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Sufficient Iodine Intake During Pregnancy: Just Do It

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The adverse effects of severe iodine deficiency and maternal hypothyroidism on fetal and neonatal neurodevelopment are well-established. In recent decades, there has been an increasing emphasis on studying the effects of mild to moderate iodine deficiency during pregnancy and lactation. The American Thyroid Association (ATA) recommended in 2006 that all pregnant and lactating women in North America take a supplement containing 150 μg iodine daily (1). In 2011, the recommendations were updated to advocate ensuring adequate iodine intake not only during pregnancy and lactation, but also in the preconception period, by supplementation with 150 μg iodine daily (as potassium iodide, given the variability of iodine content in kelp and seaweed) (2). The Public Affairs Committee of the Neurobehavioral Teratology Society has now published a position statement in support of the ATA recommendations, authored by Obican *et al.* (3), a declaration that should be duly recognized.

Inadequate iodine nutrition remains one of the most important micronutrient deficiencies globally, placing more than 2 billion individuals at risk (4). Iodine deficiency continues to be the most common cause of preventable mental retardation worldwide. The most vulnerable groups are pregnant and lactating women and their developing fetuses and neonates, given the crucial importance of adequate iodine during early maturation. In their position paper, Obican *et al.* nicely summarize the increased requirements for iodine intake during pregnancy, the available but variable sources of dietary iodine, and the important studies that have demonstrated adverse obstetrical and neonatal outcomes associated with both overt and subclinical maternal hypothyroidism.

In two prospective studies of iodine supplementation in mildly and moderately iodine-deficient women evaluating neurobehavioral outcomes, infants born to mothers who received iodine during pregnancy had improved psychological and neurocognitive measures compared to those born to nonsupplemented mothers. Berbel *et al.* (5) reported that children of mildly hypothyroxinemic women from a mildly iodine-deficient region who were supplemented with 200 μg potassium iodide/day beginning at 12–14 gestational weeks had delayed neurocognitive performance at 18 months of age, compared to children of women who received supplementation at 4–6 gestational weeks, strongly suggesting that adequate iodine intake during the first few weeks of gestation is essential. Similarly, Velasco and colleagues (6) found that infants aged 3–18 months of mildly iodine-deficient mothers who received 300 μg potassium iodide/day during the first trimester had higher neuropsychological assessment scores than those of mothers who received no iodine supplementation. These data are consistent with the meta-analysis of 37 studies ($n = 12{,}291$ children) reported by Qian *et al.* (7), which demonstrated that children of mothers living in severely iodine-deficient areas had an average 12.45 points lower Intelligence Quotient (IQ), compared to the 8.7 points relative improvement in IQ of children born to mothers who resided in areas where iodine supplementation was implemented either before or during pregnancy. In contrast, two studies reported that self-reported consumption of iodine-containing multivitamins and foods during pregnancy was not associated with psychomotor test scores in 1-year-old infants in Spain (8) and during early childhood in a Boston cohort (9), studies that may have been limited by the imperfect use of questionnaires to obtain iodine intake data, as well as the iodine-replete status of most U.S. women.

According to data from the National Health and Nutrition Examination Survey (NHANES), the median urinary iodine concentration in U.S. adults decreased by over 50% from the early 1970s to the late 1990s (10). Of particular concern in the NHANES data is that the prevalence of urinary iodine values < 50 μg/L among women of childbearing age increased by almost fourfold, from 4% to 15%, during this period. The most recent NHANES survey (2005–2008) demonstrated that 35.3% of pregnant women had urinary iodine levels below 100 μg/L (11), which suggests mild iodine deficiency (12). Reductions in U.S. dietary iodine have been variously ascribed to a possible reduction in the iodine content of dairy products, the removal of iodate dough conditioners in commercially produced bread, new recommendations for reduced salt intake for blood pressure control, the recent increased use of Kosher and sea salts (which contain no iodine), and the increasing use of noniodized salt in manufactured or "pre-made" convenience foods (13).

Data from NHANES (2001–2006) demonstrated that only 20.3% of U.S. pregnant women routinely take an iodine-containing supplement (14). Of the 223 prenatal multivitamin formulations available in the United States, only 51% list

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iodine (containing varying amounts), and measured levels can be discordant from labeled values (15). In line with the public health approach to achieve adequate iodine nutrition during pregnancy and lactation, we strongly concur with the Neurobehavioral Teratology Society's support of the standardization of iodine content in prenatal multivitamins, a move that has also been advocated by the National Research Council (16), and the recommendation to begin iodine supplementation preconception and no later than 4–6 weeks of gestation.

In recent decades, there has been considerable effort and progress in improving iodine nutrition globally. The International Council for the Control of Iodine Deficiency Disorders (ICCIDD) was established in 1985, the World Summit for Children in 1990 declared support for iodine-deficiency programs globally, and the United Nations Millennium Summit in 2000 vowed to reduce maternal mortality by 75% over the next 15 years by, in part, improving iodine intake during pregnancy. We applaud the stance of the Neurobehavioral Teratology Society to join these collective efforts, which are appropriate, safe, and preventive in the setting of continued research on the effects of mild iodine deficiency during pregnancy and lactation.

We hope that this important step will increase public awareness of the issues surrounding mild to moderate iodine deficiency in U.S. women planning to become pregnant or those who are pregnant or breastfeeding. The aim of achieving optimal iodine nutrition during these vital periods requires the collaborative efforts of the medical community at large, including primary care providers, obstetricians, endocrinologists, manufacturers of prenatal multivitamins, dietary supplement regulatory agencies, and the food and salt industries. We need to take a strong, proactive stance in support of this crucial issue and "just do it!"

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