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Sensitising potential of gluten products via intact, damaged and inflamed skin

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Background: Allergic reactions to foods have been reported to occur after the first known ingestion. This might indicate that allergic sensitisation may occur through an alternative route other than the gastrointestinal tract. This phenomenon has, in particular, been observed among children with atopic dermatitis and has led to the hypothesis that allergic sensitisation to food might occur through the skin, potentiated by skin barrier defects and inflammation. Furthermore, there is more evidence that the skin route is important for allergic sensitisation as there have been reports where food derived ingredients in personal care products caused an allergy. For example, various cosmetics and personal care products contain wheat proteins and wheat protein derivatives for their emulsifying and foaming properties. The aim of this study was to establish an Altromin Brown Norway rat model of atopic dermatitis and irritant contact dermatitis to determine whether sensitisation to proteins occurs through the skin, especially during active inflammation.

Methods: Wheat tolerant Brown Norway rats were used to compare the sensitising capacity of proteins through inflamed, slightly damaged and intact non-inflamed skin. The rats were treated with titrated concentrations of the vitamin D-analogue, MC903 and Sodium lauryl sulfate (SLS) topically three times per week for 2 weeks. They were then administered a topical solution of MC903 or SLS mixed with either acid-hydrolysed wheat or PBS for five weeks. Sera and skin samples were analysed and the sensitisation was assessed by in-house wheat-specific IgG1 and IgE assays and skin inflammation was evaluated on skin sections stained with Hematoxylin and Eosin, Periodic acid–Schiff and Toluidine blue.

Results & conclusion: In this study, we observed that topical administration of low-dose SLS and MC903 and wheat treatment was unable to induce inflammation or irritation, though there was a minor degree of hyperkeratosis and hyperplasia and low wheat-specific IgE titers. High doses of SLS and MC903 in addition to wheat proteins induced severe skin inflammation and irritation that appeared histologically similar to atopic- and irritant contact dermatitis in patients. In conclusion, topical administration of high-dose SLS and MC903 induces a clinically relevant experimental model of atopic dermatitis and irritant contact dermatitis in rats and demonstrates that inflamed, irritated skin may be important for allergic sensitisation to food allergens.