CONTRIBUTIONS OF THE RESEARCH WORK IN THE NATIONAL AND INTERNATIONAL CONFERENCES
Title: Release kinetics of Diclofenac Sodium from Carbopol 934p Sol-Gel Systems with Added Hydroxy Ethyl Cellulose for Ophthalmic Use:

Abstract:

Carbopol 934p solutions 0.3% and 0.4% w/w at pH 4 phosphate buffer with and without added hydroxy ethyl cellulose (0.3 to 0.4%) were prepared, which showed gel transformation when pH is changed to 7.4. The viscosity was determined by using Brookfield viscometer model LVDV-II+. The drug release from these gels was studied by dynamic dialysis technique. Added hydroxy ethyl cellulose was found to increase viscosity and delay the drug release from the gels. Solutions of 0.3% carbopol at pH 4 with and without added hydroxy ethyl cellulose were found to be 1.99, 3.12 and 3.62 at 7.4 pH the transformed gels gave values of 14.3, 18.1 and 18.7 cps respectively. Similarly solutions of 0.4% carbopol and pH 4 with and without added hydroxy ethyl cellulose were found to be 2.51, 4.04 and 4.78 at 7.4 pH the transformed gel gave values of 46.0, 53.1 and 55.5 cps respectively, which will be within the range of ophthalmic use. The release data was treated according to Higuchi's equation $Q=Kt^{1/2}$ and exponential equation $Q=Kt^n$ and found to be Fickian diffusion control. Added hydroxy ethyl cellulose in the selected concentration was found to increase the viscosity without interfering with the gel formation of carbopol 934p.
Studies on Sol-gel transformed systems – an approach to optimise topical ocular drug delivery

Abstract:

Poor bioavailability of ophthalmic products is due to the dilution and drainage of the drugs from the ophthalmic cavity. Among the various techniques, sol-gel transformation is the technique by which one can improve the bioavailability of drug by increasing residence time. Carbopol-974p solutions 0.3% and 0.4% w/w at pH 4.0 phosphate buffer with and without added hydroxyethyl cellulose (0.3% and 0.4%) were prepared. At pH 4.0, the solutions were of low viscosity and after increasing the pH to 7.4, the solutions became more viscous. The viscosity is measured by using Ostwald’s and Brookfield Viscometer model LVDV-II+. Solutions of 0.3% carbopol at pH 4.0 with and without added hydroxyethyl cellulose were found to be 1.7, 3.25 and 3.62 at pH 7.4 the transformed gels gave values of 14.8, 18.0 and 20.5 cps respectively. Similarly, carbopol solutions of 0.4% at 4.0 pH with and without added hydroxyethyl cellulose were found to be 1.93, 3.91 and 4.38 at pH 7.4 the transformed gels gave the values of 56.8, 75.9 and 76.5 cps respectively. The drug release from the selected gels was studied by dynamic dialysis technique. The release data was treated according to Higuchi’s equation $Q=Kt^n$ and Peppa’s exponential equation $Q=Kr^n$. The kinetic values shows that, the drug diffusion follows fickian diffusion control. Hydroxy ethyl cellulose in the selected concentration added as a viscolizer was found to increase the viscosity and prolong the drug release from the gels.
INTERNATIONAL CONVENTION OF APTI 2004

Venue: DEPARTMENT OF PHARMACEUTICAL SCIENCES, COLLEGE OF ENGINEERING, ANDHRA UNIVERSITY, VISAKHAPATNAM.

Date: 2nd – 3rd OCTOBER 2004

Title: Gel-forming Solutions (pH-Modulated Drug Delivery Systems for Ophthalmic Use)

Abstract:

