



## **Purified extracts from chicory (*Cichorium intybus*) inhibit *Ascaris suum* glutathione-S transferase activity and reduce survival of larvae in vitro**

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*Published in:*  
25th International Conference of the World Association for the Advancement of Veterinary Parasitology

*Publication date:*  
2015

*Document Version*  
Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

*Citation (APA):*  
Williams, A., Pena-Espinoza, M. A., Alstrup Hansen, T., Boas, U., & Milan Thamsborg, S. (2015). Purified extracts from chicory (*Cichorium intybus*) inhibit *Ascaris suum* glutathione-S transferase activity and reduce survival of larvae in vitro. In *25th International Conference of the World Association for the Advancement of Veterinary Parasitology: Abstract Book* (pp. 142-142).

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Tuesday 18 August 2015

### Concurrent Session 4.3

#### C: Novel approaches to chemical and non-chemical control (endo and ecto-parasites)

Ref: O102/0480

##### **Purified extracts from chicory (*Cichorium intybus*) inhibit *Ascaris suum* glutathione-S-transferase activity and reduce survival of larvae *in vitro***

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New feed-based control options for parasitic nematodes are urgently needed due to the threat of drug resistance and consumer demand for organic animal products. Chicory is a nutritious bioactive forage that can be used for grazing outdoor-reared pigs and ruminants, and may have direct anthelmintic effects due to high concentrations of sesquiterpene lactones (SL). Here, we investigated direct anti-parasitic effects of extracts from two chicory cultivars on survival and glutathione-S-transferase (GST) activity of *Ascaris suum*, the most prevalent nematode parasite of pigs.

Fresh chicory leaves (cv. Spadona and Puna II) were collected and extracted with methanol. Extracts were then purified by solid-phase extraction for selective recovery of SL. Resulting SL-extracts were analysed by liquid chromatography-mass spectrometry (LC-MS). *A. suum* third-stage larvae (L3) were produced by *in vitro* hatching of eggs, whilst L4 were collected from the gut of experimentally infected pigs. Larval survival was assessed by motility for up to 36 hours after incubation in two-fold dilutions of SL-extracts. Native GST was obtained by homogenisation of adult *A. suum* and purification using a commercial GST isolation kit. GST activity was assessed by the CNDB assay.

Preliminary LC-MS analyses demonstrated distinct SL profiles between the two cultivars. Incubation with SL-extracts dramatically reduced the *in vitro* survival of both L3 and L4 stages of *A. suum*, however the effect was cultivar-dependent, with cv. Spadona significantly more potent than cv. Puna II. Spadona extract also strongly inhibited the activity of *A. suum* GST, suggesting that the anthelmintic mechanism may involve accumulation of toxic reactive oxygen species within the parasite.

In conclusion, if *in vivo* efficacy can be demonstrated, chicory has potential to be used as an alternative or complementary option to control *A. suum* in outdoor pigs. However, our results suggest that the selection of appropriate cultivars will be important. On-going experiments are further investigating the mechanism of anthelmintic action.