

WHITE PAPER

CurcuWIN™: A NOVEL CURCUMIN
FORMULATION WITH CLINICALLY
PROVEN SUPERIOR ABSORPTION



Dr. Ralf Jäger (FISSN, CISSN, MBA)

California Institute of Technology (Caltech)

Fellow of the International Society of Sports Nutrition

CurcuWIN™: A NOVEL CURCUMIN FORMULATION WITH CLINICALLY PROVEN SUPERIOR ABSORPTION

Dr. Ralf Jäger

Curcumin is the yellow pigment isolated from the rhizomes of *Curcuma longa* L., commonly known as turmeric, a member of the ginger family (Zingiberaceae), and has a long history of use in food as a spice. The plant is distributed throughout tropical and subtropical regions of the world and is being widely cultivated in Southeast Asian countries. The bioactive ingredients of *Curcuma longa* L. are curcuminoids, fat-soluble, polyphenolic pigments, which are used as the main coloring substances in many varieties of curry powders, mustards and sauces. Commercially available natural curcumin is a mixture of three curcuminoids: curcumin (ca. 75%), demethoxycurcumin (ca. 15%), and bisdemethoxycurcumin (ca. 5%) [1].

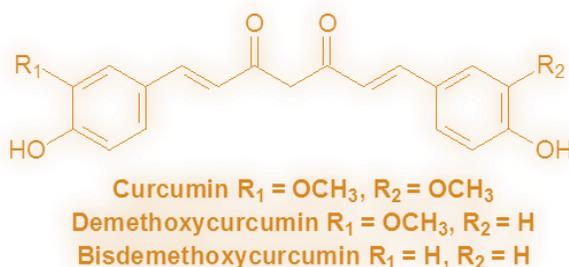


Figure 1. Chemical structures of curcumin, demethoxycurcumin and bisdemethoxycurcumin.



“Inflammation reduces the body’s normal immune response. Curcumin is a powerful natural antioxidant and anti-inflammatory ingredient that has been shown to help maintain healthy immune function.”

Daily lifestyle stress can challenge immune function and create oxidative stress which have become major health concerns in our modern society. The human body is exposed to free radicals from numerous internal and external sources such as pollution, sunlight and exercise, as well as your body’s internal metabolic processes. Oxidative stress occurs if your body is unable to stop the spiraling free radical chain reaction. Inflammation reduces the body’s normal immune response. Curcumin is a powerful natural antioxidant and anti-inflammatory ingredient that has been shown to help maintain healthy immune function.



ABOUT THE AUTHOR

Dr. Ralf Jäger (FISSN, CISSN, MBA) is a leading researcher of functional foods and dietary supplements, as well as an award-winning speaker in these subject areas. He has designed and conducted clinical studies on prominent ingredients and respected products. He has authored numerous peer-reviewed scientific papers on sports nutrition, brain, joint, heart, and gut health, and writes for industry publications and mainstream media. A postdoctoral scholar in bio-organic chemistry at the California Institute of Technology (Caltech) in Pasadena, Calif., Dr. Jäger originally earned his Ph.D. in organic chemistry from the University of Bonn in Germany. He is a member of numerous scientific associations, a Fellow of the International Society of Sports Nutrition (FISSN), and is an editorial board member, a co-editor and reviewer for several leading peer-reviewed journals.

Health Benefits

In addition to its use as a spice and pigment, curcumin has been used for centuries in India and China for medicinal purposes. Curcumin’s unique properties have created a strong interest in basic, applied and clinical research, and the number of research studies investigating the benefits of curcumin have exponentially increased during the last years (see figure 3).

