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The physical properties and ion release of CPP-ACP-modified calcium silicate-based cements

ABSTRACT:

Background: This study investigated the physical properties and ion release of casein phosphopeptide-amorphous
calcium phosphate (CPP-ACP)-modified calcium silicate-based cements (CSCs) and compared the properties of a trial
mineral trioxide aggregate (MTA) with two commercially available CSCs, BiodentineTM and Angelus_ MTA.
Methods: The setting time, solubility, compressive strength and Vickers surface microhardness of the three CSCs incorporated
with 0%, 0.5%, 1.0%, 2.0% and 3.0% (w/w) CPP-ACP were investigated. Release of calcium (Ca2+), phosphate
ions (Pi) and pH of the test cements were measured after 24, 72, 168 and 336 h of storage.
Results: The addition of up to 1.0% CPP-ACP into BiodentineTM and 0.5% into the other cements did not adversely
affect their physical properties except for the setting time. The addition of 0.5% CPP-ACP increased Ca2+ released
from BiodentineTM (after 168 and 336 h), Angelus_ MTA (after 168 h) and the trial MTA (after 72 h). The addition of
1.0–3.0% CPP-ACP increased Ca2+ and Pi released from all the cements. BiodentineTM released more Ca2+ particularly in
the early stages and showed shorter setting time and higher mechanical properties than the other cements. The mechanical
properties of Angelus_ MTA and the trial MTA were similar. All the cements produced highly alkaline storage solutions.
Conclusions: Up to 1.0% CPP-ACP in BiodentineTM improves Ca2+ and Pi release and 0.5% CPP-ACP in Angelus_ MTA
and the trial MTA improves Ca2+ release without altering the mechanical properties and solubility. The addition of CPPACP
into CSCs prolonged the setting time.