

## Healthy Nutrition: A Biochemist's View

**Peter F Surai**<sup>1-7\*</sup>

<sup>1</sup>*Department of Microbiology and Biochemistry, Faculty of Veterinary Medicine, Trakia University, Stara Zagora, Bulgaria*

<sup>2</sup>*Department of Hygiene and Poultry Sciences, Moscow State Academy of Veterinary Medicine and Biotechnology Named After K. I. Skryabin, Moscow, Russia*

<sup>3</sup>*Department of Animal Nutrition, Faculty of Agricultural and Environmental Sciences, Szent Istvan University, Godollo, Hungary*

<sup>4</sup>*Saint-Petersburg State Academy of Veterinary Medicine, St. Petersburg, Russia*

<sup>5</sup>*Sumy National agrarian University, Sumy, Ukraine*

<sup>6</sup>*Odessa National Academy of Food Technologies, Odessa, Ukraine*

<sup>7</sup>*Russian Academy of Sciences, Moscow, Russia*

**\*Corresponding Author:** Peter F Surai, Department of Microbiology and Biochemistry, Faculty of Veterinary Medicine, Trakia University, Stara Zagora, Bulgaria.

**Received:** May 15, 2019; **Published:** October 15, 2019

### Abstract

Dietary variety, moderation and physical activity are interlinked in determining healthy nutrition. Indeed, by inclusion into the diet a great variety of various foods it is possible to meet physiological requirement in major essential nutrients. Therefore, by following a "moderation law" it is easy to keep calorie consumption under the control and by involving in physical activity it is possible to increase calorie expenditure preventing unnecessary weight gain. Furthermore, adaptive action of physical activity has tremendous effects on general health, including digestion, cognition, mood, immunity and disease prevention.

**Keywords:** *Healthy Nutrition; Dietary Variety; Physical Activity*

### Introduction

More than 1600 years ago the Greek philosopher Hippocrates stated, "Let the food be your medicine and the medicine be your food". In modern terms this could be read as "You are what you eat". The statement, although not strictly true, still has substantial validity. In fact, diet remains a pivotal determinant of human health. In present day nutrition, the dramatic expansion of number of available foods, aggressive marketing and appealing taste have major effect on human diet choices. Unfortunately, there are mixed and conflicting messages to general public in terms of what would be an ideal healthy diet. One can go to bookstore and buy quite a few books devoted to healthy nutrition and be confused by messages related to promotion of some dietary compounds and prohibiting others. The brightest example of misunderstanding general nutritional principles could be semi-skimmed milk served by a stewardess in a plane with coffee. It seems likely that those few millilitres of milk would not affect fat balance in the body but has no taste and whole milk or cream for coffee await their return into healthy diet paradigm. It becomes clear that no dietary recommendation can be written in stone. The extent of nutritional data and its interpretation by the public can, in all truth, be said to have reached the point of serious confusion [1].

### Three major principles of healthy nutrition

There is a range of different diets promoted in various countries by dieticians but, generally speaking, three major principles of healthy nutrition include:

- Variety- a balanced choice from a diverse and well proven list of food components
- Moderation- always bear in mind that excessive amounts of any dietary component may be detrimental under certain circumstances and there is a need to maintain a balance between caloric intake and energy expenditure.
- Physical exercise/activity - regular activity, according to age, is essential for all people, not only in terms of maintaining an appropriate weight but also for its beneficial effect on metabolic and physiological functions.

### Variety

There is no single food containing all the essential nutrients to meet human requirements in adulthood. That is why, human diets should contain a variety of different foods providing the wide range of essential nutrients. This includes major animal protein sources providing essential amino acids including eggs, meat/fish and milk. There is a range of publications based mainly on correlation studies to show some detrimental effects of animal origin food ingredients. For example, red meat consumption was shown to promote prostate and gastric cancer [2-3]. However, detailed analysis of that issue clearly indicates that meat is not responsible for cancer promotion, but a way of meat cooking predisposing meat to formation of cancerogenic compounds (for example, in the case of overcooked meat) plays a major role in the aforementioned conclusions [4]. Therefore, a moderate consumption of properly cooked meat would not cause any significant increase in cancer risk.

