

# #56

# Physical Properties of Dental Fluoride Varnishes



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## Objectives

Recently, a range of calcium phosphate technologies have been developed to enhance the effectiveness of fluoride. Several new calcium phosphate compounds such as casein phosphopeptide -amorphous calcium phosphate (CPP-ACP) and functionalized tricalcium phosphate (fTCP) are incorporate into commercial fluoride varnishes. The aim of this study is to compare the ability of commercially available dental fluoride varnishes to release fluoride, calcium and phosphate ions.



## Methods

### Materials

Five dental fluoride varnishes were selected for analysis.

Table 1. Fluoride varnishes selected for analysis.

Products	Manufacturer	Calcium Phosphate Technology	Abbreviation	LotNo.
MI Varnish	GC	CPP-ACP	MIV	1304261
Clinpro White Varnish	3MESPE	fTCP	CWV	N545905
Duraphat	Colgate	none	DRP	143776
Profluorid Varnish	VOCO	none	PFR	1335534
Flor-Opal Varnish	Ultradent	none	FLO	B96JQ

### Test methods

- ① Each Fluoride varnish was applied to an acrylic plate (40 mm × 20 mm; n = 5 per group).
- ② Samples were placed in a chamber at 37 °C, 100% R.H. for 30 min.
- ③ Samples were immersed in deionised water (25 mL) and incubated with gentle agitation.
- ④ Amount of released fluoride, calcium and phosphate ions was measured using ion-specific electrode, atomic absorption spectrophotometry and colourimetry respectively.

Data were analyzed statistically (ANOVA, Tukey's test).

## Results & Discussion

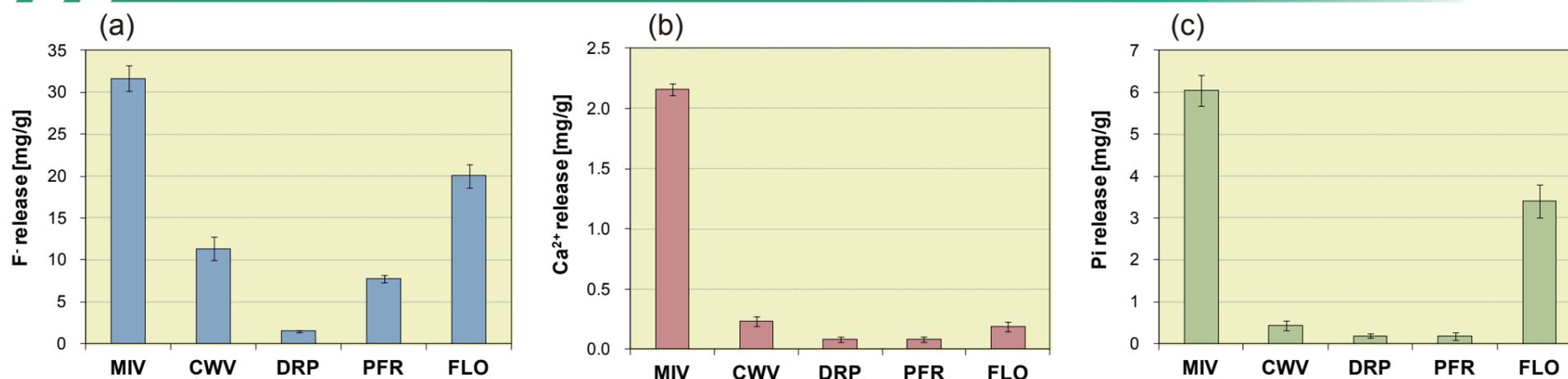


Figure 1. Ion release from dental varnishes (1 day).  
 (a) Fluoride, (b) Calcium, (c) Phosphate

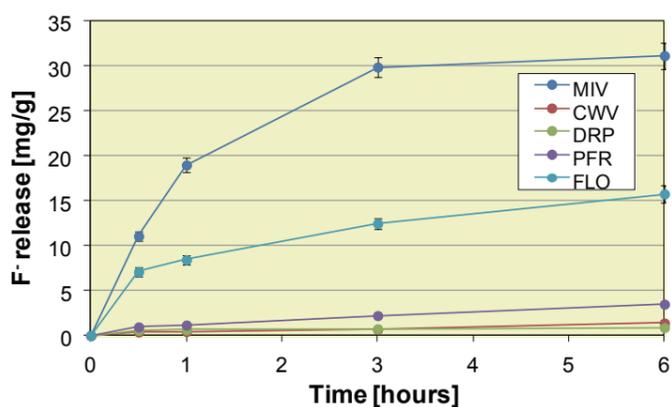


Figure 2. Early stage fluoride ion release. (cumulative)

Dental fluoride varnishes have relatively short persistence in the oral environment. Therefore, varnishes should release their ions in a short period before the varnish is lost.

The amount of ion released from dental fluoride varnishes at Day 1 is shown in figure 1. As expected, MIV containing CPP-ACP released significantly higher amounts of Ca<sup>2+</sup> and PO<sub>4</sub><sup>3-</sup> compared to other varnishes (P<0.05). Substantial Ca<sup>2+</sup> and PO<sub>4</sub><sup>3-</sup> was not released from the other calcium phosphate containing varnish CWV containing fTCP.

The cumulative F<sup>-</sup> release at early stage is shown in figure 2. The greatest cumulative F<sup>-</sup> release at all time points was from MIV (P<0.05). MIV discharged almost all amount of releasable F<sup>-</sup> in 3 hr.

## Conclusion

This study determined that MI Varnish (MIV) containing CPP-ACP had significantly higher fluoride, calcium and phosphate ion release than the other tested fluoride varnishes (P<0.05).