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Evaluation of inherent immunogenicity and allergenicity of camel and cow's milk products – a study using Brown Norway rats

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Background

Cow's milk is the most common cause of food allergy among infants and children. However, it is also an essential source of nutrition when breastfeeding is impossible or insufficient. Alternatives to intact cow's milk products are available such as other mammalian-based milk products or hypoallergenic infant formulas. Camel milk has been suggested as an alternative to cow's milk products as camel milk proteins show a low cross-reactivity to their counterpart cow's milk proteins. Evaluating whether changes in camel milk protein structure caused by enzymatic hydrolysis (EH) or heat treatment (HT) can affect camel milk products as suitable alternatives to cow's milk-based products is of great interest.

Methods

The aim of the study was to compare the inherent immunogenicity, allergenicity and cross-reactivity of different camel and cow's milk products. Brown Norway rats kept on a diet free from milk for more than 10 generations, were immunised i.p. three times with one of six products: camel or cow's milk, EH camel or cow's milk, or HT camel or cow's milk. Different ELISAs were used to assess the inherent immunogenicity, allergenicity as well as cross-reactivity and immunoblotting was performed in order to evaluate the specificity of antibody responses. Allergic reactions were studied by ear swelling test and symptom scoring.

Results

Intact camel and cow's milk displayed similar immunogenicity and allergenicity. EH camel and cow's milk were both shown to be less immunogenic as well as allergenic than their parent product. The same was shown for HT cow's milk, whereas HT camel milk showed a higher immunogenicity and allergenicity. There was low cross-reactivity between intact counterpart proteins of camel and cow's milk, while greater cross-reactivity was shown between EH versions of camel and cow's milk indicating greater cross-reactivity between linear compared to conformational epitopes. The greatest cross-reactivity was seen between serum albumins (SA) from intact camel and cow's milk, a cross-reactivity retained after EH.

Conclusions

Modification of camel and cow's milk affected their immunogenicity and allergenicity in different ways, which indicates differences in protein as well as matrix compositions of camel and cow's milk.