Another hot topic is related to egg consumption in relation to cholesterol issue and CVD. Increased cholesterol consumption was shown to be a risk factor of CVD development [5]. However, observational epidemiological studies (correlation studies) have a range of limitations which should be taken into account before the restrictions on egg consumption are imposed. For example, increased cholesterol in human blood is a risk factor but not the main cause of CVD development. In fact, oxidative stress and damages to vessel intima due to ROS/RNS produced as a result of various stresses is a primary event initiating further metabolic changes, cholesterol accumulation and atherosclerotic plaques formation [6]. It is well appreciated that, redox balance in cells and in the body in general is responsible for regulation of many important processes, including CVD initiation and development.

When talking about egg and cholesterol, several important issues should be mentioned [1,6]:

- High level of cholesterol in the egg does not automatically mean that cholesterol is absorbed and accumulated. First, such egg compounds as choline substantially decrease cholesterol absorption. Secondly, in healthy individual cholesterol synthesis and dietary consumption are tightly regulated and usually an increased cholesterol dietary consumption is associated with a decreased synthesis and maintenance of cholesterol balance/homeostasis. Thirdly, very often increased cholesterol level in plasma is related to HDL cholesterol ("good cholesterol");
- Certain percentage of so called "cholesterol responders" in a population can substantially affect correlation study results;
- Eggs are an important source of essential nutrients including proteins/essential amino acids, unsaturated fatty acids, vitamins, choline and minerals and avoiding eggs can have more harmful effect in terms of balancing diet rather than beneficial effects.
- Epidemiological evidence has consistently shown that it is unlikely that the moderate egg consumption has any significant impact on the risk of CVD in healthy people. For example, the HELENA study, showed that egg consumption was not associated with the lipid profile, adiposity, insulin resistance, blood pressure, good cardiorespiratory function, or the integrated CVD risk score [7]. Therefore, egg consumption is not associated with risk of CVD, CD, or cardiac death in the general population [8].

Dietary variety could also help meeting requirements in optimal omega-3/omega-6 ratio. It has been established that long chain PUFAs play a central role in major physiological and biochemical events within the cells and participate in maintaining optimal cellular function. It is widely believed that for maintaining a healthy status a balanced omega-6 to omega-3 ratio in human diet is more important than the absolute amounts of individual fatty acids. Unfortunately, modern Western diets are characterised by a high intake of omega-6 and low

consumption of omega-3 fatty acids leading to prothrombotic and proinflammatory actions associated with development of arthritis, cancer, hypertension, diabetes, asthma, atherosclerosis, Alzheimer, Parkinson, allergies and many more diseases [9]. Therefore, usage of omega-3 rich products, including fish and some plants, is a part of the “variety” paradigm of the healthy nutrition.

In recent years, a lot of attention has been paid to fruit and vegetable consumption as a way of healthy nutrition. In fact, a range of beneficial compounds can be found in these foods and polyphenolic compounds, including flavonoids, deserve more attention. For many years, flavonoids were considered to be feed-derived antioxidants. However recent studies clearly indicate that they are not traditional antioxidants and depending on conditions can show antioxidant or pro-oxidant properties [10]. It seems likely that due to mild pro-oxidant properties, flavonoids can affect expression of transcription factors (e.g. Nrf2 and NF-κB) [11] and vitagene activities [12-14] being a kind of nutrients alerting antioxidant system of the gut and whole body and adapting it to the challenging environments. Recent developments in understanding beneficial roles of various poorly digested compounds (e.g. fibers) in human diet related to feeding gut microbiota and maintaining its optimal composition, underline the importance of dietary variety in healthy nutrition [15-17].

### Moderation

First of all, it should be mentioned that taking in excess, all nutritional components and products of proven benefit can, under certain conditions, also become less than beneficial. Furthermore, a healthy diet should provide the right amount of energy from foods and drinks to maintain energy balance. Consuming calories in excess of requirement over a period of time is responsible for weight gain due to fat synthesis and accumulation. A balance between calories consumption and their expenditure is a way to maintain a healthy weight. A moderate consumption of a great variety of various foods is a most important principle of healthy nutrition. Once, calories are consumed in excess, it is necessary to increase their expenditure by, for example, increasing physical activity.

