VITAMINS AND MINERALS AND FERTILITY

FEMALE

Preconception & Pregnancy — Core Support

Vitamin A	• Required for cell growth, differentiation and gene expression during embryonic development.[5] • Immune regulator.[5] • Required for epithelial tissue integrity and for healthy fallopian tube ciliary function. • Deficiency is linked with anovulation, infertility, miscarriage and cleft palate. • Retinoic acid plays an essential role in central nervous system development.[6]
Vitamin B6	• Vitamin B6 status is observed to influence reproductive events throughout pregnancy. • Deficiency is linked with recurrent spontaneous miscarriage and placental abruption and infarction.[5]
Vitamin B12	• Low vitamin B12 status is associated with nearly a three-fold higher risk of neural tube defects.[7] • Assists with homocysteine metabolism. • Hyperhomocysteinemia is associated with adverse pregnancy outcomes including pre-term delivery, small for gestational age infants, or intrauterine growth retardation.[8]
Vitamin D	• Plays an important role in egg implantation and regulation of local immunological embryo protection.[9] • Deficiency during pregnancy associated with adverse health problems in offspring including, impaired growth, skeletal problems, type 1 diabetes, asthma and schizophrenia.[10]
Folic Acid	• Folate needs to be taken for at least three months prior to conception for optimal benefits for prevention of neural tube defects. • It is not known whether forms of folate, other than folic acid (such as methyl-folate) are equally as effective for NTD prevention.[11] • Folic acid is the most stable form of folate and the bioavailability is approximately 70% greater than natural folate in foods.[11] • Supplementation is more effective than food fortification.[11] • Altered homocysteine metabolism is thought to play a major role in NDT.[5] • Low folate status increases the risk of pre-term delivery.[5] • Folic acid is essential for DNA synthesis and cell division.[5]
Iodine	• Deficiency is increasingly common due to poor soil content and loss of iodine rich cleaning products in glass milk bottles. • Iodine deficiency, leading to foetal hypothyroidism, results in cretinism leading to severe mental retardation. Prevented by correcting maternal iodine deficiency before or during the first three months of pregnancy.[12] • An Australian study demonstrated that even mild iodine deficiency during pregnancy reduced the educational outcomes of their offspring during the 9-year follow up period despite ensuring iodine sufficiency during childhood.[13] • Deficiency also increases the risk of miscarriage, stillbirth and neonatal mortality.[14]
Iron	• Most common nutrient deficiency among pregnant women and requirements are significantly increased during gestation. • Preventive iron supplementation reduces anaemia at term by 70%. • Supplementation reduces the risk of low-birthweight newborns and pre-term delivery.[15] • Iron deficiency anaemia in early development is linked with altered behavioural and neural development as deficiency results in hypomyelination.[5] • Anaemia associated with perinatal maternal and infant mortality and premature delivery.[12] • RDI increases from 18 to 27mg/day in pregnancy and additional supplementation is often required achieve recommended intakes.

