

# ChromaDex and Collaborators Report Unexpected Discovery of Novel Biomarkers of Effective NAD+ Precursor, Nicotinamide Riboside

2015-08-12

Unexpected Results in the First Human Clinical Study of the Company's NIAGEN(R) (Nicotinamide Riboside) Led to the Filing of a Provisional Patent on the Discovery  
IRVINE, Calif., Aug. 12, 2015 (GLOBE NEWSWIRE) -- ChromaDex Corp. (OTCQX:CDXC), an innovator of proprietary health, wellness, and nutritional ingredients that creates science-based solutions for dietary supplements, food and beverage, skin care, sports nutrition, and pharmaceutical products, announced that ChromaDex Scientific Advisory Board member Charles Brenner, PhD presented data today revealing the discovery of unexpected and sensitive biomarker of effectively increasing NAD+ metabolism with nicotinamide riboside (NR). A provisional patent on the discovery has been filed.

The University of Iowa discovery was confirmed in the first controlled human clinical study on the use of the ChromaDex's NIAGEN® nicotinamide riboside (NR), which were presented today at **4<sup>th</sup> Federation of American Societies for Experimental Biology (FASEB) Science Research Conference on NAD+ Metabolism and Signaling**, currently being held in Germany.

Dr. Brenner presented an oral platform talk on "How Nicotinamide Riboside Promotes Weight Loss." In addition, Jaksch, Dellinger, Brenner and their co-workers presented a poster entitled, "Dose-Dependent Elevation of the Blood NAD Metabolome by NR in Healthy Human Beings." Science Research Conference on NAD+ Metabolism and Signaling.

Data presented indicate that single doses of NR can elevate NAD+ in the blood by as much as 2.7-fold. Moreover, Samuel Trammell and Charles Brenner discovered from their first n=1 experiments that nicotinic acid adenine

dinucleotide (NAAD) is an unanticipated and highly sensitive biomarker of increased NAD<sup>+</sup> metabolism. The results showed NAAD increases from non-detectable levels prior to NR supplementation, to levels that are clearly correlated with increasing levels of NAD<sup>+</sup> with NR supplementation. The dramatic fold-change increases of NAAD validates NIAGEN<sup>®</sup> as an effective agent at elevating blood cell NAD<sup>+</sup> metabolism in healthy human beings.

**Nobel Laureate Dr. Roger Kornberg**, who chairs ChromaDex's Scientific Advisory Board, commented, "Cellular NAD<sup>+</sup> is a highly abundant metabolite and is under tight controls that limit its rise and fall. The high endogenous concentration of NAD<sup>+</sup> and the mechanisms that buffer changes in NAD<sup>+</sup> make it a challenging molecule to monitor for significant increases due to NR supplementation. Dr. Brenner's new finding revealing NAAD is an ideal biomarker for measuring the effectiveness of a NAD precursor, NR, is a game changer in understanding and studying NAD<sup>+</sup> metabolism."

As an NAD<sup>+</sup> precursor vitamin, NR goes through a number of known intermediates in producing cellular NAD, NADH, NADP and NADPH. Dr. Brenner's prior work in 2004 and 2007 published in *Cell* established two biosynthetic pathways to NAD<sup>+</sup> through nicotinamide mononucleotide (NMN). The new discovery revealed that when NR is provided orally to a human being or mouse, levels of nicotinic acid adenine dinucleotide (NAAD), and to a lesser extent nicotinic acid mononucleotide (NAMN), rise from levels below the detection limit in highly sensitive mass spectrometry assays to levels that are easily quantifiable.

Whereas some NAD<sup>+</sup> metabolites associated with waste or loss of effective NAD<sup>+</sup> metabolism have been previously reported, NAMN and NAAD accumulation contribute to production of NAD<sup>+</sup> and temporally mark rises in NAD<sup>+</sup>. Thus, the rises in these unanticipated metabolites are biomarkers of effective NAD<sup>+</sup> precursor, NR. The invention is documented with data from mouse liver and from human blood cells.

After observing increases in these biomarkers in an n=1 human experiment and mouse experiments, Brenner and University of Iowa personnel measured increases in blood cell NAAD in the first-in-humans controlled clinical trial of NR to elevate blood cell NAD<sup>+</sup> metabolism. In this trial, NAD<sup>+</sup> levels in blood cells were elevated by single doses of 100 mg, 300 mg and 1 gram of NR.

NAD<sup>+</sup> is a critically important cellular cofactor that is required for fuel utilization and function of every cell in the human body. When fuel is oxidized, NAD<sup>+</sup> is converted to NADH for cellular energy production. The related compound NADP is converted to NADPH for synthesis of lipids and detoxification of reactive oxygen species. In 2004, then at Dartmouth College, Dr. Brenner reported NR as a previously unappreciated vitamin precursor of NAD<sup>+</sup> in humans.

ChromaDex's **NIAGEN<sup>®</sup>** is the first and only commercially available form of NR and is supported by five patents issued and several pending, with patent rights acquired from Dartmouth College, Cornell University and

Washington University.