### Physical exercise/activity

Human physical activity is the most important element of healthy life. Physical activity has been an essential part of human evolution and dramatic decrease in physical activity in modern society is responsible for many detrimental health-related problems. It was shown that physical inactivity affects behaviour, central nervous system, cardiorespiratory fitness, metabolism, adipose tissue, skeletal muscle, bone, immunity, digestion and cancer development [18]. Furthermore, physical inactivity, itself, is shown to play an independent role as a direct cause of the losses of cardiovascular and strength fitness, shortening of health span and lowering of the age for the onset of the first chronic disease, decreasing quality of life, increasing health care costs and accelerating mortality risk [18]. On the other hand, an increasing body of evidence shows that engagement in regular physical activity is associated with numerous health benefits. For example, a recent systematic review indicated that there was overwhelming evidence that regular physical activity is associated with a reduced risk for all-cause mortality. Furthermore, several chronic medical conditions (including cardiovascular disease, all-cause mortality, all-cancer mortality, type 2 diabetes, hypertension, breast cancer, colon cancer, gestational diabetes, gallstone disease, ischemic heart disease and ischemic stroke) are also affected by regular physical activity [19]. It remains to be determined what the optimal and minimal volume of physical activity is required for health benefits, but beneficial effect of physical activity is quite obvious. Interestingly, simply moving from an inactive state to any level of physical activity is shown to be associated with the marked health benefits in apparently healthy individuals and persons living with chronic medical conditions [20]. There is a linear relationship between physical activity and health status and increases in physical activity and fitness result in additional improvements in health status [21]. Adequate physical activity provides substantial protection against chronic diseases and helps balancing energy expenditure and intake. Participation in regular physical activity is also associated with improvements in psychosocial wellbeing as demonstrated through reductions in stress, anxiety and depression [21]. It seems likely that the periodic metabolic stress imposed by regular exercise is associated with cardiovascular tissue adaptation including cardiomyocyte growth and proliferation. Furthermore, physical activity is important for regulating quality and function of mitochondria (main source of free radicals), for orchestrating cell signalling, stimulating metabolism-mediated exercise gene programs and for coordinating biosynthetic pathway activity [22]. It seems likely that Nrf2, the master regulator of antioxidant defences,

a transcription factor regulating expression of more than 200 cytoprotective genes is involved in exercise-induced adaptation of muscles. In fact, accumulating evidence shows that Nrf2 signalling plays a key role in oxidative stress-mediated beneficial effects of exercise. In fact, Nrf2 activation in response to exercise across variety of tissues is an important mechanism of systemic effects of exercise that are not limited to skeletal muscle and myocardium [23]. Furthermore, it has thus been hypothesized that contraction-induced production of ROS may stimulate the hormesis-like adaptations [24] and possibly activates various vitagenes [25-27].

### Conclusion

Dietary variety, moderation and physical activity are interlinked in determining healthy nutrition. Indeed, by inclusion into the diet a great variety of various foods it is possible to meet physiological requirement in major essential nutrients. By following a "moderation law" it is possible to keep calorie consumption under the control and by involving in physical activity it is easy to increase calorie expenditure preventing unnecessary weight gain. Furthermore, adaptive action of physical activity has tremendous effects on general health, including digestion, cognition, mood, immunity and disease prevention.

### Funding

Peter F. Surai is supported by a grant of the Ministry of Education and Science of the Russian Federation, Agreement № 14.W03.31.0013.

### Disclosures

None.

