Oral Gelling Liquid Formulations

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Technology description

Background

Hydroxypropyl methylcellulose (HPMC) is a cellulose derivative widely used in biomedical and pharmaceutical applications. Its modifiable viscosity and ability to form thermally-responsive hydrogels are highly advantageous over other thermo-responsive polymers. Upon heating, HPMC containing solutions will exhibit hydrogen bonding and hydrophobic properties, resulting in the formation of a gelatin structure. The gelation temperature of HPMC is heavily reliant on the presence of specific additives at appropriate concentrations. Variations in additives and their respective concentrations enable the control of the solution-gelation (sol-gel) temperature transition.
Currently, many dental fluoride treatments that are applied to teeth simply coat the area and are unable to penetrate into the smaller spaces and cavities (due to their consistency). In addition, other fluoride delivery methods (mouthwash and foams) lack time effectiveness following their application, as they simply wash away. By applying fluoride in the liquid state and adjusting the sol-gel transition temperature, the tooth would have maximum surface contact before the fluoride composition gels, at which point it would adhere to the entire surface of the affected area for an extended period of time.. The ability to manipulate this transition temperature would provide an effective method for the controlled release of certain active agents, particularly fluorides.

Technology Description

Researchers at the University of New Mexico have developed an innovative technique that allows for the lowering of the HPMC sol-gel transition temperature to form an oral gel. The technique incorporates the use of specific gelling aids to reduce the sol-gel transition temperature. Since the gelation temperature is lowered to below that of the human body temperature, the release of fluoride can be prolonged. By lowering the sol-gel transition temperature, the tooth is initially exposed in the solution phase, before an extended release of the active agent in the gel phase. This exposure allows both dental crevices and exposed surfaces to be treated.

Application area

Manipulation of the sol-gel transition temperature

Prolonged release of fluoride
Complete fluoride treatment for hard-to-reach areas and the rest of the tooth
A platform for other therapeutic delivery in the oral cavity (e.g. to treat infection).

Institution

The University of New Mexico

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