

Fluoride plays an important role in dental health, with its presence in small quantities promoting the re-mineralization and strengthening of tooth enamel [1]. This occurs when hydroxyl ligands in the hydroxyapatite rod structure of the enamel are replaced by Fluoride. As a result of this and the deposition of calcium Fluoride on the enamel surface, the tooth surface can become stronger and more resistant to the destructive effects of plaque acid.

As a result of studies showing these beneficial effects of Fluoride, many countries have added Fluoride – in the form of hexafluosilicic acid (H_2SiF_6) - to their drinking water supplies. Fluoride is also present in many of the commercially available toothpastes, tooth-gel and mouth-wash products that are used around the world, as well as certain food-stuffs (tea for example).

However, the jury is still out on the benefits of fluoride, and further studies have indicated that long term exposure to high levels of Fluoride in water can prove to be counterproductive. Dental fluorosis (a weakening of the surface tooth enamel leading to a pitted surface with discoloured or mottled appearance) is observed in young children exposed to high fluoride levels. Other research has even suggested links between high levels of Fluoride exposure and an increased risk of hip bone fracture amongst the elderly [2] and even to the crippling disorder skeletal fluoridosis [3] - a condition similar to arthritis in its effects. In response to concerns, the World Health Organization now suggests that a daily intake of less than 3mg Fluoride is acceptable for adults.

As ingestion through drinking water consumption is the most common source of dietary fluoride, the Fluoride level in drinking water is controlled strictly in most countries. In many countries and regions the addition of Fluoride to drinking water supplies is now illegal and/or has ceased altogether. Fluoride limits for some different countries (source from WHO) are in the table below.

Automated calibration and Standard Addition

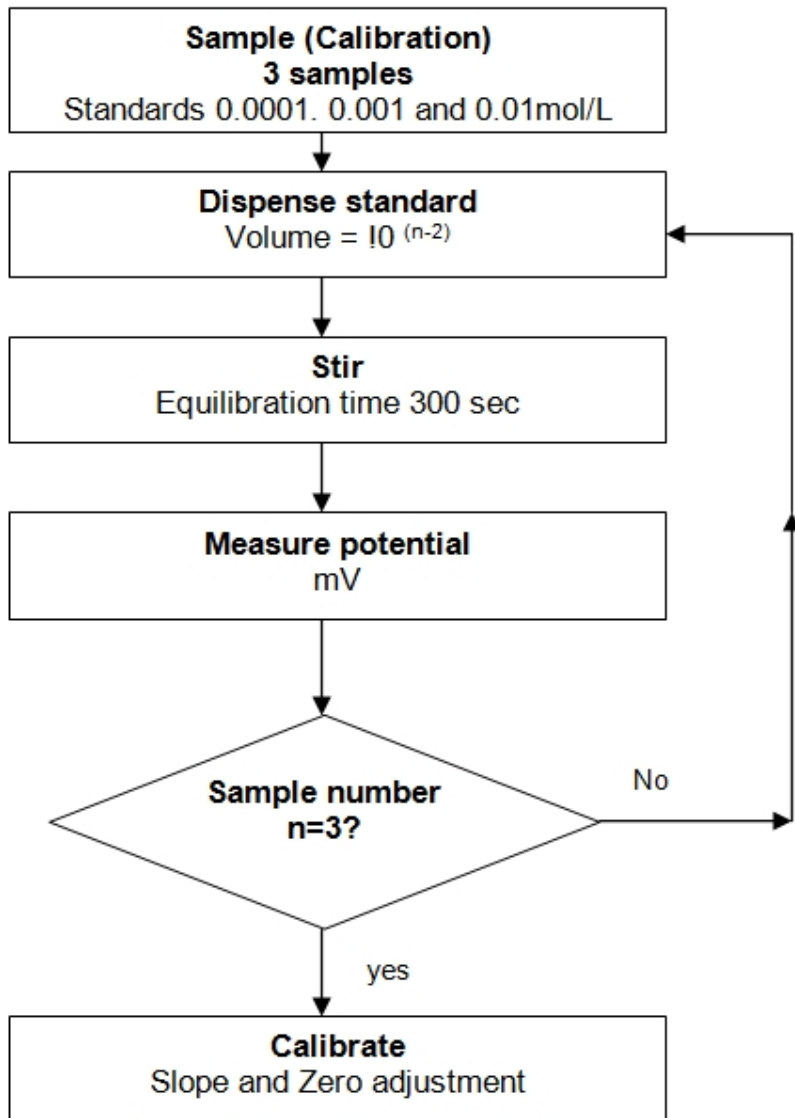
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Country	Maximum permissible Fluoride in Drinking water (mg/L)
UK	1.5
USA	4.0
EU	1.5
Switzerland	1.5
India	1.0

Table 1. WHO permitted Fluoride levels

Fig 1. Flowchart of method



Estimated Concentration of Fluoride in Drinking Water (mg/L) vs. Potential (mV) for three standards (0.0001, 0.001, 0.01 mol/L) and three samples. The volume added and concentrations of the resulting solutions are shown in tables 1 & 2.