### Bibliography

1. Surai PF and Noble RC. "Eggs in your life". Feed-Food. Ltd (2013).
2. Ismail N. "Diet as A Risk Factor of Prostate Cancer: A Review". *International Journal of Public Health Research* 9.1 (2019): 1051-1058.
3. Kim SR., *et al.* "Effect of Red, Processed, and White Meat Consumption on the Risk of Gastric Cancer: An Overall and Dose-Response Meta-Analysis". *Nutrients* 11.4 (2019): 826.
4. Surai PF and Fisinin VI. "Ill health effects of food lipids: Consequences of inadequate food processing, storage and cooking" In: Fabien De Meester, Sheerna Zibadi and Donald Ross Watson, Eds". *Modern Dietary Fat Intakes in Disease Promotion, Humana Press* (2010): 251-274.
5. Zhong VW., *et al.* "Associations of dietary cholesterol or egg consumption with incident cardiovascular disease and mortality". *JAMA* 321.11 (2019): 1081-1095.
6. Marhuenda J., *et al.* "Cardiovascular Disease and Nutrition". In *Nutrition in Health and Disease*. IntechOpen (2019): 1-16.
7. Soriano-Maldonado A., *et al.* "Ingesta de huevo y factores de riesgo cardiovascular en adolescentes; papel de la actividad física: Estudio HELENA". *Nutrición Hospitalaria* 28.3 (2013): 868-877.
8. Nakamura Y., *et al.* "Re-evaluation of the associations of egg intake with serum total cholesterol and cause-specific and total mortality in Japanese women". *European Journal of Clinical Nutrition* 72.6 (2018): 841-847.
9. Zárte R. *et al.* "Significance of long chain polyunsaturated fatty acids in human health". *Clinical and Translational Medicine* 6.1 (2017): 25.
10. Surai PF. "Polyphenol compounds in the chicken/animal diet: from the past to the future". *Journal of Animal Physiology and Animal Nutrition* 98.1 (2014): 19-31.

11. Ballard CR and Junior MRM. "Health Benefits of Flavonoids". In *Bioactive Compounds*. Woodhead Publishing (2019): 185-201.
12. Calabrese V, *et al.* "Redox regulation of cellular stress response in aging and neurodegenerative disorders: role of vitagenes". *Neurochemical Research* 32.4-5 (2007): 757-773.
13. Calabrese V, *et al.* "Cellular stress responses, hormetic phytochemicals and vitagenes in aging and longevity". *Biochimica et Biophysica Acta* 1822.5 (2012): 753-783.
14. Surai PF. "Silymarin as a Natural Antioxidant: An Overview of the Current Evidence and Perspectives". *Antioxidants (Basel)* 4.1 (2015): 204-247.
15. Leprun PMB and Clarke G. "The gut microbiome and pharmacology: a prescription for therapeutic targeting of the gut-brain axis". *Current Opinion in Pharmacology* 49 (2019): 17-23.
16. Santos-Marcos JA, *et al.* "The role of diet and intestinal microbiota in the development of metabolic syndrome". *Journal of Nutritional Biochemistry* 70 (2019): 1-27.
17. Behrouzi A, *et al.* "The significance of microbiome in personalized medicine". *Clinical and Translational Medicine* 8.1 (2019): 16.
18. Booth FW, *et al.* "Role of Inactivity in Chronic Diseases: Evolutionary Insight and Pathophysiological Mechanisms". *Physiological Reviews* 97.4 (2017): 1351-1402.
19. Warburton DER and Bredin SSD. "Health benefits of physical activity: a systematic review of current systematic reviews". *Current Opinion in Cardiology* 32.5 (2017): 541-556.
20. Warburton DE. and Bredin SSD. "Reflections on physical activity and health: what should we recommend?". *Canadian Journal of Cardiology* 32.4 (2016): 495-504.
21. Hills AP. *et al.* "Physical Activity and Health: "What is Old is New Again". *Advances in Food and Nutrition Research* 75 (2015): 77-95.
22. Fulghum K. and Hill BG. "Metabolic Mechanisms of Exercise-Induced Cardiac Remodeling". *Frontiers in Cardiovascular Medicine* 5 (2018): 127.
23. Done AJ and Traustadóttir T. "Nrf2 mediates redox adaptations to exercise". *Redox Biology* 10 (2016): 191-199.
24. Ji LL, *et al.* "Exercise-induced hormesis and skeletal muscle health". *Free Radical Biology and Medicine* 98 (2016): 113-122.
25. Surai PF and Fisinin VI. "Vitagenes in poultry production. Part 3. Vitagene concept development". *World's Poultry Science Journal* 72 (2016): 793-804.
26. Surai PF. "Selenium in Poultry Nutrition and Health". Wageningen Academic Publishers, The Netherlands (2018).
27. Surai PF and Fisinin VI. "Antioxidant System regulation: From Vitamins to Vitagenes". In: *Handbook of Cholesterol*. Edited by Ronald Ross Watson and Fabien De Meester, Wageningen Academic Publishers (2016): 451-481.

**Volume 14 Issue 11 November 2019**

**©All rights reserved by Peter F Surai.**