

## White Paper

### **Product:**

INVIGORATE™

### **Ingredients:**

Green Tea (20% Caffeine/ 36% EGCG), Raspberry Ketones, Ginseng Extract: (80% Ginsenosides), Zinc Citrate, Probiotic Blend (5 million Lactobacillus acidophilus; 1 million Bifidobacterium bifidum), Chromium Picolinate, Vanadyl Sulfate, Diiodotyrosine.

### **Ingredient Pharmacology:**

#### **Green Tea (20% Caffeine/ 36% EGCG):**

Glycosylase and amylase inhibitory activity to reduce dietary carbohydrate digestion, absorption and related blood sugar elevation. (1, 2);

Supports body weight reduction and hypocholesterolemic effect. (3)

#### **Raspberry Ketones :**

Reduces risk for weight gain induced by high fat diet; improves fatty liver; supports lipolysis (4, 5)

#### **Ginseng Extract: (80% Ginsenosides):**

Reduces memory loss and improves brain plasticity to support coping during adversity; (6)

Neuroprotective activity against corticosteroids in brain during stress. (7)

Antidepressant like activity to reduce related immobility (8)

#### **Zinc Citrate:**

Zinc plays a role in the synthesis and secretion of insulin by the pancreas islet cells and research indicates a clear deficiency of zinc in type II diabetic conditions; deficiency of zinc is associated



with lack of insulin molecule integrity and efficacy as a serum glucose clearance signalling hormone; supplementation with zinc reduces the risk of zinc deficiency. (9, 10)

**Probiotic Blend (5 million *Lactobacillus acidophilus*; 1 million *Bifidobacterium bifidum*):**

Improves digestion and absorption of nutrients and ginsenoside metabolism to produce ginsenoside active metabolites (11)

**Chromium Picolinate:**

Chromium picolinate supplementation is shown in research to support blood sugar clearance and lower postprandial blood sugar levels. Chromium picolinate dose in this formula is a regulatory approved subclinical level intended to support healthy insulin activity (12)

**Vanadyl Sulfate:**

Oral Vanadyl Sulfate supplementation has been shown to improve glycemic control, lower serum insulin needed to clear blood sugar in the type II diabetic and prediabetic conditions; Vanadyl sulfate dose in this formula is a regulatory approved subclinical level intended to support healthy insulin activity. (13, 14)

**Diiodotyrosine:**

Diiodotyrosine is an amino acid chelate iodine source; a direct precursor to the thyroid hormone thyroxin; two diiodotyrosine molecules come together to form the thyroid hormone;

## References:

- 1) Sugar compositions,  $\alpha$ -glucosidase inhibitory and amylase inhibitory activities of polysaccharides from leaves and flowers of *Camellia sinensis* obtained by different extraction methods. *Int J Biol Macromol*. 2010 Nov 1;47(4):534-9. Epub 2010 Aug 3; Wang Y, Yang Z, Wei X.
- 2) Chemical compositions and bioactivities of crude polysaccharides from tea leaves beyond their useful date; *Int J Biol Macromol*. 2011 Dec 1;49(5):1143-51. Epub 2011 Sep 19.. Xiao J, Huo J, Jiang H, Yang F.
- 3) Effect of green tea extract on body weight, serum glucose and lipid profile in streptozotocin-induced diabetic rats. A dose response study. *Saudi Med J*. 2012 Feb;33(2):128-33; Haidari F, Shahi MM, Zarei M, Rafiei H, Omidian K.
- 4) Raspberry ketone increases both lipolysis and fatty acid oxidation in 3T3-L1 adipocytes. *Planta Med*. 2010 Oct;76(15):1654-8. Epub 2010 Apr 27.; Park KS. ; Nutrition & Functional Food Research Team, Korea Food & Drug Administration, Seoul, Korea.
- 5) Anti-obese action of raspberry ketone. *Life Sci*. 2005 May 27;77(2):194-204. Epub 2005 Feb 25.; Morimoto C, Satoh Y, Hara M, Inoue S, Tsujita T, Okuda H; Department of Medical Biochemistry, Ehime University School of Medicine, Shigenobu-cho, Onsen-gun, Ehime 791-0295,
- 6) Long-term ginsenoside administration prevents memory loss in aged female C57BL/6J mice by modulating the redox status and up-regulating the plasticity-related proteins in hippocampus. *Neuroscience*. 2011 Jun 2;183:189-202. Epub 2011 Apr 2.; Zhao HF, Li Q, Li Y.; Department of Nutrition and Food Hygiene, School of Public Health, Shanxi Medical University, Taiyuan, Shanxi 030001, PR China.
- 7) The antistress effect of ginseng total saponin and ginsenoside Rg3 and Rb1 evaluated by brain polyamine level under immobilization stress. *Pharmacol Res*. 2006 Jul;54(1):46-9. Epub 2006 Mar 10. Lee SH, Jung BH, Kim SY, Lee EH, Chung BC. Bioanalysis and Biotransformation Research Center, Korea Institute of Science and Technology, P.O. Box 131, Cheongryang, Seoul 130-650, South Korea.

- 8) Inhibition of stress-induced plasma corticosterone levels by ginsenosides in mice: involvement of nitric oxide. *Neuroreport*. 1998 Jul 13;9(10):2261-4.; Kim DH, Jung JS, Suh HW, Huh SO, Min SK, Son BK, Park JH, Kim ND, Kim YH, Song DK.; Department of Psychiatry, College of Medicine, Institute of Natural Medicine, Hallym University, Kangwon-Do, S. Korea.
  
- 9) Zinc, Insulin and Diabetes; Arthur B. Chausmer, MD, PhD, FACN; *Endocrinology, Diabetes and Metabolism Section, Medical Service, VA Medical Center, and Department of Internal Medicine (Endocrinology and Metabolism), Louisiana State University School of Medicine at Shreveport, Shreveport, Louisiana*
  
- 10) Disturbed zinc homeostasis in diabetic patients by in vitro and in vivo analysis of insulinomimetic activity of zinc. *J Nutr Biochem*. 2012 Mar 6. ; Jansen J, Rosenkranz E, Overbeck S, Warmuth S, Mocchegiani E, Giacconi R, Weiskirchen R, Karges W, Rink L.
  
- 11) 20(S)-protopanaxadiol, an active ginseng metabolite, exhibits strong antidepressant-like effects in animal tests; *Progress in Neuro-Psychopharmacology & Biological Psychiatry* Changjiang Xu a, Jijun Teng a, Weidong Chen a, Qiang Ge a, Zhiqi Yang a, Chunying Yu a, Zirong Yang a, William Jia a,b,
  
- 12) Biofactors. 2012 Jan;38(1):59-68. doi: 10.1002/biof.194. Epub 2012 Jan 30. Ameliorating effect of chromium administration on hepatic glucose metabolism in streptozotocin-induced experimental diabetes. Sundaram B, Singhal K, Sandhir R. Department of Biochemistry, Panjab University, Chandigarh, India.
  
- 13) Vanadyl sulfate improves hepatic and muscle insulin sensitivity in type 2 diabetes. *J Clin Endocrinol Metab*. 2001 Mar;86(3):1410-7.; Cusi K, Cukier S, DeFronzo RA, Torres M, Puchulu FM, Redondo JC.
  
- 14) Vanadyl sulfate lowers plasma insulin and blood pressure in spontaneously hypertensive rats S Bhanot and JH McNeill Division of Pharmacology and Toxicology, Faculty of Pharmaceutical Sciences, University of British Columbia, Vancouver, Canada.