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THE PROCESS MANAGEMENT OF FOOD ENRICHMENT SUPPLEMENTS WITH ANTIOXIDANTS AND THEIR IMPACT ON QUALITY OF LIFE

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Abstract. Resveratrol is a fitoalexina, which belongs to a class of antibiotics produced by plants as a means of defense against possible infections especially fungal. Resveratrol (3.5, 4 I trihidroxistilben) is a polyphenolic fitoalexin. It is a stilbenoid, stilbene derivative. There are two isomers: cis–(Z) and trans–(E).

Tran's isomer can undergo isomerization to the cis–form when heated or exposed to ultraviolet irradiation. Currently on the market nutritional supplements these special supplements containing resveratrol these that bring added value to the daily diet especially in the fight to reduce the risk of carcinogenesis have a special place. This paper seeks to bring additional justification for such an improved diet and emphasizes on process management approach to implement the use of these supplements with the clear purpose of improving the quality of life.

***Keywords*:** process management, nutritional supplements, antioxidants, trans–resveratrol

Introduction

A management principle, which is based ISO 9000:2000 series of standards is the principle of the process approach, which is very concisely defined as "the desired result is achieved more efficiently when activities and related resources are managed as a process" (SR EN ISO 9000:2000) [Agriculture and Agri–Food Canada. Undated, 2010.].

Many changes occurring in the environment (global and regional) in which a company operates, lead to an approach more and more oriented towards the process.

For the time being, due to competition from nutritional supplements market, in terms of price, delivery time and quality, manufacturers of such products shall conduct increasingly more value–added achievement towards the needs and expectations of customers and try to make this approach be as flexible as possible[BUTNARIU *et al.*, 2007].

The individual steps of achieving added value are linked, in terms of market demands and are structured as processes.

Filmmaker's value processes, so the creation of performance, are those processes within the organization for whose results the client is willing to pay accordingly.

In this case the client is:

– Relatively healthy person who wants to maintain quality of life;
– A sick patient with various diseases that wants drug treatment that has to be supported by nutritional supplements to improve their quality of life;
– Healthy person but having an increased risk for various degenerative diseases who wants nutritional support supplements to decrease this risk [GUSMAN, *et al.*, 2001].

Nutritional antioxidant supplements are currently highly publicized for their impact that can satisfy the previously mentioned requirements of all categories [Healthy Living Int.com. 2000].

Resveratrol, one of the most powerful natural antioxidants, was first discovered in the grain of grape skins and then to come.

Research content of resveratrol in wine was due to the interest of the scientific world to find cures for cancer and heart disease and reduce the risk of carcinogenesis [BABICH, *et al.*, 2000].

Resveratrol inhibits triggering cellular events associated with tumors and their progress. This antioxidant also works as an ant mutagenic and has antifungal properties [BARLASS, *et al.*, 1987].

Until now, numerous studies have been conducted on this quantity of resveratrol in table wines. The most commonly used methods are HPLC techniques (High Performance Liquid Chromatography) [SCALBERT, *et al.*, 2000], but gazcromatografia combined with mass spectroscopy and capillary electrophoresis zone (CZE) has been proposed, too [YANG, *et al.*, 2001]. Resveratrol exists in three isoforms that may have varying amounts in commercial wines. Trans–isomer

is converted into cis–isomer under the action of UV light [LIN, *et al.*, 2001]. Physiological activity of cis–form has not been extensively studied, so it is important to separately distinguish and quantify the Trans isome r[BUTNARIU *et al.*, 2011].

For the moment, current methods of analysis for cis are less numerous, although many techniques have become available in this HPLC. Also, the only published procedure to synthesize resveratrol was the Trans isomer as main product.

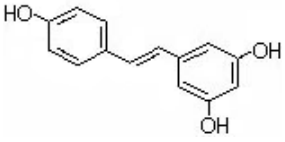
Several companies produce *trans*–resveratrol commercially. Pharmascience of Montreal, Canada, produces a pure form of *trans*–resveratrol [ZHU, *et al.*, 2000]. InterHealth of Concord, CA, produces a standardized extract of *trans*–resveratrol [PEARSON, *et al.*, 2008]. Pharmascience calls its patented product Resverin®. InterHealth manufactures Protykin™, a standardized extract containing *trans*–resveratrol [BUTNARIU *et al.*, 2010] and emodin, also a polyphenol, from the dried rhizome of *P. cuspidatum*.

