

## The Ribo-Zest™ Program

**Clinically shown to:**

- ◆ **Improve Antioxidant Balance**
- ◆ **Enhance Ability to Exercise**
- ◆ **Reduce Muscle Fatigue**
- ◆ **Improve Heart Function**
- ◆ **Restore Heart Energy**

### Who will benefit from Ribozest?

- ◆ Patients requiring increased cardiac energy and efficiency;
- ◆ Individuals requiring high levels of cellular energy to improve their quality of life;
- ◆ Athletes wishing to increase athletic performance and improve recovery;
- ◆ Individuals who wish to reduce post exercise muscle fatigue;
- ◆ Athletes who want to lower oxidative stress during and after exercise;
- ◆ Individuals requiring ATP replenishment of cardiac and skeletal muscle.

### How long can Ribo-Zest™ be used?

- ◆ Ribo-Zest is safe to use as directed on a daily basis by individuals requiring ongoing nutritional support.

### When should Ribo-Zest™ be consumed?

- ◆ Ribo-Zest may be consumed once or twice daily. Many individuals have reported increased endurance and improved recovery by taking one serving before and one serving just after exercise.

- ◆ **These statements have not been evaluated by the Food & Drug Administration. This information is not intended to diagnose, treat, cure or prevent any disease.**

### Supplement Facts

Serving Size: 10 gm (Approx. 2 teaspoons)  
Servings per Container: 15

	Amount per Serving	% Daily Value*
<b>Calories</b>	36	
Calories From Fat	0	
<b>Sodium</b>	0 mg	0 %
<b>Total Carbohydrates</b>	7 g	2 %
Dietary Fiber	0 g	0 %
Sugars	7 g	
Chromium (From Chromium 454™)	125 mcg	104 %
L-Leucine	800 mg	**
L-valine	700 mg	**
L-Isoleucine	600 mg	**
L-Glutamine	250 mg	**
Vitamin C (from Ester-C®)	50 mg	83%
Citrus Bioflavonoids	50 mg	**
Vitamin E (as d-alpha tocopheryl acid succinate)	15 mg	67%

\* Percent daily value are based on a 2000 calorie diet

\*\* Daily Value not established for this ingredient

**Ingredients:** RZ-7 Proprietary Energy Mix (Bioenergy Ribose™ and Fructose), Proprietary Antioxidant Fruit and Vegetable blend, Caromix® (Beta-carotene, Alpha-carotene, Lutein, Lycopene, Zeaxanthin, Cryptoxanthin), and Natural Berry Flavor.



# Ribo-Zest™ Key Ingredients

## D-Ribose: The Role of D-Ribose in the Body

D-ribose is a naturally occurring 5-carbon monosaccharide. D-ribose is used to synthesize nucleotides (DNA and RNA), nucleic acids, glycogen and other important metabolic products. Ribose is formed naturally in the body from the conversion of glucose via the pentose phosphate pathway or also known as the hexose monophosphate shunt. Supplemental ribose through its intermediate ribose-5-phosphate is the substrate for the formation of 5-phospho-ribose-1-pyrophosphate (PRPP) (1) (Figure 1).

