ABSTRACTS

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Characterization of Polycaprolactone (PCL) after treatment into ruminant digestive system

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The ruminants represent an important segment of the economy farming world. The peculiar digestive system of these species, characterized by fermentation chambers with high storage capacity of the previous acid and enzyme digestion, allows them to use efficiently foods rich in cellulose, or even the non-protein nitrogen as an aminoacids precursor[1]. These features make the rumen development of drug delivery systems based on polycaprolactone (PCL) a very promising strategy for improving on the productive system, since this polymer in addition to low cost has already been successfully used in other species for drug delivery of drugs, promoters growth and micronutrients[2]. This work aims to characterize PCL front of rumen fermentation.

PCL pellets (Aldrich 181,609) were properly packed in bags of nylon with porosity of 50 µm and placed in the rumen of three fistulated cows for 24 and 216 hours. It was detected adsorption and the incorporation of ruminal substances in to PCL pellets, which was measured by optical microscopy with the help of a graduated eyepiece. The penetration of the ruminal substance made in a layer of 0.22 mm from the external layer to inner pelet in the first 24 hours. With 216 hours of exposure to layer and penetration was extended to 0.76 mm and acquired more intense brown coloration. Samples of PCL untreated, with 24 and 216 hours of rumen treatment and the outer surfaces of the pellet by 216 h were characterized by Termogravimetry (TG), Differential Scanning Calorimetry (DSC) and Fourier Transform Infrared Spectroscopy (FTIR). TG curves showed an increase of mass loss of PCL after exposition into rumen liquids when compared to untreated PCL. As noted in Figure 1, the FTIR results has shown a trend of increased in 1295 cm^{-1} band depending on the time of incubation in the rumen, and this trend is further evaluated only when the outside of pellet of 216h. According Zhao (1999)[3] this band is characteristic of the crystalline PCL, and it indicates an increase of crystallinity of PCL with the exposure time. At 1730 cm^{-1}, it was observed an increase of carbonyl band after treatment, indicating a possible formation of new carbonyl groups in PCL chains after ruminant digestive system exposure. DSC analysis showed an increase of melt enthalpy (ΔH_m) of PCL after treatment, consistent with the results of FTIR. The values of ΔH_m observed were: untreated PCL (ΔH_m = 67.02 J/g); PCL after 216h of treatment (ΔH_m = 68.40 J/g) and external layer after 216h of treatment (ΔH_m = 81.42 J/g), indicating the increase of crystallinity after treatment. In conclusion, the degree of crystallization of the PCL and a level of degradation of PCL chains seems to be influenced by the incorporation of ruminal substance, which can interfere with the pattern of release of any substances embedded in the PCL with the goal of rumen drug delivery.

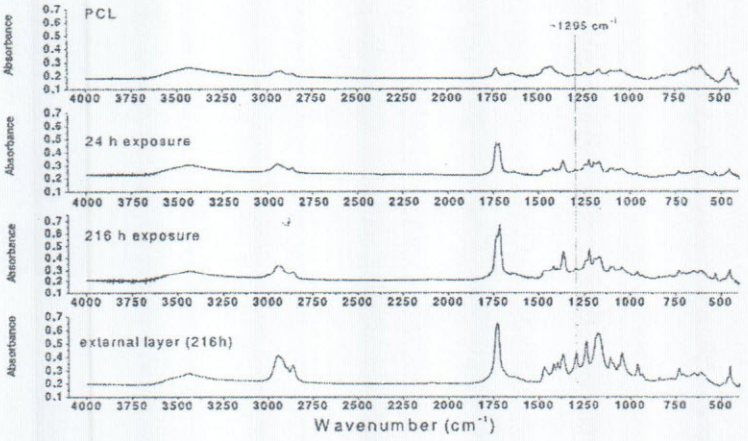

Figure 1- Infrared (FTIR) spectra of untreated PCL, PCL after exposure for 24 and 216h and external layer of PCL after exposure for 216h.

References

[1]Vandamme, F; Ellis, K., J. *Adv. Drug Deliv. Rev.* **2004**, 56, 1415-1436.
[2] Sinha, V. R.; Bansal, K.; Kaushik, R.; Kumria, R.; Trehan, A. *Int. J. Pharm.* **2004**, 278, 1-23.
[3]Zhao, Y.; Keroack, D.; Prud'homme, R. *Macromolecules.* **1999**, 32, 1218-1225.