Recurrent Miscarriage and Recurrent Unexplained Pregnancy Loss	**NAC -** Supplementation improved pregnancy continuation and live birth rate in women with a history of recurrent unexplained pregnancy loss.[17]
	Omega-3 fatty acids - Whilst not as effective as aspirin, or a combination of aspirin and omega-3 combined, omega-3 supplementation alone was able to significantly improve uterine artery blood flow in women with **recurrent miscarriage due to abnormal uterine perfusion.**[18]
Supporting Assisted Reproductive Techniques (ART).	**Vitamin D -** Enhances IVF outcomes by improving endometrial health.[19]
	CoQ10 - Supplementation combined with DHEA during IVF reduced the requirement for gonadotropin suggesting an improved responsiveness to ovarian stimulation. CoQ10 and DHEA supplementation also resulted in a higher number of mature follicles on the day of trigger during IUI cycles.[20]
	EPA/DHA - Pre-conceptional intake of EPA and DHA improves embryo morphology possibly by reducing the number of poorer quality follicles after ovarian stimulation.[21]
Endometriosis	**NAC -** Supplementation resulted in reductions in pain and cyst diameter. Treatment compares favourably with other hormonal treatments whilst having the advantage of fertility preservation.[22]
Poly Cystic Ovarian Syndrome (PCOS)	**NAC -** Improved pregnancy rates when given alongside clomiphene citrate in women with PCOS.[23-25]
	NAC - Improved pregnancy rates in clomiphene citrate resistant women with PCOS undergoing unilateral ovarian drilling.[26]
	NAC - Improved menstrual regularity, hormonal profile, hirsutism and insulin sensitivity.[27]
	Vitamin D - Improved fertility outcomes in PCOS patients.[19,28]
	CoQ10 - Supplementation increased endometrial thickness, ovulation rate and pregnancy rates when given alongside, clomiphene citrate in clomiphene citrate resistant polycystic ovarian syndrome. The oocyte has the largest number of mitochondria of any cell. The functional status of the mitochondria contributes to the quality of the oocyte, and the process of fertilisation and embryo development.[29]
Luteal phase defects	**Vitamin C -** Improved pregnancy rates in women with luteal phase defects.[30] It is also a synergistic nutrient with NAC and protects against oxidation of folate.
	Chaste Tree - Indirectly progesterogenic. Enhances corpus luteal function which may be inhibited by latent hyperprolactinaemia. Preliminary data supports the use of Chaste Tree in infertile women. Supplementation for 3 months corrected pathologically low levels of serum progesterone in 25 out of 45 cases in early clinical trials. The remaining 20 cases demonstrated a trend towards normal levels.[31]
Support detoxification pathways	Exposure to harmful environmental compounds such as endocrine disrupting chemicals is associated with a host of adverse reproductive outcomes and health effects in the offspring.[32] Supporting major detoxification pathways in the **preconception** period and reducing exposure during the critical early developmental period can have significant health benefits. Dietary and lifestyle changes in conjunction with nutrients such as **NAC, glutathione, Milk Thistle, curcumin, green tea, zinc and folic acid** may play an important role. See further resources by BioMedica for detailed evaluation and implementation of treatment strategies.

MALE	
NUTRACEUTICAL	**RATIONALE/INDICATION**
Vitamin A	• Deficiency associated with abnormal sperm parameters.[40]
Vitamin C	• Present at high concentrations in seminal fluid.[41] • Prevents sperm agglutination and oxidative damage.[42] • Supplementation improves sperm count, morphology and motility.[42] • Supplementation improves intracytoplasmic sperm injection (ICSI) success rates.[43]
Vitamin D	• Deficiency associated with reduced sperm motility and morphology. Both deficiencies (<50nmol/L) and vitamin D excess (>125nmol/L) is associated with poor sperm count.[9] • Essential for inducing the acrosome reaction during sperm and egg fusion.[9]
Selenium	• Increased sperm count, concentration and morphology observed after supplementation in idiopathic oligo-astheno-terato-spermia. Significant increase in motility was observed with additional NAC (600mg).[44]
Zinc	• Deficiency associated with reduced sperm fertilisation capacity.[45] • Supplementation increases semen volume, progressive sperm motility and total normal sperm count.[46]
Coenzyme Q10	• CoQ10 is highly concentrated in the mitochondria rich mid-piece of sperm, where is plays a role in sperm motility and other energy dependent processes.[47] • Prevents lipid peroxidation of sperm cell membranes.[47] • CoQ10 intake from food alone may not be sufficient to optimise semen parameters.[47] • Indicated for varicocele-associated asthenozoospermia.[48] • Improves sperm count, morphology and motility in idiopathic asthenoteratozoospermia.[45] • Improves antioxidant capacity (catalase and SOD concentration) and reduces markers of seminal oxidative stress.[49]
N-Acetyl-Cysteine	• Excessive ROS production is associated with abnormal morphological characteristics of spermatozoa.[50,51] • The addition of NAC to surgery has been shown to significantly increase sperm motility post-varicocelectomy.[52] • Co-administration of NAC with a multivitamin/mineral increased sperm count after treatment for varicocele by retrograde embolization.[53] • Increased sperm count, concentration and morphology observed after supplementation in idiopathic oligo-astheno-terato-spermia. Significant increase in motility was observed with additional selenium (200mcg).[44] • Improved semen volume, viscosity and sperm motility in idiopathic infertility.[54]
Omega 3 fatty acids	• Supplementation improved total sperm count, concentration, motility and morphology and increased SOD and catalase activity. Antioxidant enzyme activity was positively correlated with sperm count, motility and morphology.[55] • DHA supplementation reduces the percentage of spermatozoa with DNA damage.[56]
Tomato Juice	• Daily consumption of canned tomato juice containing approximately 30mg of naturally occurring lycopene decreased semen white blood cells (thought to negatively impact semen quality as a result of ROS production), and significantly improved sperm motility compared to control.[58]

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