

E. Targeted release coatings or carrier media for pharmaceuticals

It is frequently desirable to transport drugs, which are unstable in stomach acids or react adversely with the stomach lining, through the stomach. Gels of beta-1,3-glucans serve this purpose by virtue of their acid insoluble, base soluble characteristics. Accordingly, it is now possible, as in Example 1, to prepare in one step a solution of beta-1,3-glucans for gelling in contact with a drug preparation. By appropriate selection of polysaccharide, thickness of the gel and concentration of drug in the gel, the thus-formulated pharmaceutical will have controlled release, e.g., slow-release, characteristics.

F. Edible gels

Human and animal foods based on coherent beta-1,3-glucan gels are more easily prepared (in accordance, for example, with the teachings of U.S. Pat. No. 3,822,250) with the solutions and gels of the invention such as those of Example 1.

G. Toothpaste

Heat-stable beta-1,3-glucan based gel toothpastes are conveniently prepared with neutralized solutions and gels of the invention by adding suitable amounts of abrasives, edible dyes, flavors and/or sweeteners, and other known dentrifice ingredients to a neutralized polysaccharide solution of Example 1 and cooling or heating to cause the solution to gel.

H. Gel coatings for biological materials

By preparing a 1% (w/v) solution of Takeda polysaccharide 13140 in 0.05N NaOH, heating to 55° C. and neutralizing with 5N H₃PO₄, seeds, embryos, plantlets and the like can be coated by dipping into the solution and rapidly cooling to gel. Drying is optional as is the addition of nutrients, humectants, hormones, and the like.

I. Disposable contact lenses

Using the method of Example 1 to prepare neutralized beta-1,3-glucan solutions, and using as is or including polymeric additives which can be later leached for increased porosity and therefore liquid and/or gas permeability, the solutions are poured into contact lens molds, and then heat-treated to form contact lenses. The lenses are sterilized by boiling. Illustrative of this process, 1 ml of the neutralized solution described in Example 1 (at 55° C.) is placed in one of the hemispherical wells of a multiwell spot plate at 50° C. The spot plate containing the solution is heated to 100° C. for 10 minutes under high humidity conditions to retard evaporation. The resulting gel simulates a contact lens and can be boiled for sterilization. If agarose or another boiling water leachable hydrocolloid is added during solution preparation, a more porous final product is obtained. Upon drying, at least partial rehydration is possible by placing the gelled product in water.

We claim:

1. A beta-1,3-glucan polysaccharide gel characterized by (a) coherent, uniform, non-particulate structure, and (b) a substantially uniform pH throughout.

2. The gel of claim 1 wherein the polysaccharide is biologically produced.

3. The gel of claim 1 wherein the polysaccharide is produced by a microorganism of the genus *Alcaligenes* or *Agrobacterium*.

4. The gel of claim 1 wherein the polysaccharide is produced by the microorganism *Alcaligenes faecalis* var. *myxogenes*.

5. A method of preparing an aqueous polysaccharide solution capable upon cooling below about 40° C. of forming a reversible, high strength gel and capable upon being heated above about 50° C. of forming a thermally irreversible, high strength gel, said gel having a coherent, uniform, non-particulate structure and a substantially uniform pH throughout, which method comprises:

(a) providing a beta-1,3-glucan polysaccharide normally insoluble in neutral aqueous medium but soluble in alkaline aqueous medium;

(b) dissolving the polysaccharide in an aqueous alkaline medium at a temperature of about 55° C. or below to provide a solution thereof; and

(c) while maintaining the solution at a temperature of at least 50° C. but lower than the decomposition temperature of the polysaccharide, adjusting the pH of the solution to 10.5 or lower.

6. The method of claim 5 wherein the polysaccharide is biologically produced.

7. The method of claim 5 wherein the polysaccharide is produced by a microorganism of the genus *Alcaligenes* or *Agrobacterium*.

8. The method of claim 5 wherein the polysaccharide is produced by the microorganism *Alcaligenes faecalis* var. *myxogenes*.

9. The method of claim 5 wherein the pH of the solution is adjusted by the addition of an organic acid.

10. The method of claim 9 wherein the organic acid is acetic acid.

11. The method of claim 5 wherein the solution is neutralized by the addition of a mineral acid.

12. The method of claim 11 wherein the mineral acid is phosphoric acid.

13. The polysaccharide solution prepared by the method of claim 5.

14. The polysaccharide solution prepared by the method of claim 6.

15. The polysaccharide solution prepared by the method of claim 7.

16. The polysaccharide solution prepared by the method of claim 8.

17. A method of preparing a reversible, high strength gel of a beta-1,3-glucan polysaccharide, which comprises cooling below about 40° C. the polysaccharide solution of claim 13.

18. A method of preparing a reversible, high strength gel of a beta-1,3-glucan polysaccharide, which comprises cooling below about 40° C. the polysaccharide solution of claim 14.

19. A method of preparing a reversible, high strength gel of a beta-1,3-glucan polysaccharide, which comprises cooling below about 40° C. the polysaccharide solution of claim 15.

20. A method of preparing a reversible, high strength gel of a beta-1,3-glucan polysaccharide, which comprises cooling below about 40° C. the polysaccharide solution of claim 16.

21. The reversible polysaccharide gel prepared by the method of claim 17.

22. The reversible polysaccharide gel prepared by the method of claim 18.

23. The reversible polysaccharide gel prepared by the method of claim 19.