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Tolerance to Water Buffalo Milk in a Child with Cow Milk Allergy

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Cow milk allergy is the most common food allergy affecting toddlers with a prevalence of 2-3%.¹ Alternatives include hydrolyzed or elemental cow milk, soy milk, and rice milk. Other mammalian sources, such as goat milk and sheep milk, have shown a high degree of cross-reactivity.^{2, 3} Milk from water buffalo (*Bubalus bubalis*) is a common drinking milk in many developing countries and is the main component of buffalo mozzarella eaten throughout the world. *In vitro* studies demonstrate a similar proteomic make-up and suggest antibody cross-reactivity between cow milk and water buffalo milk proteins.^{4, 5} Similarly, one human study showed a high degree of skin test positivity to water buffalo milk in patients with cow milk allergy.⁶ However, the use of water buffalo milk in these patients has never been further studied. We describe the first report of a child with cow milk allergy who is able to tolerate water buffalo milk.

Our patient is a 3 year old male followed in our program for cow milk allergy. At age 4 months, he developed immediate vomiting after drinking 4 ounces of cow milk formula. He was transitioned to a partially hydrolyzed whey based cow milk formula without any reaction. At 11 months of age, cow milk products were reintroduced into his diet. On this occasion, he developed facial erythema and diffuse urticaria within 30 minutes of ingestion of 8 ounces of cow milk.

He was referred to our allergy program at age 20 months and was found to have a positive skin prick test (5 mm wheal) to cow milk extract (Greer Laboratories, Lenoir, North Carolina) and a negative skin prick test to casein extract (Adamis Pharmaceutical Corp, San Diego, California) in the presence of a negative saline and positive histamine control (6 mm wheal). His total IgE level was 1,440 units/mL with positive allergen-specific Ig E levels (ImmunoCap 250, Phadia AB, Portage, Michigan) to cow milk (4.99 kU/L), casein (2.09 kU/L), and whey proteins alpha-lactalbumin (2.92 kU/L) and beta-lactalbumin (0.78 kU/L).

Repeat skin testing was performed at age 2 years and continued to be positive for cow milk (5 mm wheal). Per parental request, he was skin prick tested to water buffalo milk based yogurt (Woodstock Water Buffalo Company, Woodstock, Vermont), and found to be negative. Subsequently, he passed an open food challenge to water buffalo milk based yogurt. Over the next year, he continued to strictly avoid cow's milk and cow milk containing products. He continued to consume water buffalo milk yogurt and cheese on a regular basis without any reaction.

At 3 years of age, he was seen in follow up, and found to be negative on skin prick testing to cow milk with a reduction in his allergen-specific IgE levels to to cow milk (1.34 kU/L), casein

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(0.71 kU/L), alpha-lactalbumin (0.89 kU/L), and beta-lactalbumin (< 0.35 kU/L). He underwent an open food challenge to cow milk. During this challenge, he developed urticaria within 15 minutes of 15 mL of whole cow milk. The failure of this challenge was indicative of the persistence of his cow milk allergy.

To our knowledge, this is the first reported case of a patient with cow milk allergy who was clinically tolerant of water buffalo milk. Previous *in vitro* and skin prick studies indicate that this scenario is unexpected.^{5, 6} However, the true rate of water buffalo milk allergy in cow milk allergic patients is unknown, since a clinical intervention study has never been performed.

It is also interesting that our patient was able to tolerate partially hydrolyzed whey based cow milk formula. These formulas are not typically recommended as they have been shown to be allergenic in 45% of patients with cow milk allergy.⁷ Our patient had allergen-specific IgE to the whey proteins alpha-lactalbumin and beta-lactalbumin, however these levels were lower than to other cow milk proteins. Therefore, it is possible that our patient is allergic to whey, however the partial hydrolysis has allowed for tolerance.

There exists a case report of a patient with the opposite scenario in that this patient was allergic to water buffalo milk, but was tolerant to cow's milk.⁸ That report, in combination with our patient, suggests that there are allergenic proteins in cow milk that are not contained in water buffalo milk, and vice versa. This implies that other cow milk allergic patients may tolerate water buffalo milk. Further clinical studies are required to determine if water buffalo milk is a suitable alternative for children with cow milk allergy.

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