Innovation of a Semipermeable Membrane with Cellulose Acetate and Keratin from Chicken Feathers (Gallus gallus Domesticus) as Its Base for Initial Testing of a Dialyzer Membrane

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Hemodialysis is a treatment used to clean the blood of patients with kidney failure. The problem with this treatment is that it uses a machine which contains a cellulose-based membrane that is not reusable therefore it's not eco-friendly. This research aims to use keratin from chicken feathers combined with cellulose acetate using malic acid as a crosslinker to strengthen the membrane in many aspects, making the membrane reusable. Keratin was extracted using sodium sulfide as a solvent and ammonium sulfate as the protein precipitator. Keratin was then identified using FTIR through its bonds. The membrane is made using the phase inversion method then tested by testing the quality of the membrane (elasticity, heat and acid resistance, morphology, and flux) and the permeability of the membrane (H+ ions, ammonia, urea, and CaCl2). The elasticity of the membrane with 0% keratin to 5% keratin gradually increases, the more elastic the membrane the harder it is to break. In the body acid-base balance is an important process to maintain homeostasis, and it is proven that the keratin-based membranes can withstand acidic conditions with tests using 2M HCl. The flux of the membrane shows that the 5% keratin membrane can be passed by permeate faster than the 1% keratin membrane. The morphology tested through SEM, shows that the membrane with 0% keratin is most homogenous, and as the percentage of keratin increases the less homogenous it becomes. There are a few aspects that still need to be improved in the future such as the antibacterial properties of keratin in the membrane, the testing of the hemocompatibility of the membrane, the measurement of the pore size, making the keratin into nanoparticles, and finally making the membrane into the hollow-fiber shaped.

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