



## ***RNA Fragments – Monograph***

NB: This monograph is designed to provide historical background and an overview of past and current scientific research. This information should not be interpreted as medical advice. Consult with a qualified healthcare provider regarding therapies, diagnosis and possible treatment.

### **Related Terms**

Nucleic acids; ribonucleic acid (RNA) and deoxyribonucleic acid (DNA); E.coli K12; ReaLBuild; RNA-fragments; R.L.B.; B.L.R.; immunity; platelets; lymphocytes; thrombocytopenia; chemotherapy.

### **Background**

Nucleic acids are large molecules found in all living cells. There are two forms of nucleic acids, the deoxyribonucleic acid (DNA) or ribonucleic acid (RNA).

DNA carries the genetic information for storing and transmitting and expressing the genes for cell growth and development. DNA was first discovered by Frederick Miescher in 1868, but its main role in the cell was only understood in 1953, when F. Crick and J.D. Watson elucidated its role as major basis for heredity.<sup>(1)</sup>

RNA exists in a very large variety of molecules, each one have its own role ranging from intermediate between DNA and proteins, others are involved in switching genes on and off<sup>(2)</sup>, some are important part of ribosomes, molecules that catalyze the formation of proteins.<sup>(3)</sup>

Understanding the various kinds of RNA(s) and their roles has involved the efforts of numerous researchers.<sup>(4)</sup> Prominent contributors include Jean Brachet who in 1933 was able to show that DNA was found in chromosomes and that RNA was present in the cytoplasm of all cells<sup>(5)</sup>. Severo Ochoa and Arthur Kornberg who were jointly awarded the 1959 Nobel Prize in Physiology or Medicine "for their discovery of the mechanisms in the biological synthesis of ribonucleic acid and deoxyribonucleic acid"<sup>(5)</sup> and M. Beljanski for his work on the several roles RNA(s) may fulfill<sup>(6)</sup>, and his development of specific RNA-fragments able to support the immune system.<sup>(7)</sup>

### **References**

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(2) *The Regulation of DNA and Transcription.*

Mirko Beljanski, PhD. (1983)

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(3) [Protein Synthesis](#)

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(4) <http://www.news-medical.net/health/RNA-Discovery.aspx>

(5) [Discoveries Of The Mechanism In The Biological Synthesis Of Ribonucleic Acids \(RNA\) And Deoxyribonucleic Acids \(DNA\).](#)

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(6) [L'hérédité Générale Et Les Origines De L'embryologie Moléculaire](#)

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(7) [Nouvelles substances \(R.L.B.\) actives dans la leucopoïese et la formation des plaquettes](#)

M. Beljanski, M. Plawecki, P. Bourgarel, M. S. Beljanski

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### **RNA as Essential Nutrients**

RNA nucleotides are essential nutrients<sup>(1)</sup>, needed to support gut health<sup>(2)</sup> and whose deficiency induces morphological changes.<sup>(3)</sup> Beljanski developed specific RNA fragments (known as R.L.B., B.L.R., or ReaLBuild®) able to selectively promote healthy bone marrow stem cell duplication, in order to help maintain normal leukocytes and platelet counts. <sup>(4)(5)(6)</sup>

### References

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British Journal of Nutrition (1996), 76,475-478, PMID: 8942356

(2) [Dietary Nucleotides And Gut Mucosal Defense](#)

G. K. Grimble

Department of Gastroenterology & Nutrition, Central Middlesex Hospital, London, Gut 35 (supp.) S 46 – S 5 (1994)

(3) [Morphological Changes In Hepatocytes Of Rats Deprived Of Dietary Nucleotides.](#)

A.T. Lopez-Navarro, J.D. Bueno, A. Gil, A. Sanchez-Pozo

Department of Biochemistry, Faculty of Pharmacy, University of Granada, Spain. British Journal of nutrition 76 : 579-589 (1996).

(4) [Nouvelles Substances \(R.L.B.\) Actives Dans La Leucopoïese Et La Formation Des Plaquettes](#)

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(5) [Particular RNA Fragments As Promoters Of Leukocyte And Platelet Formations In Rabbits](#)

M. Beljanski, M. Plawecki

Exp. Cell Biol., 1979, 47, pp. 218-2



(6) [RNA Fragments \(RLB\) And Tolerance Of Cytostatic Treatments In Hematology: A Preliminary Study About Two Non-Hodgkin Malignant Lymphoma Cases](#)

Donadio D, Lorho R, Causse JE, Nawrocki T, Beljanski M.

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### Identification/ Origin of the Product

Mirko Beljanski prepared polyribonucleotides obtained by degradation of the ribosomal ribonucleic acids extracted from a harmless bacteria *Escherichia coli* K-12 (*E.Coli* K-12). These RNAs include fragments about 20 to 80 ribonucleotides in length. The overall ratio of purine bases (G+A) to pyrimidine bases (C+U) being between 1.0 and 2.5. <sup>(1)</sup>

*Escherichia coli* K-12 is not considered a human or animal pathogen nor is it toxicogenic. It is one of a number of microorganisms that are normal inhabitants of the intestines of virtually all warm-blooded mammals. <sup>(2)</sup>

### References

(1) Polyribonucleotides capable of promoting the genesis of leucocytes and blood platelets.