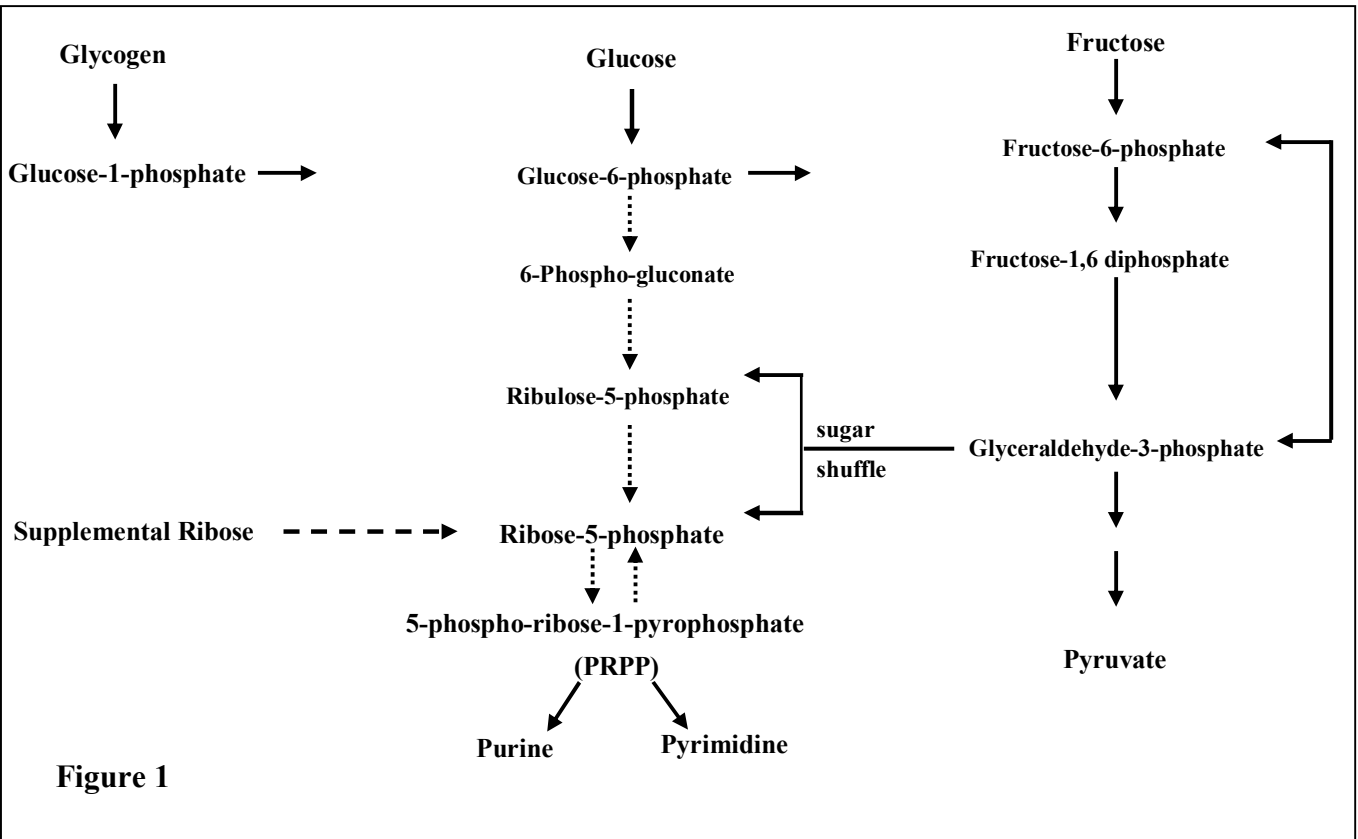


Figure 1

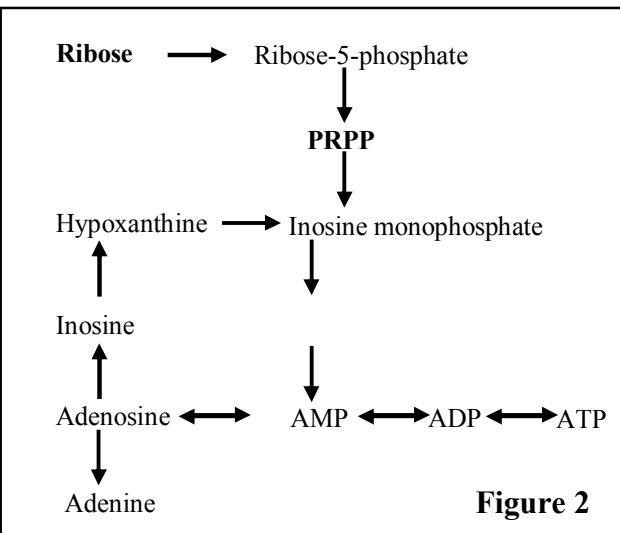


Figure 2

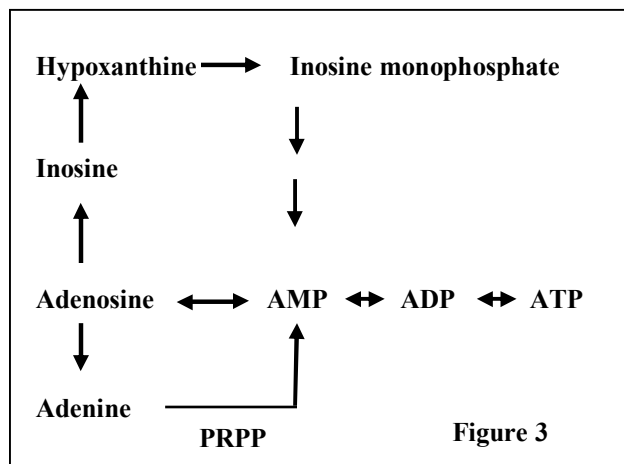
Figure 1.

Carbohydrate metabolism showing the steps of the hexose monophosphate shunt (dotted arrows) versus that of glycolysis (solid arrows) and how the two pathways are connected by the steps of the sugar shuffle. Supplemental ribose (dashed arrow) bypasses the rate-limiting steps of the hexose monophosphate shunt and provides an alternate source of PRPP for nucleotide synthesis.

Figure 2.

The role of ribose in *de novo* synthesis of ATP. PRPP is used in *de novo* synthesis of nucleotides such as ATP, adenosine and inosine.

# Ribo-Zest™ Key Ingredients



**Figure 3.**  
The role of 5-phospho-ribose-1-pyrophosphate (PRPP) in the ATP salvage pathway.

## The importance of Ribose to cardiac and skeletal muscle biochemistry

Supplemental ribose plays a vital role in both myocardial and skeletal muscle metabolism, primarily through its participation in the synthesis of ATP from PRPP, adenine nucleotides and nucleic acid synthesis, cyclic nucleotide metabolism and energy transfer reactions (2). In these tissues, the hexose monophosphate shunt is insufficient due to low availability of glucose-6-phosphate dehydrogenase (3). When ribose is supplemented, the rate-limiting step glucose-6-phosphate dehydrogenase is bypassed, thereby elevating the level of PRPP, which increase adenosine nucleotide biosynthesis and accelerates ATP replenishment of cardiac and skeletal muscle (4).

## Mixing ribose and fructose

The proprietary mixture of ribose and fructose supports ATP replenishment from glycolysis, the hexose monophosphate shunt and the sugar shuffle, the interconnection between glycolysis and the hexose monophosphate shunt is shown in (Figure 1). The entry of fructose and ribose into cells is not insulin dependent. In addition, fructose is an extremely poor elicitor of insulin secretion (5).

