

## **ATTACHMENT E**

### **POTENTIAL HEALTH EFFECTS OF FLUORIDE ON THYROID FUNCTION**

The plurality of generally accepted scientific evidence indicates that fluoride does not have an adverse effect on the thyroid gland or its function, certainly not at recommended levels of exposure.

Several systematic reviews and individual studies completed in the last 15 years have looked at a possible association between exposure to fluoride and thyroid function. Much of the literature that reports an association is focused on excessive fluoride exposure<sup>1,2,3</sup> at levels well above those currently recommended by the ADA and most public health institutions, and thus should not be used as evidence against fluoride exposure at recommended levels.

#### **National Toxicology Program Monograph (2024)**

The NTP Monograph<sup>4</sup> systematically reviewed human, animal, and mechanistic studies on the thyroid gland and hormones on the extent and quality of the evidence linking fluoride exposure to neurodevelopmental and cognitive effects in humans (Question 41). Changes in thyroid hormones have been proposed as a potential mechanism for neurodevelopmental effects,<sup>5,6</sup> which is why thyroid effects were also evaluated in the final report. The NTP report evaluated eight low risk-of-bias studies and 16 high risk-of-bias studies. The studies examined thyroid hormones—the thyroid-stimulating hormone (TSH), triiodothyronine (T3), and thyroxine (T4)—as markers of thyroid gland function. The evidence includes a mix of findings, with some variability across studies based on factors such as fluoride concentration, age, and study design. When examining associations between fluoride exposure and thyroid hormones (TSH, T3, and T4), studies that analyzed changes across all three hormones reported varied results, including increases, decreases, or no changes in hormone levels.

These studies also highlighted age-related differences in the associations between fluoride exposure and thyroid hormones. The findings indicate that while high levels of fluoride exposure may influence thyroid hormones, the evidence does not conclusively demonstrate that consuming fluoridated water at recommended levels adversely affects the thyroid gland or its function. The variability in study results and the complex interplay between the thyroid and other physiological systems suggest that any potential effects are not straightforward. Therefore, based on current evidence, fluoridated water at recommended concentrations is not clearly linked to negative impacts on thyroid health.<sup>4</sup>

#### **Iamandii et al. (2023)**

A 2023 systematic review<sup>3</sup> of fluoride exposure and thyroid function evaluated data from studies conducted in Asia, Europe, Africa, and Canada. The authors examined low and high levels of naturally fluoridated water reported in the original papers. Thyroid function, as measured by TSH and T4, showed little or no impact related to water fluoride. It is important to note that community water fluoridation was not evaluated, and no US studies were included. Furthermore, results showed that levels of natural fluoride at the same level as that recommended in the United States (0.7 ppm) showed no negative impact on thyroid function or thyroid disease.<sup>3</sup>

#### **Australian National Health and Medical Research Council Systematic Review (2017)**

In 2017, the Australian National Health and Medical Research Council's systematic review Information Paper—Water Fluoridation: Dental and Other Human Health Outcomes<sup>7</sup> concluded, “There is no reliable evidence of an association between water fluoridation and current Australian levels and thyroid function including goiter (enlargement of the thyroid gland) and hypothyroidism (underactive thyroid).” (Current recommendations for fluoride levels in drinking water in Australia are a range of 0.6–1.1 mg/L depending on climate.)<sup>7</sup>

### USPHS Recommendation (2015)

In 2015, the *USPHS Recommendation for Fluoride Concentration in Drinking Water for the Prevention of Dental Caries*<sup>5</sup> was released. It referred to the 2006 NRC's report, *Fluoride in Drinking Water—A Scientific Review of the EPA's Standards*,<sup>8</sup> stating:

“The 2006 NRC review considered a potential association between fluoride exposure (2–4 mg/L) and changes in the thyroid, parathyroid, and pineal glands in experimental animals and humans.” The report noted that available studies of the effects of fluoride exposure on endocrine function have limitations. For example, many studies did not measure actual hormone concentrations, and several studies did not report nutritional status or other factors likely to confound findings. The NRC called for better measurement of exposure to fluoride in epidemiological studies and for additional research “to characterize the direct and indirect mechanisms of fluoride's action on the endocrine system and factors that determine the response, if any, in a given individual.”<sup>8</sup>

### Scientific Committee on Health and Environmental Risks Report (2011)

A scientific evaluation of agents used in fluoridating drinking water was done by the Scientific Committee on Health and Environmental Risks (SCHER) as requested by the European Commission (EC).<sup>9</sup> The EC is the European Union's (EU) executive body with responsibility to manage EU policy. The final report, *Critical review of any new evidence on the hazard profile, health effects, and human exposure to fluoride and the fluoridating agents of drinking water*, was released in 2011. It stated, “A systematic evaluation of the human studies does not suggest a potential thyroid effect at realistic exposures to fluoride.”<sup>9</sup>

