Allergenicity assessment of mealworm proteins used as a novel dietary protein source for dogs

P-08.3-44

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Edible insects, such as the yellow mealworm (*Tenebrio molitor*), have been proposed as a high-quality and sustainable alternative protein source for human and animal consumption. Unfortunately, cross-reactivity and/or co-sensitization of some insect proteins has been demonstrated in house dust mite and seafood allergic people. Since there are insect proteins commercially available in pet feed formulations, allergenic risk assessment is needed to prevent new food allergies. Therefore, the aim of this study was to evaluate the potential cross-reactivity to mealworm proteins in dogs sensitized to storage mites.

Raw and frozen *Tenebrio molitor* larvae were ground and defatted. Proteins were extracted and digested *in vitro* with pepsin, trypsin and α-chymotrypsin. The protein extracts and digests were analysed by SDS–PAGE and immunoblots were performed with canine sera. Two groups of dogs were included in the study: clinically healthy dogs and dogs with clinical signs of allergy. The mealworm proteins were identified by liquid chromatography coupled with tandem mass spectrometry analysis (LC-MS/MS).

IgEs from all tested dog sera strongly cross-reacted with several proteins of 20–30 kDa in the non-digested mealworm acidic extract. IgE binding to proteins between 34 and 55 kDa and to a 14 kDa protein obtained after digestion with enzymes differed between sera from clinically allergic and clinically healthy dogs, but not significantly. The proteomic approach resulted in identification of several mealworm proteins, including some known invertebrate pan-allergens. Among them proteins such as tropomyosin and α-amylase, were previously recognised as IgE-binding cross-reacting allergens in humans. In conclusion, our results suggest that mealworm proteins used as ingredients in dog feed pose a risk to the existing allergic population.