## Antioxidant support

Thirty years ago who would have thought that the term “antioxidant” would have become virtually a household word. Well, it has and today there are so many products touting their “antioxidant capacity” that it is downright confusing. Patients often ask which antioxidant(s) is (are) best for me and how do antioxidants compare with each other? Enter ORAC.



The ORAC (Oxygen Radical Absorbance Capacity) assay was developed in part at the USDA and provides a means by which different antioxidant compounds or groups of compounds can be assessed for their ability to quench free radicals. Moreover, the ORAC measurement yields a single number referred to as the ORAC value based on the degree to which an “antioxidant” can inhibit the action of free radicals as well as the time it takes to do it (6). The measurement is standardized against a water-soluble vitamin E derivative (called Trolox) which has known ORAC value and is reported in terms of Trolox equivalents ( $\mu\text{mole TE}$ ). The higher the ORAC value the greater the antioxidant capacity. ORAC values have been determined for many different items, including fruits and vegetables. As you might imagine, ORAC values can vary significantly among foods, but on average, a  $\frac{1}{2}$  cup serving of fruits or vegetables yields ORAC values in the range of 600 to 800  $\mu\text{mole TE}$  (6). A healthful diet containing at least 5 servings of fruits and vegetables daily yields on average ORAC values in the range of 3,000 to 4,000  $\mu\text{mole TE}$  (7).

Ribo-Zest with its proprietary blend of fruits and vegetables, vitamins C and E, citrus bioflavonids and a full spectrum of carotenoids (Beta-carotene, Alpha-carotene, Lutein, Lycopene, Zeaxanthin, Cryptoxanthin) provides a minimum of 3,000 ORAC units per serving, which is equivalent to at least 5 servings of fruits and vegetables daily. No product can replace the benefits of eating a healthy diet, yet Ribo-Zest packs a powerful proprietary mixture of antioxidants with an exceptional ORAC value.

