

Nutrient Loading

The preconception window—why the 3–6 months before pregnancy may be the most important nutritional period of your life

Introduction

Most conversations about pregnancy nutrition start too late. They begin at the first prenatal appointment, eight or ten weeks into pregnancy, when the most critical period of fetal development—neural tube closure, organ formation, placental establishment—is already underway or complete. By the time a woman learns she is pregnant, many of the nutritional foundations her body needs to support that pregnancy have already been drawn upon.

This paper makes the case for a different starting point: the 3–6 months *before* conception. Drawing on research in nutritional biochemistry, reproductive endocrinology, and epigenetics, we examine why preconception nutrient loading—deliberately building nutritional reserves before pregnancy begins—may be one of the most impactful investments a person can make in their own health and the health of their future child.

The 90-Day Window: Why Timing Matters

The human egg takes approximately 90 days to mature from a primordial follicle to an ovulation-ready oocyte. During this maturation window, the developing egg is sensitive to nutritional and environmental inputs. The quality of the egg—its mitochondrial function, its chromosomal integrity, its capacity to support successful fertilization and early embryonic development—is influenced by the mother's nutritional status during these three months.¹

Similarly, sperm production (spermatogenesis) takes approximately 72 days. Male nutritional status during this window affects sperm quality, motility, and DNA integrity. Preconception nutrition is not exclusively a women's issue—it is a couples' issue.²

This 90-day window means that the nutritional environment of the three months before conception is a direct input into the biological quality of the gametes that will form the embryo. It also means that nutrient stores must be established *before* conception, because the first weeks of pregnancy—when demand is already escalating—are too late to build reserves from scratch.

The Critical Nutrients

Folate (Vitamin B9)

Folate is the most well-established preconception nutrient. Neural tube closure—the process that forms the brain and spinal cord—occurs between days 21 and 28 after conception, often before a woman knows she is pregnant. Adequate folate during this window reduces the risk of neural tube defects (NTDs) by up to 70%. This is not a modest effect—it is one of the most dramatic nutritional interventions in medicine.³

Because the critical window for NTD prevention begins before most pregnancies are detected, the CDC recommends that all women of reproductive age consume 400 micrograms of folic acid daily—not just those actively trying to conceive. For women planning pregnancy, preconception supplementation for at least one month (ideally three) before conception is standard medical guidance.

It is worth noting the distinction between folic acid (the synthetic form used in supplements and fortified foods) and folate (the natural form found in leafy greens, legumes, and liver). A significant minority of women carry MTHFR gene variants that impair conversion of folic acid to its active form, methylfolate. For these women, food-based folate and methylfolate supplementation may be more effective than standard folic acid.⁴

Choline

Choline is emerging as the "next folate"—a nutrient whose importance for pregnancy is increasingly recognized but whose intake remains dramatically inadequate. Choline supports neural development, methylation processes, and placental function. It works synergistically with folate in one-carbon metabolism, the biochemical cycle that governs DNA synthesis and gene expression.⁵

The data on choline inadequacy is alarming: **only 6% of women meet daily choline requirements.** This is not a marginal shortfall—it is a population-wide deficit. Rich dietary sources

of choline include eggs (particularly yolks), liver, and cruciferous vegetables. Preconception is the ideal time to establish a choline-adequate diet, as demand escalates dramatically during pregnancy to support fetal brain development.

The Choline Gap: Only 6% of women meet daily choline needs. Choline supports neural development, methylation, and placental function. Egg yolks are one of the richest food sources—a single large egg provides approximately 147 mg of the recommended 450 mg daily intake during pregnancy.⁵

Omega-3 Fatty Acids (DHA and EPA)

DHA (docosahexaenoic acid) is the primary structural fatty acid in the fetal brain and retina. Adequate maternal DHA is critical for fetal neural development, particularly during the third trimester when the fetal brain undergoes its most rapid growth—but the mother's omega-3 stores must be established well before this point.⁶

Preconception omega-3 status also appears to influence fertility directly. Research has shown that increased preconception omega-3 intake improves embryo morphology and may enhance ovulatory function by modulating inflammatory pathways that can interfere with implantation. Women undergoing IVF who had higher omega-3 levels showed improved embryo quality.⁷

Iron

Iron requirements increase dramatically during pregnancy—from 18 mg/day to 27 mg/day—to support the 50% expansion of maternal blood volume and fetal iron stores. Iron deficiency is the most common nutrient deficiency worldwide, and entering pregnancy with inadequate iron stores is associated with increased risk of preterm birth, low birth weight, and maternal anemia.⁸

Building iron stores takes time. The body absorbs dietary iron slowly, and ferritin levels (the storage form of iron) respond gradually to dietary intervention. This is why preconception is the optimal window for iron repletion—waiting until pregnancy to address iron deficiency means playing catch-up against escalating demand.