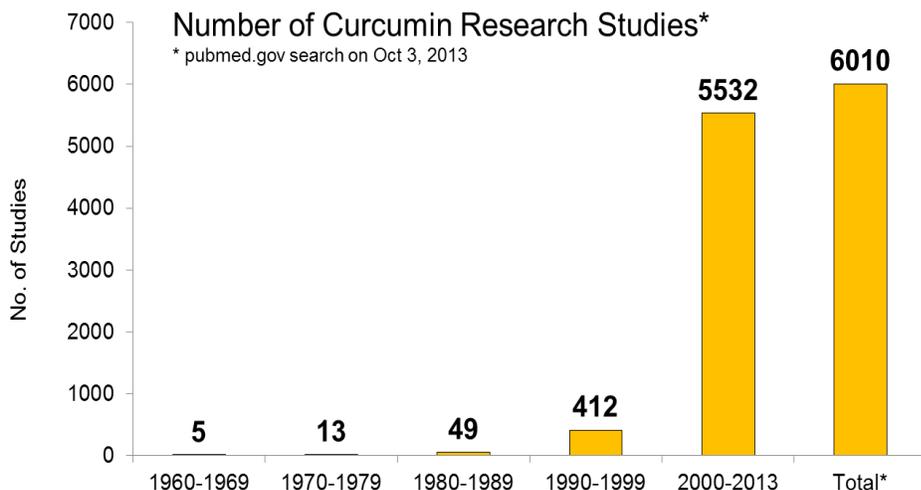
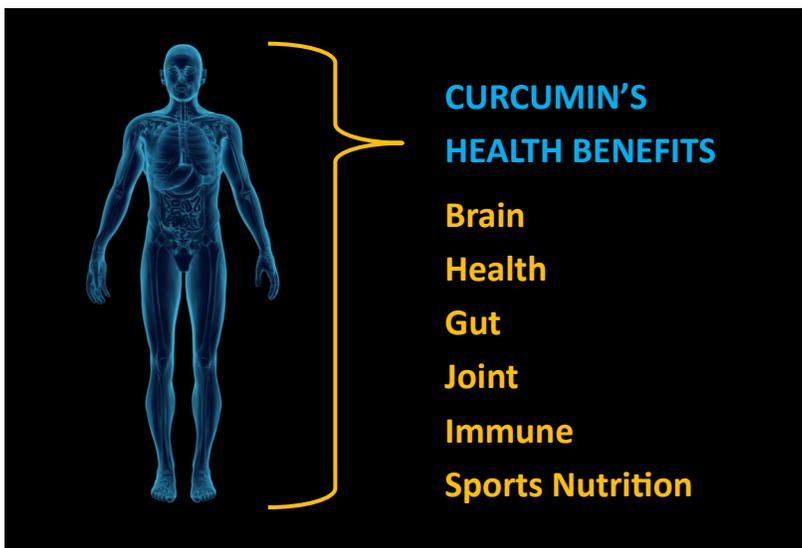


Figure 3. The number of curcumin studies is growing exponentially (Based on available data in PUBMED [accessed on 10/03/2013]).

As a polyphenolic antioxidant, curcumin has been shown to have neuroprotective [2] and anti-inflammatory properties [3]. Curcumin works by way of modulating multiple molecular targets, cell signaling proteins, cell cycle proteins, cytokines and chemokines, enzymes, receptors and cell surface adhesion molecules [4,5]. Curcumin—the principal curcuminoid found in turmeric—is generally considered its most active constituent, followed by demethoxycurcumin and bisdemethoxycurcumin.

Recent controlled clinical studies have demonstrated curcumin’s health benefits in different applications [6-10]. Curcumin supplementation has been shown to benefit cardiovascular health by improving vasodilation [6] and reducing triglyceride levels [7], and as a natural antioxidant with demonstrated neuroprotection curcumin has been shown to



improve brain health [8]. Reduction of inflammation by curcumin has been shown to benefit joint health by improving mobility and reducing mild pain [9] and benefit gut health [10]. In sports nutrition, curcumin has been shown to increase vasodilation similar to exercise [6] and curcumin ingestion with aerobic exercise training is more effective than curcumin ingestion or aerobic exercise training alone [11].

Fate of Orally Administered Curcumin—Absorption and Metabolism

Despite its demonstrated effects, the potential health benefits of curcumin are limited by its poor solubility (practically insoluble in water at acidic [stomach] conditions), low absorption from the gut, rapid metabolism and rapid systemic elimination [12]. While the major portion of ingested curcumin is excreted through the feces unmetabolized, the small portion that is absorbed is extensively converted to its water-soluble metabolites, glucuronides and sulfate in the intestine and liver.

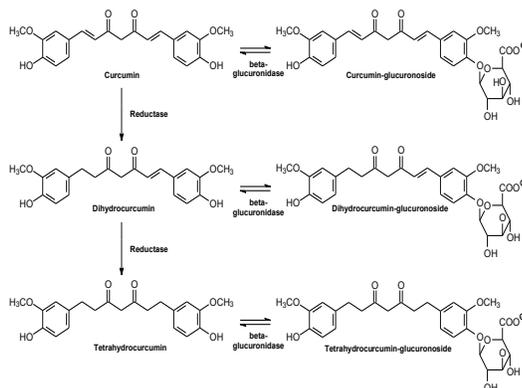


Figure 4. Fate of orally ingested curcumin.