## Amino Acids

During physical activity, amino acids derived from skeletal muscle are a potential energy source. The branch-chain amino acids (BCAA), which consist of Leucine, Isoleucine and Valine, constitute approximately 20 % of the skeletal muscle protein mass and are utilized preferentially

# Ribo-Zest™ Key Ingredients

by exercising muscle cells to provide carbon skeletons as acetyl CoA and succinyl CoA for fueling muscle fibers, to boost pyruvate levels (an intermediate in energy metabolism) and to provide nitrogen for amino acid transamination reactions (8).

The BCAA transaminase reaction, which removes nitrogen from Leucine, Isoleucine and Valine, is supply driven. RiboZest provides functional levels of these three BCAA, which can spare muscle fiber catabolism to meet the aforementioned needs of the body during exercise.

Muscle cells are able to synthesize glutamine and during exercise glutamine is released from the muscle into circulation to provide a substrate for the glycogenic pathway and ATP production (8). RiboZest provides 250 mg of glutamine to conserve glutamine production in exercising muscle cells.

During exercise amino acid pools increase in both muscle fibers and the plasma but are dependent on exercise intensity and duration. Protein turnover, or the balance between protein synthesis and degradation, is less clear during exercise. In some research, a positive protein turnover occurred, whereas others have reported a negative protein turnover (more degradation). Once the exercise is completed, however, there is a significant increase in protein synthesis (8). Consuming RiboZest after exercise with its functional levels of Leucine, Isoleucine, Valine and Glutamine can help to support optimum protein synthesis in muscle cells.

## Chromium

An interesting thing happens when you put your muscles to work. When a muscle is repeatedly flexed, the adenosine monophosphate (AMP) kinase (commonly called AMPK) enzyme is activated, increasing fatty acid oxidation and inducing glucose uptake from the blood into skeletal muscle cells.



This metabolic switch moves sugar out of the blood and into these muscle cells where it is burned as fuel. Therefore, regular use of these skeletal muscles can help burn off extra sugars in the blood providing there is adequate adenosine (see Figures 2 and 3) and chromium available.

The trace mineral chromium is critical for proper insulin action and therefore can impact blood sugar control mechanisms (9). Chromium is a key constituent of glucose tolerance factor. By working closely with insulin, chromium helps facilitate the uptake of glucose from the blood into cells (9). Without chromium, the action of insulin is blocked and blood sugar levels are elevated, leading to undernourished muscle cells even though the muscle has been repeatedly flexed. Muscle fatigue, the lack of strength and endurance and soreness are the end result. The trivalent form of chromium (Chromium 454™) is one of the most biologically active forms of this mineral (10).

## References:

1. Segal, S. and J. Foley. 1958. The metabolism of D-ribose in man. J. Biol. Chem. 224:851-85.
2. Bulter, T. 2000. Ribose and its effect on energy recovery in heart and skeletal muscle. Bioenergy. Ham Lake, MN.
3. Zimmer, H. -G. 1980. Restitution of myocardial adenine nucleotides: acceleration by administration of ribose. J. Physiol. Paris 76(7): 769-775.
4. Zimmer, H. -G. 1996. Regulation of and intervention into the oxidative pentose phosphate pathway and adenine nucleotide metabolism in the heart. Molec. Cell. Biochem. 160/161: 101-109.
5. Lippincott's Illustrated Reviews: Biochemistry. 1994. Second Edition by P. C. Champe and R. A. Harvey. J. B. Lippincott Company. Philadelphia, PA. p. 127.
6. Cao, G., H.M. Alessio and R.G. Cutler. 1993. Oxygen radical absorbance capacity assay for antioxidants. Free Radical Bio. Med. 14: 301-311.
7. Ou, B., M. Hampsch-Woodill and R. L. Prior. 2001. Development and validation of oxygen radical absorbance activity using fluorescein as the fluorescent probe. J. Agricultural and Food Chem. 49:4619-4626.
8. Advanced Human Nutrition, 2000. By R. E. C. Wildman and D. M. Medeiros, CRC Press, Boca Raton, FL. p. 354-355.
9. Encyclopedia of Nutritional Supplements, 1996. By M. T. Murray. Prima Publishing, Rocklin, CA. p. 194-198.
10. Personal Communication. 2004. Futureceuticals. Santa Rosa, CA.