Laboratorio Italiano Biochimico Farmaceutical Lisapharma has patented a pharmaceutical composition of grape and wine polyphenols, particularly resveratrol, with yeast [TRANTAS, *et al.*, 2009].

Other manufacturers of *trans*resveratrol include TCI America of Portland, OR; LKT Laboratories of St. Paul, MN; and Samlong Chemical Co., Ltd. of China.

Moravek Biochemicals of Brea, CA produces radio labeled resveratrol [FARINA, *et al.*, 2006].

The present study focuses on both trans–resveratrol preparations impact on the human body and how to implement the process of improving population nutrition by consuming antioxidant supplements in this case, those containing transveratrol[ELLIOTT, *et al.*, 2008].



Resveratrol (3,5,4'–trihydroxy–trans–stilbene) is a stilbenoid, a type of natural phenol, and a phytoalexin produced naturally by several plants when under attack by pathogens such as bacteria or fungi [BASS, *et al.*, 2007].

Material and methods

Comparative clinical trial evaluating the impact of the antioxidants vitamin C and trans–resveratrol In order to assess biochemical parameters coming from consumption of antioxidants with glucose lowering effect, a randomized multiple crossover study was achieved.

Randomization procedure and inclusion in the study groups study.

The study was conducted on 30 healthy young volunteers divided into 3 groups using multiple Latin squares.

The three formed groups were:

- Group 1, a group that consumed trans–resveratrol supplementation of 200mg/day, in addition to the basic diet.
- Group 2, that consumed nutritional supplements consumed with vitamin C 80 mg / day in addition to the basic diet.
- Group 3 of control, the basic diet without the consumption of supplements.

The basic diet for nutritional study was set for a balanced caloric intake of 35 kcal / kg / day, corresponding to an average physical activity.

All food menus had a constant content in terms of fat and fiber.

Daily meat consumption was 150 g / day chicken, fish or beef. There were no restrictions on the beverages, excepting the alcohol and soft sweet drinks, forbidden to be consumed during the study. It was also banned the consumption of more than a cup of coffee, green tea or black as they can change the results. During the study smoking has been avoided. The wash–out period–was considered to be enough the period of 2 weeks before inclusion of each participant in one of the groups of study, when it is considered that there is a sufficient elimination of any product similar to those tested, calculated to be equal to 5 times the maximum half–life of any bioactive compounds tested in order not to run any transfer effect.

Stages of the study:

Screening (day 1)–filling individual files and conducting investigations and sampling for laboratory analysis–glucose, insulin / IRHOMA, lipidogram.

The "Wash–out" period (day 1–14)–2 weeks before inclusion of each participant in a study group. This period was necessary to

annihilate any antioxidant effect of food supplements, herbal extracts or tea consumed by participants before the actual start of the study nutritional products that may contain components similar to those tested.

The volunteers were informed in this regard to discontinue any such product, during this wash period–out and during the study.

Randomization visit (day 14): samples were collected for biochemical analysis mentioned above and there were lots of study. Nutritional period (day 14–day 42): tested products were consumed as product management features.

Completion of the study (day 42): Review of possible side effects and sampling for biochemical analysis.

- Glucose determination
- Determination of glucose in serum glucose concentration was performed using COBAS automated analyzer using the spectophotometric method 6000.
- Determination of total serum cholesterol
- Determination of total serum cholesterol was performed using automated analyzer COBAS 6000 through the spectrophotometric method.
- Determination of HDL–cholesterol
- Determination of HDL concentration
- Serum cholesterol was performed using automated analyzer COBAS 6000 through the spectrophotometric method.
- Triglyceride Determination
- Determination of triglycerides concentration in serum was performed using automated analyzer COBAS 6000 through the spectrophotometric method.

Results

The results are summarized for each study group separately in *Tables 1–3* and there were drawn diagrams appropriate to all the observed parameters.

