole milk was consumed almost daily (CI 0.02; 14.62,  $p = 0.049$ ).

## Benefits of pure nutrients

Our study showed that nutritional advice is an elegant, and effective method for decreasing some symptoms of medically unresolved fatigue in children. The observed positive effect on fatigue can be explained by an increased intake of minerals, vitamins and fatty acids. Four further factors can explain these results, including a beneficial effect of combining nutrients, effects of anti-oxidants, better sleep behavior due to the high concentration of melatonin in milk, and an improvement of the immune function. Vitamins and minerals have been shown to mutually benefit their absorption when consumed simultaneously. On top of this, it has been shown that pure nutrients are absorbed better than artificial nutrients. Beside vitamins and minerals, green

vegetables and melatonin in whole milk contain many anti-oxidants, which can reduce oxidative stress in the human body.

## Better sleep behavior with melatonin

Melatonin has more beneficial properties on fatigue, especially on sleep behavior. Whole milk is known to contain melatonin, which has been shown to be effective in improving sleep onset, maintenance of sleep, and prolongation of sleep. Our study demonstrated that whole milk is significantly associated with a decreased need to sleep or rest, and that there was a stronger decline in fatigue in children who drank more whole milk than in children who drank less whole milk.

## Improved immune function

Additionally, the components of the advised diet can improve the immune function in children. Earlier studies in our hospital showed that this diet has a beneficial effect on recurrent upper respiratory tract infections. This is supported in the literature by an improvement of the immune functions by vitamins and minerals, which are present in high concentrations in the advised diet. Even without recurrent infections, improvement of the immune system can be reflected in the general wellbeing, and an increase in energy due to a decrease in pro-inflammatory cytokines.

More research in a larger, randomized trial with more supervision on the dietary intake could further validate the results shown here.



Based on: Steenbruggen, T.G.; Hoekstra, S.J.; van der Gaag, E.J. Could a Change in Diet Revitalize Children Who Suffer from Unresolved Fatigue? *Nutrients* 2015, 7, 1965-1977.