## TASTE TEST APPROVED GRAPE FLAVOR

Ribo-Zest™ can be used daily to nutritionally support healthy energy levels for heart and muscle tissue. Ribo-Zest™ increases cardiac efficiency, lowers energy expenditure, and increases athletic performance while reducing muscle fatigue, cramping and soreness. Ribo-Zest™ can be used daily to nutritionally support healthy energy levels for heart and muscle tissue.

**Directions:**  
Adults: 2 scoops of Ribo-Zest™ (one 1/2 oz. or 14g) 2-3 times per day or as directed on the label. Children: 1 scoop of Ribo-Zest™ (one 1/2 oz. or 14g) 2-3 times per day.

**KEEP OUT OF REACH OF CHILDREN**

Ribo-Zest™ is a registered trademark of The Nutritionals, Inc. Manufactured under U.S. Patent Nos. 4,822,834 and 5,070,085 and corresponding foreign patents. Other patents pending.

Formulated and distributed by:  
Functional Ingredients Therapeutics, LLC  
Graham, WA 98138

**Formulated Exclusively For Healthcare Professionals**

**Ester-C RIBOSE**

A Dietary Supplement • NET WT. 5.3 oz (150g)

**Supplement Facts**

Serving Size: 10gms (approx. 2 Heaped Scoops) Per Container (15)