CurcuWIN™ —A Novel Water Soluble Curcumin Formulation

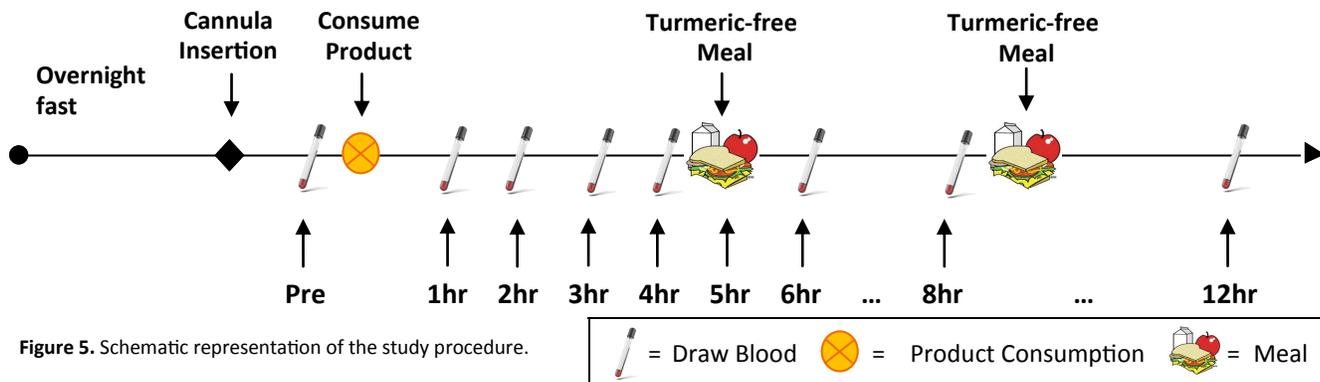


(OmniActive Health Technologies, Inc.) is a novel water-soluble curcumin formulation containing turmeric extract 20-28%, a hydrophilic carrier 63-75%, cellulosic derivatives 20-40% and natural antioxidants 1-3%.

CurcuWIN™'s UltraSOL™ technology increases the solubility of standard curcumin by dispersing a highly purified powder [with min 95% curcuminoids] in a water-soluble carrier along with other encapsulating agents. Antioxidants are used to prevent degradation of curcumin. CurcuWIN™ has been specifically developed to overcome the current shortcomings of curcumin formulations, its low bioavailability.

Clinically Comparing Commercially Available Forms of Curcumin Formulation

In a double-blind, placebo-controlled, crossover design, four commercially available curcumin formulations were tested in a head-to-head comparison: unformulated standard curcumin (CS), phytosome curcumin (CP), formulation with volatile oils of turmeric rhizome (CTR), formulation with a combination of food excipients and natural antioxidants (CHC, CurcuWIN™) [13]. The study was performed in a U.S. population and was conducted at the University of Tampa, in Florida. The blood plasma samples were collected at nine different time points and evaluated for curcumin, demethoxycurcumin, and bisdemethoxycurcumin and tetrahydrocurcumin by tandem mass spectrometry detection (HPLC/MS/MS).



As a result, the curcumin formulation with volatile oils (CTR) showed a 30% improvement over standard for total curcuminoids (CS), whereas the phytosome curcumin formulation (CP) increased total curcuminoids 7.9-fold over standard unformulated curcumin (CS) and 6.0-fold improvement over the formulation with volatile oils (CTR). However, CurcuWIN™ significantly outperformed all three formulations. CurcuWIN™ increased curcuminoid appearance in the blood in comparison to unformulated standard curcumin CS (45.9-fold), to curcumin with volatile oils CTR (34.9-fold) and phytosome curcumin CP (5.8-fold). In addition, CurcuWIN™ showed a staggering 136.3-fold improved curcumin appearance in the blood in comparison to unformulated standard curcumin.

Conclusion

Curcumin is widely accepted for its anti-inflammatory and antioxidant properties [14, 15]. However, large doses have been required because of curcumin’s poor bioavailability, making it difficult for consumers to achieve beneficial amount of curcuminoids. OmniActive Health Technologies’ breakthrough ingredient, CurcuWIN™ (min. 20% curcuminoids) delivers highly bioavailable curcuminoids in the profile in which they are naturally found in turmeric. Using patented UltraSOL™ technology, CurcuWIN™ increased relative absorption of total curcuminoids 46 times over standard curcumin and was significantly more bioavailable than other enhanced forms [13]. Now consumers can easily obtain the undeniable benefits of curcumin by using products containing highly bioavailable CurcuWIN™.

