Bast Fiber and Novel Hydrogel Integration for Sustainable Postpartum Care

Thomas, Joanna (School: Arizona College Prep High School)
Patel, Aarna (School: Arizona College Prep High School)
Bermeo, Reese (School: Arizona College Prep High School)

Postpartum women often use cotton pads with endocrine-disrupting chemicals, risking secondary infertility and solid waste accumulation. Bast fibers require less water to cultivate, biodegrade faster, and are antimicrobial. To evaluate components, tests were done on woven bast fiber pads (with and without witch hazel) and two types of sodium alginate-pectin hydrogel (low/high methoxyl). Absorption speed, capacity, and thermoregulation were measured to assess the efficiency of the biodegradable alternatives. Bast fibers were woven into standard-weight pads, with witch hazel added for certain trials. Alginate-pectin hydrogels were crosslinked by a combined solution of calcium lactate and citric acid. Pads were weighed before and after submersion in fluid to measure absorption capacity. Absorption speed was assessed by timing fluid absorption after pressure was applied. Hydrogels were air dried, powderized, and soaked in fluid for 1 hour with mass measurements before and after submersion. Pad and hydrogel temperatures after refrigeration were measured in standard intervals for temperature tests. Bamboo displayed the highest absorption capacity of 5.83 ml/g, and ramie had the lowest absorption time of 1.39 sec/g, which was statistically significant by a t-interval comparison to other fiber types, and best thermoregulation. High methoxyl pectin hydrogels demonstrated superior thermal retention post-refrigeration and absorbed 13.87 times its weight. These findings support cross-fiber integration for optimal sustainability and function throughout the pad. Ramie can be used for the cooling top layer, high methoxyl pectin for an absorbent core, and bamboo for the absorbent layer. A hydrogel bast fiber pad would decrease waste accumulation in landfills from menstrual products.

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