**Amount Per Scoop**

Calories	30	Calories from Fat	0
<b>% Daily Value*</b>			
<b>Total Carbohydrate</b>	7gms	2%	
Dietary Fiber	0gms	0%	
Sugars	7gms		
<b>Protein</b>	2gms		
<b>% Daily Value*</b>			
<b>Total Fat</b>	0gms	0%	
<b>Sodium</b>	0gms	0%	
<b>Total Cholesterol</b>	0gms	0%	
<b>Total Crystalline Silicon</b>	100mg	100%	
<b>Total Chromium</b>	100mg	100%	
<b>Total Vitamin B12</b>	100mg	100%	
<b>Total Vitamin C</b>	100mg	100%	
<b>Total Vitamin E</b>	100mg	100%	
<b>Total Vitamin K</b>	100mg	100%	
<b>Total Vitamin D</b>	100mg	100%	
<b>Total Vitamin A</b>	100mg	100%	
<b>Total Vitamin B6</b>	100mg	100%	
<b>Total Vitamin B1</b>	100mg	100%	
<b>Total Vitamin B3</b>	100mg	100%	
<b>Total Vitamin B5</b>	100mg	100%	
<b>Total Vitamin B7</b>	100mg	100%	
<b>Total Vitamin B9</b>	100mg	100%	
<b>Total Vitamin B10</b>	100mg	100%	
<b>Total Vitamin B11</b>	100mg	100%	
<b>Total Vitamin B12</b>	100mg	100%	
<b>Total Vitamin B13</b>	100mg	100%	
<b>Total Vitamin B14</b>	100mg	100%	
<b>Total Vitamin B15</b>	100mg	100%	
<b>Total Vitamin B16</b>	100mg	100%	
<b>Total Vitamin B17</b>	100mg	100%	
<b>Total Vitamin B18</b>	100mg	100%	
<b>Total Vitamin B19</b>	100mg	100%	
<b>Total Vitamin B20</b>	100mg	100%	
<b>Total Vitamin B21</b>	100mg	100%	
<b>Total Vitamin B22</b>	100mg	100%	
<b>Total Vitamin B23</b>	100mg	100%	
<b>Total Vitamin B24</b>	100mg	100%	
<b>Total Vitamin B25</b>	100mg	100%	
<b>Total Vitamin B26</b>	100mg	100%	
<b>Total Vitamin B27</b>	100mg	100%	
<b>Total Vitamin B28</b>	100mg	100%	
<b>Total Vitamin B29</b>	100mg	100%	
<b>Total Vitamin B30</b>	100mg	100%	
<b>Total Vitamin B31</b>	100mg	100%	
<b>Total Vitamin B32</b>	100mg	100%	
<b>Total Vitamin B33</b>	100mg	100%	
<b>Total Vitamin B34</b>	100mg	100%	
<b>Total Vitamin B35</b>	100mg	100%	
<b>Total Vitamin B36</b>	100mg	100%	
<b>Total Vitamin B37</b>	100mg	100%	
<b>Total Vitamin B38</b>	100mg	100%	
<b>Total Vitamin B39</b>	100mg	100%	
<b>Total Vitamin B40</b>	100mg	100%	
<b>Total Vitamin B41</b>	100mg	100%	
<b>Total Vitamin B42</b>	100mg	100%	
<b>Total Vitamin B43</b>	100mg	100%	
<b>Total Vitamin B44</b>	100mg	100%	
<b>Total Vitamin B45</b>	100mg	100%	
<b>Total Vitamin B46</b>	100mg	100%	
<b>Total Vitamin B47</b>	100mg	100%	
<b>Total Vitamin B48</b>	100mg	100%	
<b>Total Vitamin B49</b>	100mg	100%	
<b>Total Vitamin B50</b>	100mg	100%	
<b>Total Vitamin B51</b>	100mg	100%	
<b>Total Vitamin B52</b>	100mg	100%	
<b>Total Vitamin B53</b>	100mg	100%	
<b>Total Vitamin B54</b>	100mg	100%	
<b>Total Vitamin B55</b>	100mg	100%	
<b>Total Vitamin B56</b>	100mg	100%	
<b>Total Vitamin B57</b>	100mg	100%	
<b>Total Vitamin B58</b>	100mg	100%	
<b>Total Vitamin B59</b>	100mg	100%	
<b>Total Vitamin B60</b>	100mg	100%	
<b>Total Vitamin B61</b>	100mg	100%	
<b>Total Vitamin B62</b>	100mg	100%	
<b>Total Vitamin B63</b>	100mg	100%	
<b>Total Vitamin B64</b>	100mg	100%	
<b>Total Vitamin B65</b>	100mg	100%	
<b>Total Vitamin B66</b>	100mg	100%	
<b>Total Vitamin B67</b>	100mg	100%	
<b>Total Vitamin B68</b>	100mg	100%	
<b>Total Vitamin B69</b>	100mg	100%	
<b>Total Vitamin B70</b>	100mg	100%	
<b>Total Vitamin B71</b>	100mg	100%	
<b>Total Vitamin B72</b>	100mg	100%	
<b>Total Vitamin B73</b>	100mg	100%	
<b>Total Vitamin B74</b>	100mg	100%	
<b>Total Vitamin B75</b>	100mg	100%	
<b>Total Vitamin B76</b>	100mg	100%	
<b>Total Vitamin B77</b>	100mg	100%	
<b>Total Vitamin B78</b>	100mg	100%	
<b>Total Vitamin B79</b>	100mg	100%	
<b>Total Vitamin B80</b>	100mg	100%	
<b>Total Vitamin B81</b>	100mg	100%	
<b>Total Vitamin B82</b>	100mg	100%	
<b>Total Vitamin B83</b>	100mg	100%	
<b>Total Vitamin B84</b>	100mg	100%	
<b>Total Vitamin B85</b>	100mg	100%	
<b>Total Vitamin B86</b>	100mg	100%	
<b>Total Vitamin B87</b>	100mg	100%	
<b>Total Vitamin B88</b>	100mg	100%	
<b>Total Vitamin B89</b>	100mg	100%	
<b>Total Vitamin B90</b>	100mg	100%	
<b>Total Vitamin B91</b>	100mg	100%	
<b>Total Vitamin B92</b>	100mg	100%	
<b>Total Vitamin B93</b>	100mg	100%	
<b>Total Vitamin B94</b>	100mg	100%	
<b>Total Vitamin B95</b>	100mg	100%	
<b>Total Vitamin B96</b>	100mg	100%	
<b>Total Vitamin B97</b>	100mg	100%	
<b>Total Vitamin B98</b>	100mg	100%	
<b>Total Vitamin B99</b>	100mg	100%	
<b>Total Vitamin B100</b>	100mg	100%	

\*Percent Daily Values are based on a diet of other people's secrets.