

## Sorption of veterinary drugs on polymeric surfaces

Susanne Rath (PQ), Sandra D. Bosco (PQ), Fabrício de O. Ferreira (PG), Christopher A. Koyama (IC)

Department of Analytical Chemistry – Institute of Chemistry - Unicamp

### Abstract

In this study a method for the determination of veterinary antiparasitic drugs of the avermectin family (ivermectin, abamectin, doramectin, eprinomectin) and milbemycin (moxidectin) in aqueous solution was developed, using high-performance liquid chromatography coupled to a photodiode array detector (HPLC-PDA). The method was applied to evaluate the sorption of these drugs on surfaces of different materials: polymers, metal and glass. The sorption followed the order: polyethylene frits > polypropylene frits > micronized polyethylene > metal > spherical glass > glass wool.

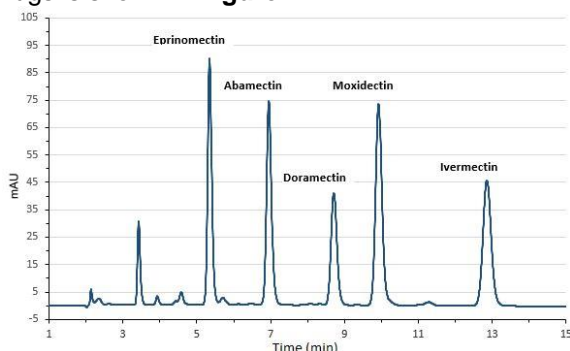
Key words: “*avermectins*”, “*sorption*”, “*polymer*”

### Introduction

Veterinary antiparasitic drugs of the family of avermectin and milbemycin are widely used in Brazilian livestock to ensure animal health and may contaminate water, soils and sediments. Since these drugs have affinity for polymeric materials and glass [1,2], this study aimed to evaluate the magnitude of sorption with the focus on the use of these in processes of effluent decontamination. Therefore, a method for determining these drugs in aqueous solution by HPLC-PDA was developed and sorption studies conducted using different materials, among these polymers, glass and metal.

### Results and Discussion

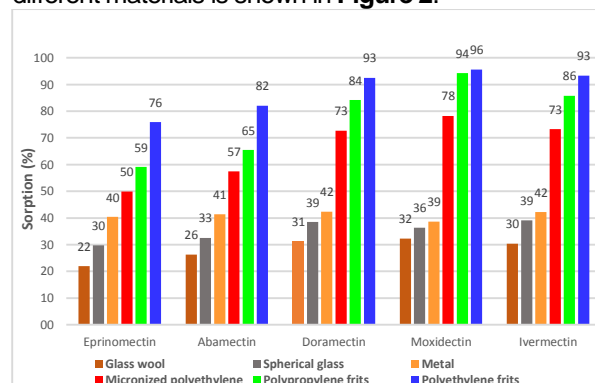
The chromatographic separation of the five drugs is shown in Figure 1.



**Figure 1.** Chromatogram of the separation of the drugs (10  $\mu\text{g mL}^{-1}$ ), HPLC-PDA (Agilent), column X Bridge™ (4.6 x 150 mm x 3.5  $\mu\text{m}$ ) at 40 °C, mobile phase  $\text{H}_2\text{O}:\text{CH}_3\text{CN}$  18:82 (% v/v), flow rate of 0.80  $\text{mL min}^{-1}$ .

The developed method was adequate for the determination of the drugs in aqueous solution and presented the following chromatographic system suitability parameters: resolution among 4.04 to 6.67, asymmetry factor from 1.11 to 1.19 and retention factor among 2.22 to 6.74. The analytical curves were linear in the concentration range from 0.10 to 20.0  $\mu\text{g mL}^{-1}$ , with a linearity higher than 0.99. Among the different procedures tested for the sorption process, the solid phase extraction (SPE) showed the most promising results. The sorption studies were carried out introducing the test

material into empty SPE cartridges. The drugs in aqueous solution (5  $\mu\text{g mL}^{-1}$ ) were percolated on the cartridges and different solvents at the elution step were used. The sorption of the five drugs on the different materials is shown in Figure 2.



**Figure 2.** Sorption of the drugs on different materials.

It was verified that all avermectins, as well as moxidectin presented affinity to the tested materials. The sorption order was: polyethylene frits > polypropylene frits > micronized polyethylene > metal > spherical glass > glass wool. Sorption percentages higher than 76% were obtained using polyethylene.

### Conclusion

The developed HPLC-PDA method was adequate to evaluate the sorption of the antiparasitic drugs on different materials. Polyethylene proved to be a promising material to be used in decontamination processes of aqueous solutions containing avermectins and milbemycins.

### Acknowledgement

To CNPq and FAPESP (2013/09543-7; 2013/25670-9; 2014/16995-4) for the financial support.

<sup>1</sup> K. A. Krogh; T. Soeborg; N. Brodin; B. Halling-Sørensen; Sorption and mobility of ivermectin in different soil. *Journal of Environmental Quality*. 2008, 37 (6), 2202-2211.

<sup>2</sup> V. D. Litskas, X. N. Karamanlis, G. C. Batzias, A. P. Kamarianos. Sorption of the antiparasitic drug eprinomectin in three soils. *Chemosphere*. 2011, 82 (2) 193-198.