Delivery of medication to the human eye is an integral part of medical treatment. Conventional ophthalmic preparations have an inherent disadvantage of short duration of action due to their dilution and flushing off by the flow of tears. For the effective treatment of eye diseases the drug should be administered frequently and this frequent administration is inconvenient to anybody. Keeping this in mind gel-forming solutions were prepared by using carbopols, ophthalmic solution containing carbopol on instillation into the eye increases the viscosity and thereby improves residence time in the eye and hence drug bioavailability is improved. In the present piece of research work three different concentrations are used. The effect of added methyl cellulose as a viscolizer is also studied. Diclofenac sodium is used as a model drug. In vitro drug release data were subjected to various kinetic equations like First-order, Higuchi’s diffusion equation and Peppas equation. Drug release from the formulations is diffusion controlled following first order mechanism. Anova results of viscosity study concludes that, all the three carbopols exerted significant effect at 5% level on viscosity and concentration of carbopol at 1% level have exerted significant effect on viscosity results of gel formulations as expected.
PUBLICATIONS OF THE RESEARCH WORK IN THE NATIONAL AND INTERNATIONAL JOURNALS
Title: Release kinetics of Diclofenac Sodium from Carbopol 934p Sol-Gel Systems with Added Hydroxy Ethyl Cellulose for Ophthalmic Use:

Abstract:

Carbopol 934p solutions 0.3% and 0.4% w/w at pH 4 phosphate buffer with and without added hydroxy ethyl cellulose (0.3 to 0.4%) were prepared, which showed gel transformation when pH is changed to 7.4. The viscosity was determined by using Brookfield viscometer model LVDV-II+. The drug release from these gels was studied by dynamic dialysis technique. Added hydroxy ethyl cellulose was found to increase viscosity and delay the drug release from the gels. Solutions of 0.3% carbopol at pH 4 with and without added hydroxy ethyl cellulose were found to be 1.99, 3.12 and 3.62 at 7.4 pH the transformed gels gave values of 14.3, 18.1 and 18.7 cps respectively. Similarly solutions of 0.4% carbopol and pH 4 with and without added hydroxy ethyl cellulose were found to be 2.51, 4.04 and 4.78 at 7.4 pH the transformed gel gave values of 46.0, 53.1 and 55.5 cps respectively, which will be within the range of ophthalmic use. The release data was treated according to Higuchi's equation Q=Kt^n and exponential equation Q=Kr^n and found to be Fickian diffusion control. Added hydroxy ethyl cellulose in the selected concentration was found to increase the viscosity without interfering with the gel formation of carbopol 934p.
Title: Studies on Sol-Gel Transformed Systems – An Approach to Optimize Topical Ocular Drug Delivery

Abstract:

Poor bioavailability of ophthalmic products is due to the dilution and drainage of the drugs from the ophthalmic cavity. Among the various techniques, sol-gel transformation is the technique by which one can improve the bioavailability of drug by increasing residence time. Carbopol-974p solutions 0.3% and 0.4% w/w at pH 4.0 phosphate buffer with and without added hydroxyethyl cellulose (0.3% and 0.4%) were prepared. At pH 4.0, the solutions were of low viscosity and after increasing the pH to 7.4, the solutions became more viscous. The viscosity is measured by using Ostwald’s and Brookfield Vviscometer model LVDV-II+. Solutions of 0.3% carbopol at pH 4.0 with and without added hydroxyethyl cellulose were found to be 1.7, 3.25 and 3.62 at pH 7.4 the transformed gels gave values of 14.8, 18.0 and 20.5 cps respectively. Similarly, carbopol solutions of 0.4% at 4.0 pH with and without added hydroxyethyl cellulose were found to be 1.93, 3.91 and 4.38 at pH 7.4 the transformed gels gave the values of 56.8, 75.9 and 76.5 cps respectively. The drug release from the selected gels was studied by dynamic dialysis technique. The release data was treated according to Higuchi’s equation $Q=Kt^{1/2}$ and Peppa’s exponential equation $Q=Kt^n$. The kinetic values shows that, the drug diffusion follows fickian diffusion control. Hydroxy ethyl cellulose in the selected concentration added as a viscolizer was found to increase the viscosity and prolong the drug release from the gels.
Title: Studies on Gel-forming Solutions of Timolol Maleate – The Strength of a Gel with the Convenience of Liquid