Table 1

Evolution of metabolic parameters for group no.1

No.	Measured parameter	Initial medium value	Medium value 30 days later
1.	Cholesterol	223	206.5
2.	Triglyceride	159	155
3.	HDL	44.5	52
4.	Blood sugar	118.5	103

Evolution of metabolic parameters for group no.1 (*Figure 1*):

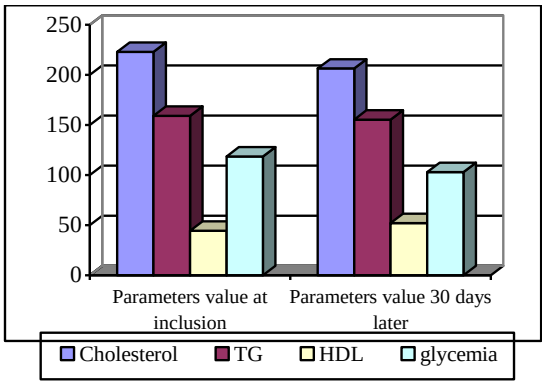


Figure 1. Evolution of metabolic parameters for group No. 1

Inside the figure a decrease for blood cholesterol levels can be observed and an increase in HDL values for group number 1.

Table 2

Evolution of metabolic parameters for group no. 2

No.	Measured parameter	Initial medium value	Medium value 30 days later
1.	Cholesterol	218	198
2.	Triglyceride	189	160.5
3.	HDL	43.5	51.5
4.	Blood sugar	124	114

Figure 2 shows a significant decrease for group 2 for cholesterol, triglycerides and glucose and an increase in HDL values.

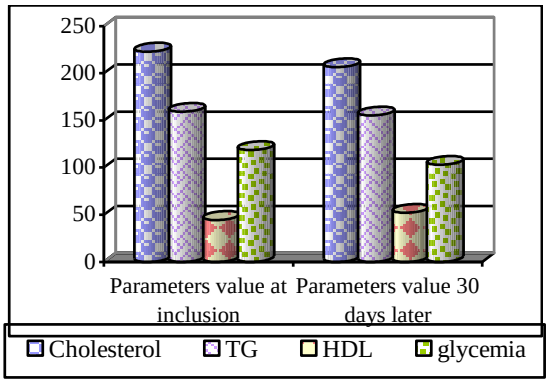


Figure 2. Evolution of metabolic parameters for group No.2

The effects of resveratrol are currently a topic of numerous animal and human studies. Its effects on the lifespan of many model organisms remain controversial, with uncertain effects in fruit flies, nematode

worms, and short–lived fish.

In mouse and rat experiments, anticancer, anti–inflammatory, blood sugar–lowering and other beneficial cardiovascular effects of resveratrol have been reported.

These results have yet to be replicated in humans.

Table 3

Evolution of metabolic parameters for group no.3

No.	Measured parameter	Initial medium value	Medium value 30 days later
1.	Cholesterol	217	214.5
2.	Triglyceride	209	184
3.	HDL	43.5	44
4.	Blood sugar	126	128

Inside *figure 3*, a small decrease in triglycerides is observed but not in blood sugar and total cholesterol for the reference group. Analyzing these results, we can make some observations.

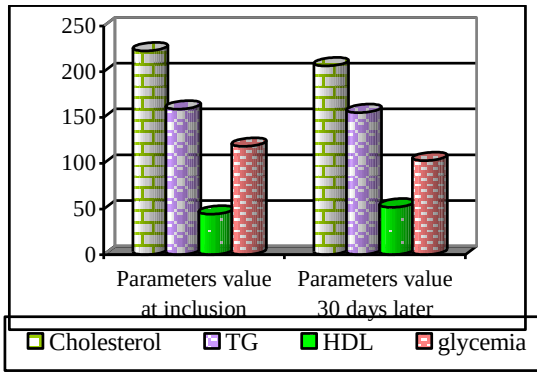


Figure 3. Evolution of metabolic parameters for group No. 3

The decrease in total cholesterol was obtained in group 1 and group 2.

In group 3 the decrease was insignificant. Triglycerides also showed a decrease in group 2, while the other two groups had an insignificant decrease. HDL increased in all patients except those belonging to group number three.

As far as the blood sugar is concerned, there was a decrease in group 1 and group 2, while for group 3 blood sugar levels raised.

Conclusions

Based on data regarding vitamin C and the antioxidant content in the products surveyed, we consider that food supplementation with a product that contains both analyzed antioxidants, the reach of most consumers are given the cost and convenience and implementing this enrichment will have beneficial effects on health, due to their ability to better manage some risk factors for degenerative diseases.

