



Lec 5

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Community water fluoridation,

also referred to as **fluoridation**, is defined as the upward adjustment of the natural fluoride level in a community's water supply to a level optimal for dental health. It is a population-based method of primary prevention that uses piped water systems to deliver a low concentration of fluoride over frequent intervals during the day. By consuming the water directly or indirectly through incorporation in foods and beverages, consumers accrue preventive benefits regardless of age or socioeconomic status.

Fluoridation has been cited by the Centers for Disease Control and Prevention (CDC) as one of the 10 great public health achievements of the 20th century.



A. Communal water Artificial Fluoridation

Fluoridation is the controlled adjustment of a fluoride compound to a public water supply in order to bring the fluoride concentration up to a level which effectively prevents caries. The studies of Dean and others up to 1943; shown that fluoride was associated with a lower prevalence of caries, and that there was a sound basis for hypothesis that the introduction of fluoride into a water supply would result in a lower communal prevalence of caries. **Water fluoridation requires a level of dental caries in the community that is high or moderate, or a firm indication that the caries level is increasing.**

History of water Fluoridation

- ✓ **Dean's results showed that both a reduction of dental caries and an acceptable level of enamel fluorosis could be attained with water containing fluoride levels at approximately 1 ppm of fluoride.**
- ✓ **In 1945 Grand Rapids, Michigan city, became the first city in the world to fluoridate its drinking water as a measure to promote dental health and prevent disease. Grand Rapids was the test, or intervention, city and Muskegon, Michigan, whose water was not fluoridated, as control in USA. The previous year (1944) a baseline study comparing Grand Rapids with the neighboring town of Muskegon had found similar decay levels in deciduous and permanent teeth in both areas. Six years later, surveys indicated that decay levels in 6-year-old children (i.e. those born since fluoridation commenced) in Grand Rapids was almost half of that of Muskegon, in 'non-fluoride' Muskegon the average number of teeth with decay experience was 5.7, compared with 3.0 in 'fluoridated' Grand Rapids**

Artificial water fluoridation level

World Health Organization (1984) guidelines suggested that the level of artificial water fluoride according to climate as:

1. In areas with a warm climate, the optimal fluoride concentration in drinking water should remain below 1 mg/liter (1 ppm or part per million).

2. While in cooler climates it could go up to 1.2 mg/liter. (A range of 0.7-1.2 ppm).

The differentiation derives from the fact that perspiration is more in hot weather and consequently intake is more.

Then the National Advisory Committee on Oral Health suggested a range 0.6-1.1 mg/L with variation within that range according to the mean maximum daily temperature.

Advantages of water fluoridation:

- 1. Low cost.**
- 2. No motivation or behavioral changes necessary.**
- 3. Had pre and post eruptive benefit.**
- 4. Caries reduction 50-60% in permanent teeth, and 40-50% in primary teeth. And the disadvantage is the possibility of mild to moderate fluorosis.**

Disadvantages of water fluoridation

- 1. Political and/or emotional objections to water additives.**
- 2. Possibility of mild to moderate fluorosis if other sources of fluoride are ingested**
- 3. Alleged toxicity**

Systemic effect of fluoride:

1. Pre-eruptive Systemic Effects: During tooth development, fluoride is incorporated into the developing tooth's mineralized structure. Although this is no longer believed to be the most important reason for the effect of fluoride in dental caries, the presence of fluoride in the dental enamel probably increases resistance to demineralization when the tooth surface is exposed to organic acids.

Systemic fluoride may enhance the resistance of the tooth by way of:

1. An alteration in tooth morphology, and
2. A conversion of the hydroxyapatite mineral to a fluoridated state with an attendant reduction in solubility and an enhancement of the remineralization phase of the caries process.

2. Post-eruptive Systemic Effects:

After tooth eruption, fluoride is no longer involved systemically in tooth formation. However, consumed fluoride is excreted through the saliva and can aid in tooth protection throughout the lifetime. At the time of tooth eruption the enamel is not completely calcified and undergoes a post-eruptive period of approximately 2 years during which enamel calcification continues. Throughout this period-period of enamel maturation'

Fluoride compound used in water fluoridation

1. **Fluorspar**: It is a mineral containing calcium fluoride [CaF₂].

2. **Sodium fluoride.**

3. **Silicofluorides.**

4. **Sodium silicofluorides:**

Most commonly used due to its low cost. Solutions of this compound are corrosive hence materials for piping, etc. should be chosen accordingly.

5. **Hydrofluosilicic acid.**

6. **Ammonium silicofluoride [(NH)₂SiF₆].**

Medical aspect of Water Fluoridation

None has found evidence that drinking water with a concentration of around 1 ppm is harmful to health.

In fact other than dental fluorosis only endemic skeletal fluorosis is known to result from long-term ingestion of water containing high levels of fluoride. In recent years opponents of fluoridation have attempted to link fluoridation with a wide range of diseases, e.g. cancer, Alzheimer diseases or that it interferes with the immune function. But there is agreement between the scientific, medical and dental community worldwide that fluoridation of water is a safe and effective public health measure.

B. School Water Fluoridation

An alternative to community water fluoridation is the fluoridation of school drinking water. It's most applicable in rural schools, where fluoridation of community water is not feasible. Reduction in dental caries was found to be about 40 percent.

Disadvantages

- **The children do not receive the benefits until they begin school [belated exposure]**
- **Children consume the fluoridated water only when the school is in session [abbreviated exposure].**

To compensate for this belated and abbreviated exposure, the school water is usually fluoridated at 4.5 times the optimum concentration recommended for that place.

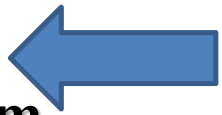


Table (1): Effect of fluoride in water on human health when consumed for longer durations

Fluoride concentration (mg/L)	Effects
<1.0	Safe limit
1.0–3.0	Dental Fluorosis
3.0–4.0	Brittle and stiff bones and joints
4.0–10	Dental fluorosis, skeletal fluorosis (pain in neck bones and back)