Vitamin D

Vitamin D deficiency is widespread in Northern latitudes and among women with darker skin tones. During pregnancy, vitamin D supports fetal skeletal development, immune function, and placental health. Deficiency is associated with increased risk of gestational diabetes, preeclampsia, and preterm birth.⁹

Over 90% of women trying to conceive in UK, Singapore, and New Zealand had low or marginal status for one or more key nutrients, with vitamin D being among the most common deficiencies. Preconception testing and supplementation provide a window to optimize levels before

pregnancy-related demand increases.

The B-Vitamin Complex

Beyond folate, the B-vitamin family—B6, B12, riboflavin, and thiamine—plays essential roles in one-carbon metabolism, energy production, and nervous system function. B12 deficiency is particularly common among women following plant-based diets and is associated with increased risk of neural tube defects independent of folate status. Research suggests that higher intakes of B6, B12, choline, and betaine may further reduce neural tube defect risk beyond folic acid supplementation alone.¹⁰

"We talk about pregnancy as the beginning. But biologically, the story starts months before conception. The nutrients a mother banks in those months become the foundation her baby is built on."

— Monika Sudakov, Founder, Mothership

The Gut-Fertility Connection

Emerging research on the gut microbiome adds another dimension to the preconception nutrition case. The composition of the maternal gut microbiome influences nutrient absorption, inflammation, immune regulation, and—through the gut-brain axis—hormonal signaling. Several studies have identified links between gut microbiome composition and fertility outcomes, including implantation success and miscarriage risk.¹¹

Dietary changes alter the gut microbiome within days, but establishing a stable, diverse microbiome community takes months. The preconception period is the optimal window for dietary interventions—increasing fiber, fermented foods, and diverse plant matter—that promote a gut microbiome composition supportive of pregnancy.

This is an area where Mothership's emphasis on fermented foods, slow-cooked bone broth (which contains glutamine for gut lining support), and diverse whole-food ingredients has particular relevance. The same dietary principles that support postpartum recovery—gut health, anti-inflammation, nutrient density—also support the preconception window.

The Epigenetic Dimension

Perhaps the most profound implication of preconception nutrition research involves epigenetics—the study of how environmental inputs, including nutrition, influence gene expression without altering DNA sequence. Maternal nutritional status during the periconceptual period (the

months immediately before and after conception) can influence the epigenetic programming of the embryo, with effects that may persist into the child's adult life and, in some animal models, into subsequent generations.¹²

The Dutch Hunger Winter studies—which followed individuals conceived during the 1944–45 famine in the Netherlands—provided the earliest human evidence for periconceptional nutritional programming. Individuals conceived during the famine showed altered methylation patterns, increased rates of cardiovascular disease and obesity, and metabolic differences that persisted into their 60s. The timing of the nutritional deprivation mattered: effects were most pronounced when the famine coincided with the periconceptional period.¹³

While these were extreme conditions, the underlying principle applies to everyday nutrition: the maternal nutritional environment during the months surrounding conception influences the epigenetic landscape on which the child's health is built. Optimizing nutrition during this window is not just about fertility—it is about the lifelong health trajectory of the next generation.

Practical Guidance: Building Your Preconception Plate

The preconception period is an opportunity, not an obligation. The goal is not perfection but *preparation*—building the nutritional reserves that pregnancy will draw upon. Key dietary priorities include:

Folate-rich foods: dark leafy greens, lentils, chickpeas, asparagus, liver. Supplementation with methylfolate (400–800 mcg) is recommended in addition to dietary sources.

Choline sources: egg yolks (the richest common food source), liver, salmon, cruciferous vegetables. Most prenatal vitamins contain little or no choline.

Omega-3 fatty acids: fatty fish (salmon, sardines, mackerel), fish oil, or algae-based DHA supplements. Aim for 200–300 mg DHA daily minimum.

Iron-rich foods: red meat, liver, lentils, spinach, fortified cereals. Pair with vitamin C sources to enhance absorption. Get ferritin levels tested.

Gut-supporting foods: fermented vegetables, yogurt, kefir, bone broth, diverse fiber sources. Minimize ultra-processed foods that reduce microbiome diversity.

Conclusion

The 3–6 months before conception represent a nutritional window of extraordinary importance—one that influences egg quality, embryonic development, epigenetic programming, and the mother's capacity to sustain a healthy pregnancy. Yet this window is almost entirely

absent from mainstream conversations about pregnancy preparation.

Mothership is expanding its offerings to support the preconception period because we understand that the nourishment story does not begin at birth. It begins in the months before conception, continues through pregnancy, and extends through the postpartum period and beyond. The same principles—warming, nutrient-dense, whole-food-based nourishment designed for the body's most demanding transitions—apply at every stage.

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