It may also be noted that the introduction of the food consumption of this supplement leads to a positive response in healthy individuals, which recommended these products and hypo caloric diet for people with diabetes, other degenerative diseases (e.g. metabolic syndrome) or predisposition to the development problems of carbohydrate metabolism.

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References

1. Agriculture and Agri–Food Canada. Undated. Functional foods and nutraceuticals: Pharmascience Inc. Internet address: http://www.agr.ca/food/markets/nutraceu/Profiles2000E/phrmasci.html. Last accessed on April 9, **2010**.
2. Babich, H., A.G. Reisbaum, and H.L. Zuckerbraun. **2000**. *In vitro* response of human gingival epithelial S–G cells to resveratrol. Toxicol. Lett. 114(1–3): 143–153.
3. Barlass, M., R.M. Miller, and T.J. Douglas. **1987**. Development of methods for screening grapevines for resistance to infection by downy mildew. Am. J. Enol. Vitic. 38(1): 65–68.
4. Bass TM, Weinkove D, Houthoofd K, Gems D, Partridge L (October **2007**). "Effects of resveratrol on lifespan in Drosophila melanogaster and Caenorhabditis elegans". Mechanisms of Ageing and Development 128 (10): 546–52.
5. Butnariu, Monica *et al*. (2007). Preliminary tests for efficacy/toxicity evaluation of *Calendulae flos* extract before and after accumulation of zinc. In W. Dekant, J. P. Kehrer & Y. Li (eds.), Toxicology Letters Official Journal of EUROTOX 172. Elsevier.
6. Butnariu, Monica *et al.* (2010). Determining antioxidant capacity of extracts of Filipendula vulgaris Moench from south-western Romania. International Journal of Food,

Agriculture and Environment 3–4: 111–116.
7. Butnariu, Monica *et al.* (2011). Antimicrobial and anti–inflammatory activities of the volatile oil compounds from *Tropaeolum majus L.* (Nasturtium). African Journal of Biotechnology 10 (31): 5900–5909.
8. Elliott PJ, Jirousek M (April **2008**). "Sirtuins: novel targets for metabolic disease". Current Opinion in Investigational Drugs 9 (4): 371–8.
9. Farina A, Ferranti C, Marra C (**2006**). "An improved synthesis of resveratrol". Nat. Prod. Res. 20 (3): 247–52.
10. Gusman, J., H. Malonne, and G. Atassi. **2001**. A reappraisal of the potential chemopreventive and chemotherapeutic properties of resveratrol. Carcinogenesis 22(8):1111–1117.
11. Healthy Living Int.com. **2000**. Where can I find the best antioxidant vitamin supplement? Internet address: http://www.healthylivingintl.com/antioxidant. Last accessed on April 9, 2010.
12. Lin, C., and Y. Chen. **2001**. On–line identification of *trans*– and *cis*–resveratrol by nonaqueous capillary electrophoresis/fluorescence spectroscopy at 77K. Electrophoresis 22:2574–2579.
13. Pearson KJ, Baur JA, Lewis KN, et al. (August **2008**). "Resveratrol delays age–related deterioration and mimics transcriptional aspects of dietary restriction without extending life span". Cell Metabolism 8 (2): 157–68.
14. Scalbert, A., and G. Williamson. **2000**. Dietary intake and bioavailability of polyphenols. J. Nutr. 130(Suppl. 8):2073S–2085S.
15. Trantas E, Panopoulos N, Ververidis F (**2009**). "Metabolic engineering of the complete pathway leading to heterologous biosynthesis of various flavonoids and stilbenoids in Saccharomyces cerevisiae". Metab. Eng. 11 (6): 355–366.
16. Yang, F., T. Zhang, and Y. Ito. **2001**. Large–scale separation of resveratrol, anthraglycoside A and anthraglycoside B. from *Polygonum cuspidatum* sieb. et Zucc by high–speed counter–current chromatography. J. Chromatogr. A 919:443–448.
17. Zhu, Y., T. Huang, M. Cregor, H. Long, C.B. Kissinger, and P.T. Kissinger. **2000**. Liquid chromatography with multichannel electrochemical detection for the determination of transresveratrol in rat blood utilizing an automated blood sampling device. J. Chromatogr. B 740(1):129–133.

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