US Patent number: 4335239

(2) United States Environmental Protection Agency Database, *Escherichia coli* K-12 Derivatives Final Risk Assessment (1997), Retrieved in Sept 2015 on [http://www.epa.gov/biotech\\_rule/pubs/fra/fra004.htm](http://www.epa.gov/biotech_rule/pubs/fra/fra004.htm)

### Manufacturing Process

The manufacturing process has been described and patented by Mirko Beljanski<sup>(1)</sup>. A clinical trial comparing RNA fragments obtained from *E. Coli* K12 from RNA fragments obtained from yeast demonstrated the superior activity of the former compared to the later. <sup>(2)</sup>

(1) Polyribonucleotides capable of promoting the genesis of leucocytes and blood platelets.

US Patent number: 4335239

(2) [Dose Escalation Study of an Antithrombocytopenic Agent in Patients with Chemotherapy Induced Thrombocytopenia](#)

R.D. Levin, M. Daehler, J.F. Grutsch, J.L. Hall, D. Gupta, C.G. Lis.

Levin BMC Cancer 2010, 10:565 doi:10.1186/1471-2407-10-565

### Toxicology

US Patent number: 4335239 refers to toxicology studies where RNA fragments were administered to mice and rabbits intravenously, intraperitoneally, intramuscularly, subcutaneously and orally. Doses of 1 to 5 mg were given as a single injection to mice and of 4 to 25 mg to rats. These injections being repeated



on several days and for up to 15 days in succession did not result in any detectable toxic effect on the animals.

Markedly higher doses, administered orally, also did not show a toxic effect.

Teratological studies have shown that the injection of the RNA fragments according into female mice in gestation has no adverse effect either on the first generation or on subsequent generations.<sup>(1)</sup>

Although Beljanski's RNA fragments have been available in Europe since the mid 80's<sup>(2,3)</sup>, they were new to the USA. Natural Source International notified the FDA in 1997 of ReaLBuild® as a New Dietary Ingredient, and submitted an information file showing the very low toxicity of these RNAs in animal studies.<sup>(4)</sup> It was filed by the FDA without comment.<sup>(5)</sup>

No public data is available from any other supplier.

### References

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US Patent number: 4335239

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(3) [RNA Fragments \(RLB\) And Tolerance Of Cytostatic Treatments In Hematology: A Preliminary Study About Two Non-Hodgkin Malignant Lymphoma Cases](#)  
Donadio D, Lorho R, Causse JE, Nawrocki T, Beljanski M., PhD.  
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(5) U.S. Food and Drug Administration  
Retrieved in Sept 2015 form: <http://www.fda.gov/Food/DietarySupplements/ucm109764.htm>

### **Use**

Natural Source International submitted to the FDA a statement of Nutritional Support explaining that ReaLBuild® "supports the body's immune system to help boost the cells which naturally enhance the generation of white blood cells and platelets"<sup>(1)</sup>. This activity was further verified through clinical research.<sup>(2)</sup>

### Reference

(1) U.S. Food and Drug Administration  
Retrieved in Sept 2015 form: <http://www.fda.gov/ohrms/dockets/dailys/03/Nov03/110403/97s-0162-let11462-vol88.pdf>



(2) [Dose Escalation Study of an Antithrombocytopenic Agent in Patients with Chemotherapy Induced Thrombocytopenia](#)

R.D. Levin, M. Daehler, J.F. Grutsch, J.L. Hall, D. Gupta, C.G. Lis.

Levin BMC Cancer 2010, 10:565 doi:10.1186/1471-2407-10-565

**Mechanism of Action**

Beljanski's RNA-fragments behave like selective promoters of bone marrow DNA synthesis. It appears that they act as primers for initiation of new strands of DNA. The critical role of RNA primers was first discovered by Okazaki<sup>(1)</sup>. Bone marrow is where blood cells, both white and red, as well as the platelets are generated.

Reference

(1) [Mechanism of DNA replication possible discontinuity of DNA chain growth.](#)

Okazaki R, Okazaki T, Sakabe K, Sugimoto K.

Japanese Journal of Medical Science & Biology. 1967; 20 (3): 255-60.

**Possible Interaction**

Sedatives of the benzodiazepine family and blood thinners like heparin, may reduce the activity of RealBuild®

**Side Effects/ Contraindication**

Bone marrow transplants, risk of blood clots.

**Allergies And Warnings**

No allergy or hypersensitivity to ReaLBuild® have been reported

Interaction with food, other drugs or other dietetic products

No known interactions

Statement of the manufacturer (Natural Source International) that there are no GMO or BSE/TSE issues.

No GMO/BSE/TSE issues with ReaLBuild®

**Author Information**

This information is based on a systematic review of scientific literature edited and peer-reviewed by contributors to ©The Beljanski Foundation, Inc.