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Perchlorate and Thiocyanate Exposure and Thyroid Function in First-Trimester Pregnant Women

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Context: Thyroid hormone, requiring adequate maternal iodine intake, is critical for fetal neurodevelopment. Perchlorate decreases thyroidal iodine uptake by competitively inhibiting the sodium/iodide symporter. It is unclear whether environmental perchlorate exposure adversely affects thyroid function in pregnant women. Thiocyanate, derived from foods and cigarette smoke, is a less potent competitive sodium/iodide symporter inhibitor than perchlorate.

Objective: Our objective was to determine whether environmental perchlorate and/or thiocyanate exposure is associated with alterations in thyroid function in pregnancy.

Design and Setting: We conducted a cross-sectional study at health centers in Cardiff, Wales, and Turin, Italy.

Patients: During 2002–2006, 22,000 women at less than 16 wk gestation were enrolled in the Controlled Antenatal Thyroid Screening Study. Subsets of 261 hypothyroid/hypothyroxinemic and 526 euthyroid women from Turin and 374 hypothyroid/hypothyroxinemic and 480 euthyroid women from Cardiff were selected based on availability of stored urine samples and thyroid function data.

Main Outcome Measures: Urinary iodine, thiocyanate, and perchlorate and serum TSH, free T_4 (FT_4), and thyroperoxidase antibody were measured.

Results: Urinary iodine was low: median 98 μg/liter in Cardiff and 52 μg/liter in Turin. Urine perchlorate was

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detectable in all women. The median (range) urinary perchlorate concentration was 5 μg/liter (0.04–168 μg/liter) in Turin and 2 μg/liter (0.02–368 μg/liter) in Cardiff. There were no associations between urine perchlorate concentrations and serum TSH or FT_4 in the individual euthyroid or hypothyroid/hypothyroxinemic cohorts. In multivariable linear analyses, log perchlorate was not a predictor of serum FT_4 or TSH.

Conclusions: Low-level perchlorate exposure is ubiquitous but did not affect thyroid function in this cohort of iodine-deficient pregnant women.

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