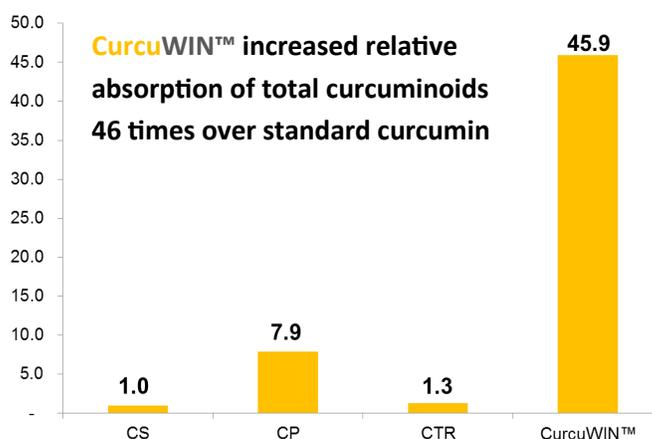


Figure 6. Jäger R et al. Comparative absorption of curcumin formulations. *Nutr.J* 2014 Jan 24;13

SPONSORED BY: *OmniActive Health Technologies offers a range of quality ingredients, which are innovative and*



scientifically validated for dietary supplementation, nutritional fortification, functional food/beverage, coloring, flavor enhancement and personal care applications. We address complex challenges for customers in the dietary supplement, food and beverage space using technology-driven, sustainable solution with application support within a global regulatory framework. Whether you’re looking for a new ingredient to add to a finished product, or technology to enhance an existing ingredient, you’ll find unmatched innovation at OmniActive. Our core products are carotenoids, plant extracts and specialty functional ingredients. We leverage our international R&D strengths to deploy an array of state of the art manufacturing technologies in extraction, purification, isolation and delivery of nutritional actives. Our manufacturing operations are located at multiple sites in India and are cGMP and HACCP system compliant.

REFERENCES

- [1] Li S, Yuan W, Deng G, Wang P, Yang P, Aggarwal BB: Chemical composition and product quality control of turmeric (*Curcuma longa* L.). *Pharmaceutical Crops* 2011, 2:28-54.
- [2] Ataie A, Sabetkasaei M, Haghparast A, Moghaddam A, Kazeminejad B: Neuroprotective effects of the polyphenolic antioxidant agent, Curcumin, against homocysteine-induced cognitive impairment and oxidative stress in the rat. *Pharmacol Biochem Behav* 2010, 96:378-385.
- [3] Naik S, Thakare V, Patil S: Protective effect of curcumin on experimentally induced inflammation, hepatotoxicity and cardiotoxicity in rats: evidence of its antioxidant property. *Exp Toxicol Pathol* 2011, 63:419-431.
- [4] Joe B, Vijaykumar M, Lokesh BR: Biological properties of curcumin-cellular and molecular mechanisms of action. *Crit Rev Food Sci Nutr* 2004, 44(2):97-111.
- [5] Shishodia S, Sethi G, Aggarwal BB: Curcumin: getting back to the roots. *Ann N Y Acad Sci* 2005, 1056:206-217.
- [6] Akazawa N, Choi Y, Miyaki A, Tanabe Y, Sugawara J, Ajisaka R, Maeda S: Curcumin ingestion and exercise training improve vascular endothelial function in postmenopausal women. *Nutr Res* 2012, 32(10):795-799.
- [7] DiSilvestro RA, Joseph E, Zhao S, Bomser J: Diverse effects of a low dose supplement of lipidated curcumin in healthy middle aged people. *Nutr J* 2012, 11:79.
- [8] Ringman JM, Frautschy SA, Cole GM, Masterman DL, Cummings JL: A potential role of the curry spice curcumin in Alzheimer's disease. *Curr Alzheimer Res* 2005, 2:131-136.
- [9] Chandran B, Goel A: A randomized, pilot study to assess the efficacy and safety of curcumin in patients with active rheumatoid arthritis. *Phytother Res* 2012, 26(11):1719-1725.
- [10] Ali T, Shakir F, Morton J: Curcumin and inflammatory bowel disease: biological mechanisms and clinical implication. *Digestion* 2012, 85(4):249-255.
- [11] Sugawara J, Akazawa N, Miyaki A, Choi Y, Tanabe Y, Imai T, Maeda S: Effect of endurance exercise training and curcumin intake on central arterial hemodynamics in postmenopausal women: pilot study. *Am J Hypertens* 2012, 25(6):651-656.
- [12] Wahlström B, Blennow G: A study on the fate of curcumin in the rat. *Acta Pharmacol Toxicol (Copenh)* 1978, 43:86-92.
- [13] Jäger R, Lowery RP, Calvanese AV, Joy JM, Purpura M, Wilson JM: Comparative Absorption of Curcumin Formulations. *Nutr J* 2014, 13:11.
- [14] Zhang Y, Zhao L, Wu J, Jiang X, Dong L, Xu F, Zou P, Dai Y, Shan X, Yang S, Liang G: Synthesis and evaluation of a series of novel asymmetrical curcumin analogs for the treatment of inflammation. *Molecules* 2014, 19(6):7287-7307.
- [15] Gota VS, Maru GB, Soni TG, Gandhi TR, Kochar N, Agarwal MG: Safety and pharmacokinetics of a solid lipid curcumin particle formulation in osteosarcoma patients and healthy volunteers. *J Agric Food Chem.* 2010, 58(4):2095-2099.