Abstract:
Timolol Maleate gel forming solutions containing carbopol-934p as gel forming polymer with hydroxy ethyl cellulose, hydroxy propyl methyl cellulose and methyl cellulose as viscolizers were prepared and investigated with a view to develop a delivery systems which improves therapeutic efficacy of timolol maleate by improving contact time on the cornea. Gel forming solutions prepared were evaluated for viscosity, drug-polymer interaction and in-vitro drug release studies. Viscosity was determined by using Brook field viscometer LVDV-II+ model. Added viscolizers were found to increase the viscosity and delay the drug release. Drug intactness in the formulation prepared was studied by infra red spectral analysis, the spectra of formulations retains the absorption bands of pure drug timolol maleate indicating the intactness of the drug in the formulations. Drug release from the gels were carried out by dynamic dialysis technique. The release data was treated according to Higuchi’s equation $Q=Kt^n$ and Peppa’s exponential equation $Q=Kt^n$ and release was found to be Fickian diffusion control.
Title: Formulation and In-Vitro Evaluation of pH-Triggered In-Situ Gelling Systems of Timolol Maleate – An Attempt for Prolonged Release Ophthalmic Drug Delivery

Abstract:

Ocular bioavailability is an important factor in the effectiveness of an applied medication. The poor bioavailability of ocular products is due to the dilution and drainage of the drugs from the ophthalmic cavity. Drug solution drainage is the most significant factor in reducing the residence time of the drug with the cornea and consequently ocular bioavailability. Considering short residence time of the drug on the cornea in situ gelling systems were prepared with a view to develop a delivery systems which improves the residence time on the cornea and therapeutic efficacy of the drug. The present work describes the formulation and evaluation of pH triggered in situ gelling systems using carbopol 971p. Solutions of 0.3% carbopol at pH 4 with and without added methylcellulose were found to be 1.57, 1.62 and 1.68, at 7.4 pH the systems gave values of 8.82, 13.3 and 14.2 cps respectively. Similarly 0.4% carbopol solutions at 4 pH with and without added methylcellulose were found to be 1.65, 1.73 and 1.82, at 7.4 pH the formulations gave the values of 13.6, 21.3 and 24.8 cps respectively. The release data was treated for Higuchi’s equation $Q=kt^{1/2}$ and exponential equation $Q=kt^n$. The release was found to be Fickian diffusion control.
Title: Formulation and Optimization of Sol-Gel Transformed Systems of Timolol Maleate for Ocular Drug Delivery

Abstract:

Timolol maleate sol-gel systems containing gel forming polymer carbopol with hydroxyethyl cellulose, hydroxypropyl methyl cellulose and methyl cellulose as viscolizer were prepared and investigated with a view to develop sol-gel transformed systems. The effect of added viscolizers on the gel forming property of carbopol were also studied. The parameters like viscosity, drug-polymer interaction and in vitro drug release from the formulations were evaluated. Among the three viscolizers studied, the viscosity effect of viscolizers is in the order of hydroxypropyl methyl cellulose> methyl cellulose> hydroxyethyl cellulose. Infrared spectral studies, the absorption bands of pure drug timolol maleate retained in the spectra of formulations prepared, indicating that the drug is there in its intact form without undergoing any interaction with the polymer. Infrared spectral study was well supported by qualitative Ultra-Violet spectrophotometry. Pure drug timolol maleate and formulation containing timolol maleate shows $\lambda_{\text{max}}$ at the same wave length 294 nm proving that the thiadiazole core structure of timolol maleate is not reacting with the polymers used in the study. Drug release data of formulations were subjected to various kinetic equations like First-order plots, Higuchi’s diffusion equation $Q=Kt^{1/2}$ and Peppas exponential equation $Q=Kt^n$. The results of diffusion study showed that the drug release follows first-order kinetics, following Fickian diffusion control.
INSTITUTIONAL ANIMAL ETHICS COMMITTEE

Reg. No. LCP CPCSEA 346

The Animal Ethics Committee reviewed the research work of Mr. S.S. Busetti entitled "In Vivo Evaluation of Timolol Maleate Formulations for Reducing Intraocular Pressure and the Ocular Safety of the Formulations" in albino rabbit eyes.

After thorough verification of the protocol of the research work, the Institutional Ethics Committee approved the research work to conduct on the rabbit eyes.

Chairman
Institutional Ethics Committee
Luqman College of Pharmacy,
Gulbarga

37696