Inositol & D-chiro-inositol

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Inositol also referred to as cyclohexane-1,2,3,4,5,6-hexol is a sugar alcohol possessing the chemical formula $C_6H_{12}O_6$ or $(CHOH-)_6$. It is a B-complex vitamin sometimes referred to as vitamin B8, though not officially recognized as a vitamin due to the fact that the body can synthesize it from glucose, via the action of the intestinal bacteria. Small amounts of it are required daily to remain healthy,[1] as it aids in the metabolism of fats, and assists in the production of healthy cells in the bone marrow, intestines and ocular membranes. It also functions to protect the arteries against elevated cholesterol values, as well as from the hardening process, and is important in hair growth. Inositol is present in all body tissues, with the highest concentrations in the brain, heart, and lens of the eye.

Functionally, inositol assists with the transportation of fats throughout the body, and also assists in neural communication. Although nine different inositol isomers occur naturally in foods, the term "Inositol" is typically used to refer to the specific stereoisomer called *myo*-inositol. Myo-inositol is the most prominent form, and occurs widely in nature.[2] "Myo-Inositol serves not only as a precursor molecule for inositol lipid synthesis, but also as a physiologically important osmolyte."[3] All nine isomers of inositol are found naturally in many foods such as fruits, nuts, beans, and especially cantaloupe and orange. Fresh vegetables and fruits are a better source, as these were found to contain more myo-inositol than frozen, canned, or salt-free products.[4]

Of the nine different types of inositol, two have insulin-sensitizing capabilities: **myo-inositol (MI)** and **d-chiro-inositol (DCI)**.[5] MI and DCI "are involved in an array of cellular functions and abnormalities in their metabolism have been involved in the development of several diseases states."[6] Examples of these disease states include panic and obsessive compulsive disorders, bipolar, depression, and Alzheimer's disease, with particular association to the development of insulin resistance and diabetic complications.[6] Functionally, MI acts as a precursor to a number of signaling molecules, which direct cellular activity. DCI is also known to be an important secondary messenger in insulin signal transduction. Both DCI and MI have been demonstrated to improve androgen levels, increase the action of insulin, and to reduce systolic blood pressure.[7] It has been suggested that a "decreased urine chiro-inositol as well as increased myo-inositol may be measures of insulin resistance."[8]

DCI "functions to accelerate the dephosphorylation of glycogen synthase and pyruvate dehydrogenase, rate limiting enzymes of non-oxidative and oxidative glucose disposal."[8] A decrease in the urine excretion rate of DCI was demonstrated to be linearly related to decreased insulin sensitivity.[8,9] Given a "generalized total body deficiency" of DCI, a resistance to the action of insulin has also been noted.[8] It is predominant in high amounts in fat, liver, brain and kidney phospholipids, while approximately equal amounts of D and L chiro-inositol are present in skeletal muscle, heart and smooth muscle. DCI is also prevalent in plants. For example, pinitol derived from pine is a rich source of DCI.[7,10]

Both MI and DCI function as second messengers of insulin, in several insulin-dependent processes, and are speculated to play important roles in disease processes, including **metabolic syndrome** and **polycystic ovary syndrome**. At high doses DCI alone has been demonstrated to negatively affect oocyte quality. Conidney) of [both] human[16] and animal[15] diabetic subjects." In comparing the glucose disposal rate (GDR) and non-oxidative GDR, Yokoyama H., et al. noted that both of these levels were significantly lower in type 2 diabetes mellitus as compared to non-DM subjects.[17] This group also summarized that a "reduction of non-oxidative glucose disposal may contribute to decreased whole-body glucose utilization."[17]

Studies performed in the mid-60s noted that the male reproductive organs in animals (rats) are particularly rich in free MI,[18] confirming high concentrations in the testis, epididymal, vesicular, and prostatic fluids.[19,20] It was thus suggested that "inositol concentration in physiological fluids may significantly influence fertility", principally due to the high MI concentrations in the male and female reproductive tracts.[11] "Clinical data demonstrate that inositol supplementation could fruitfully affect different pathophysiological aspects of disorders pertaining to Obstetrics and Gynecology."[21]

Polycystic ovary syndrome (PCOS) has been denoted one of the "most common female endocrine/reproductive disorders", with an unclear pathophysiology,[22] in both lean and obese women. In recent years in addition to genetic and environmental causes, the role of insulin resistance as the main driver in PCOS has been highlighted.[23] Both MI and DCI play a role in the management of PCOS. As noted previously and according to Nordio M and Proietti E, "the physiological plasma ratio of MI:DCI is **40:1**, and this ratio "should be considered as the **first line approach** in PCOS overweight patients."[24] This ratio of MI:DCI is effective in reducing "the metabolic and clinical alteration of PCOS and, therefore, reduce[s] the risk of metabolic syndrome."[24] PCOS patients suffer from a systemic inflammatory status that induces erythrocyte membrane alterations. By its action in improving insulin resistance, treatment with MI is effective in reducing hormonal, metabolic, and oxidative abnormalities in these patients.[25]

Insulin resistance in PCOS women is manifested in both obese and lean women, and is independent of fat mass.[26,27] Baillargeon J-P, et al.[28,29] and others[30] demonstrated that oral administration of DCI as well as specific insulin-sensitizing drugs (metformin and troglita-zone[26]) to patients with PCOS "increases the frequency of ovulation and decreases circulating androgens."[26]

It has also been demonstrated that the urinary clearance of DCI (uClDCI) was increased almost sixfold in PCOS

compared with normal women (P = 0.001), but not MI clearance (P = 0.10). The urinary clearance of DCI correlated inversely with insulin sensitivity (Si) when all women were analyzed together (n = 49, r = −0.50, P < 0.001) and was one of the three best independent parameters predicting Si.[31]

Similarly, it has been demonstrated that administration of DCI to diabetic patients functioned to "accelerate glucose disposal and sensitized insulin action."[8] The "insulin-like effectiveness" of DCI was also observed in a diabetic insulin resistant tissue, thus it is suspected that DCI acts as a potential insulin mediator.[5] Besides improvement in insulin, DCI has also "been linked to improved triglyceride and testosterone levels, as well as improved blood pressure, ovulation and weight loss."[32]

Rice inositol verses corn derived inositol:
Inositol is routinely derived from either rice or corn. Most commercially available inositol in the US is derived from corn which may present allergy issues. For obvious reasons, including GMO derivatives, rice derived inositol is the preferred source. Rice derived inositol is also gluten free.

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