In addition to functioning as a cofactor, NAD<sup>+</sup> is required for the function of sirtuins, a family of enzymes that control gene expression, metabolism and mitochondrial functions, particularly during changing nutritional conditions. Sirtuins are key target enzymes in healthy aging, such that the search for sirtuin activators has been a major goal of academic, biotechnology and pharmaceutical research for the last decade. In 2007, Dr. Brenner reported that NR extends yeast lifespan by elevating cellular NAD and increasing sirtuin function. More recently, NR has been shown to improve the metabolism of mice on high fat diet, protect mice from noise-induced hearing loss, and protect mice from the damaging effects of mitochondrial mutations.

About the FASEB Science Research Conference on NAD<sup>+</sup> Metabolism and Signaling: A main aspect of this conference will be to foster exchange of information and technology between researchers working on the biochemical, molecular, genetic and cell biological aspects of NAD<sup>+</sup> and related molecules. Moreover, the conference will provide a unique venue for those researchers worldwide who are interested in the basic and translational aspects of NAD metabolism and signaling. For more information about the conference, visit: <http://www.faseb.org/SRC-NAD/Home.aspx>.

About FASEB:

Founded in 1912, the Federation of American Societies for Experimental Biology (FASEB) was originally created by three independent scientific organizations to provide a forum in which to hold educational meetings, develop publications, and disseminate biological research results. What started as a small group of dedicated scientists has grown to be the nation's largest coalition of biomedical researchers, representing 27 scientific societies and over 125,000 researchers from around the world. FASEB is now recognized as the policy voice of biological and biomedical researchers.

About ChromaDex:

ChromaDex leverages its complementary business units to discover, acquire, develop and commercialize patented and proprietary ingredient technologies that address the dietary supplement, food, beverage, skin care and pharmaceutical markets. In addition to our ingredient technologies unit, we also have business units focused on natural product fine chemicals (known as "phytochemicals"), chemistry and analytical testing services, and product regulatory and safety consulting (known as Spherix Consulting). As a result of our relationships with leading universities and research institutions, we are able to discover and license early stage, IP-backed ingredient technologies. We then utilize our in-house chemistry, regulatory and safety consulting business units to develop commercially viable ingredients. Our ingredient portfolio is backed with clinical and scientific research, as well as extensive IP protection. Our portfolio of patented ingredient technologies includes NIAGEN<sup>®</sup> nicotinamide riboside;

pTeroPure<sup>®</sup> pterostilbene; PUREENERGY<sup>®</sup>, a caffeine-pTeroPure<sup>®</sup> co-crystal; ProC3G<sup>®</sup>, a natural black rice containing cyanidin-3-glucoside; IMMULINA<sup>™</sup>, a spirulina extract; and Suntava<sup>®</sup> Purple Corn derived from a proprietary non-GMO purple corn hybrid which contains an extraordinarily high level of anthocyanins. To learn more about ChromaDex, please visit [www.ChromaDex.com](http://www.ChromaDex.com).

#### Forward-Looking Statements:

This release contains forward-looking statements within the meaning of Section 27A of the Securities Act of 1933, as amended, and Section 21E of the Securities and Exchange Act of 1934, as amended. Statements that are not a description of historical facts constitute forward-looking statements and may often, but not always, be identified by the use of such words as "expects", "anticipates", "intends", "estimates", "plans", "potential", "possible", "probable", "believes", "seeks", "may", "will", "should", "could" or the negative of such terms or other similar expressions. Actual results may differ materially from those set forth in this release due to the risks and uncertainties inherent in ChromaDex's business. More detailed information about ChromaDex and the risk factors that may affect the realization of forward-looking statements is set forth in ChromaDex's Annual Report on Form 10-K for the fiscal year ended January 3, 2015, ChromaDex's Quarter Reports on Form 10-Q and other filings submitted by ChromaDex to the SEC, copies of which may be obtained from the SEC's website at [www.sec.gov](http://www.sec.gov). Readers are cautioned not to place undue reliance on these forward-looking statements, which speak only as of the date hereof. All forward-looking statements are qualified in their entirety by this cautionary statement and ChromaDex undertakes no obligation to revise or update this release to reflect events or circumstances after the date hereof.

Statements in this press release have not been evaluated by the Food and Drug Administration. Products or ingredients are not intended to diagnose, treat, cure or prevent any disease.

FASEB has no legal, business or other mutually beneficial relationship with ChromaDex (a sponsor) or its representative of this conference. Neither party has influenced any aspect of the program.

#### CONTACT: ChromaDex Company Contact:

Andrew Johnson  
Director of Investor Relations  
949-419-0288  
[andrewj@chromadex.com](mailto:andrewj@chromadex.com)

ChromaDex Investor Contact:  
The Del Mar Consulting Group, Inc.  
Robert B. Prag, President  
858-794-9500  
[bprag@delmarconsulting.com](mailto:bprag@delmarconsulting.com)

---

ChromaDex Corp