### Highlighted Studies

The following studies provide additional evidence that consumption of optimally fluoridated water at levels recommended in the United States (0.7 mg/L) does not affect thyroid function:

- Griebel-Thompson et al. (2023):** In 2023, a scoping review of maternal thyroid function and effects on offspring in relation to iodine and fluoride exposure during pregnancy was published.<sup>10</sup>  
  
 In this review, the authors stated that there were only two published studies<sup>11,12</sup> on the effects of fluoride exposure in relation to iodide status that appropriately corrected for urinary concentration when measuring urinary iodine and fluoride concentrations. However, only the study on nonpregnant adults measured thyroid hormones.<sup>11</sup> The authors concluded that more studies are needed to inform our understanding of iodine intake and fluoride exposure in pregnant women.<sup>10</sup>
- Two studies have explored the association between fluoridated water and cancer of the thyroid gland.<sup>13,14</sup> Both studies found no association between optimal levels of fluoride in drinking water and thyroid cancer.

<sup>1</sup> Chaitanya NCSK, Karunakar P, Allam NSJ, et al. A systematic analysis on possibility of water fluoridation causing hypothyroidism. *Indian J Dent Res*. 2018;29(3):358–363.

<sup>2</sup> Taher MK, Momoli F, Go J, et al. Systematic review of epidemiological and toxicological evidence on health effects of fluoride in drinking water. *Crit Rev Toxicol*. 2024;54(1):2–34.

<sup>3</sup> Iamandii I, De Pasquale L, Giannone ME, et al. Does fluoride exposure affect thyroid function? A systematic review and dose-response meta-analysis. *Environ Res*. 2024;242:117759.

<sup>4</sup> National Toxicology Program. NTP monograph on the state of the science concerning fluoride exposure and neurodevelopment and cognition: a systematic review. *NTP Monogr*. 2024 Aug;(8):NTP-MGRAPH-8.

<sup>5</sup> US Department of Health and Human Services Federal Panel on Community Water Fluoridation. US public health service recommendation for fluoride concentration in drinking water for the prevention of dental caries. *Public Health Rep*. 2015;130(4):318–331.

<sup>6</sup> Haschek WM, Rousseaux CG. Handbook of toxicologic pathology. San Diego, CA: Academic Press; 1991.

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<sup>7</sup> National Health and Medical Research Council (NHMRC). Information paper – water fluoridation: dental and other human health outcomes, report prepared by the Clinical Trials Centre at University of Sydney, NHMRC; Canberra, Australia. 2017. Accessed March 25, 2025. <https://www.nhmrc.gov.au/about-us/publications/water-fluoridation-dental-and-other-human-health-outcomes#block-views-block-fileattachments-content-block-1>.

<sup>8</sup> National Research Council. Fluoride in drinking water: a scientific review of EPA's standards. Washington, DC: The National Academies Press 2006. Accessed March 21, 2025. <https://nap.nationalacademies.org/catalog/11571/fluoride-in-drinking-water-a-scientific-review-ofepas-standards>.

<sup>9</sup> Scientific Committee on Health and Environmental Risks (SCHER) of the European Commission. Critical review of any new evidence on the hazard profile, health effects, and human exposure to fluoride and the fluoridating agents of drinking water. European commission directorate-general for health & consumers 2011. Accessed March 21, 2025. [https://ec.europa.eu/health/scientific\\_committees/opinions\\_layman/fluoridation/documents/fluoridation.pdf](https://ec.europa.eu/health/scientific_committees/opinions_layman/fluoridation/documents/fluoridation.pdf).

<sup>10</sup> Griebel-Thompson AK, Sands S, Chollet-Hinton L, et al. A scoping review of iodine and fluoride in pregnancy in relation to maternal thyroid function and offspring neurodevelopment. *Adv Nutr*. 2023;14(2):317–338.

<sup>11</sup> Malin AJ, Riddell J, McCague H, Till C. Fluoride exposure and thyroid function among adults living in Canada: effect modification by iodine status. *Environ Int*. 2018;121(Pt 1):667-674.

<sup>12</sup> Goodman CV, Hall M, Green R, et al. Iodine status modifies the association between fluoride exposure in pregnancy and preschool boys' intelligence. *Nutrients*. 2022;14(14):2920.

<sup>13</sup> Chilvers C. Cancer mortality and fluoridation of water supplies in 35 US cities. *Int J Epidemiol*. 1983;12(4):397–404.

<sup>14</sup> Kinlen L. Cancer incidence in relation to fluoride level in water supplies. *Br Dent J*. 1975;138(6):221–224.