A NOVEL BIODEGRADABLE TABLET FOR SHORT-TERM APPLICATIONS VIA VAGINAL ROUTE IN VETERINARY MEDICINE

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CONTENT

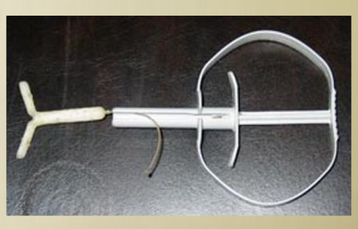
The key objective of this study is to synthesize and apply the biodegradable vaginal tablet based on starch graft copolymer for the short-term applications via vaginal route in farm animals

Keywords: Sheep, estrous synchronization, progesterone, vaginal tablet, starch based poly(acrylic acid)graft copolymer,

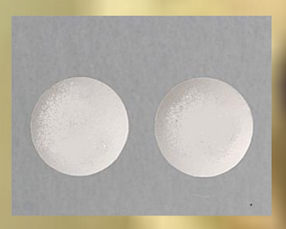
INTRODUCTION

One of the problems in veterinary medicine is the way of drug application. Although the most proper way is oral administration, sometimes the gastrointestinal metabolism prevents the adequate absorption of drug. Intramuscular administration may not always be preferred because it causes pain, irritation and abscess formation. The vaginal route offers advantages compared to other routes because of its large surface area for drug absorption and rich blood supply.

VAGINAL SPONGES



VAGINAL CIDR



VAGINAL TABLET

In vivo residence time; 6th h

Tablet form

In vivo residence time; 24th h

Swollen gel form in vagina

The swollen gel

METHOD

Starch-graft-poly(acrylic acid) copolymer $(WS\text{-}g\text{-}PAA)_g$ was synthesized by using gelatinized wheat starch (WS) and acrylic acid (AA) monomer according to the chemically initiated grafting reaction and the formation of $(WS\text{-}g\text{-}PAA)_g$ was confirmed by FTIR spectroscopy. Graft amount (G%) of the $(WS\text{-}g\text{-}PAA)_g$ was determined. The vaginal tablets were fabricated using 70 mg $(WS\text{-}g\text{-}PAA)_g$, and their equilibrium swelling degree (Q_e) (g H_2O/g solution) and matrix erosion (ME%) were determined at 37±0,1ºC in lactate buffer solution (pH=5) as a simulated vaginal fluid. The *in vitro* mucoadhesion characteristics of the tablet were tested with ewe vaginal mucosa and the cytotoxicity test of the copolymer $(WS\text{-}g\text{-}PAA)_g$ was carried out on Human Embryonic Kidney(HEK 293T) cell line. To determine the tablet residence time and the structural changes in ewe vagina, tablet formulations, containing 1.5 g $(WS\text{-}g\text{-}PAA)_g$, 0.4 mg magnesium stearate as a lubricant and 2.4 mg a diagnostic dye, Trypan blue, were prepared. Tablets were placed into the vaginal apex of different species of ewes using applicator. Then the physical status (appearance, swelling etc.) of the tablets were observed at 6th and every 24 h until they were disappeared with vaginal speculum

RESULTS AND DISCUSSION

G% of $(WS\text{-}g\text{-}PAA)_g$, ME% and Q_e of the tablet were found to be 24.84 ± 2.0, 57.80 ± 6.83 and 12.22 ± 1.23, respectively. The work of adhesion (WA) (mJ/cm^2) and maximal detachment force (MDF) (N/cm^2) of tablets were found to be 0.599 ± 0.019 and 0.546 ± 0.210, respectively. As a result of the cytotoxicity assay, $(WS\text{-}g\text{-}PAA)_g$ is not shown significant toxicity on HEK 293T cells.
It was observed that the tablets were swollen within a reasonable time, adhered to vaginal mucosa and afterwards became dispersed gel on the mucus layer. Finally, they were cleared out from vagina over a period with vaginal discharge without causing any irritation of the mucosa. The residence time of the tablets in ewe vagina was around 24 h.

CONCLUSION

It was concluded that the tablet formulation prepared with $(WS\text{-}g\text{-}PAA)_g$ has reasonable mucoadhesive characteristics in contact with ewe vaginal mucosa and was more convenient for short-term medical treatment via vaginal route in veterinary medicine

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