Comprehensive Analysis of Biomaterial for Medical Implementation

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One of the most notable environmental issues faced today is the growing number of single-use plastics that continually fill landfills. A major source of this plastic is those from medical usage where one surgery can use upwards of 10lbs of single-use plastics. That is the driving purpose of this research investigation: to develop formulas for biodegradable material that possess the required and desired qualities to be used for medical implementation. In this experiment, three polymer sources (corn starch, tapioca starch, and rice starch) were combined with two different plasticizers (polyethylene glycol and glycerol) at different ratios to make for a total of 12 formulas (80 parts polymer to 20 parts glycerol, 60 parts polymer to 40 parts glycerol, 60 parts polymer to 30 parts glycerol and 10 parts PEG, and 60 parts polymer to 35 parts glycerol and 5 parts PEG for each polymer). Upon developing these formulas, all samples underwent tensile testing to determine their tensile strength and elasticity. The two samples exhibiting the greatest statistically significant (p-value 0.05) tensile strength were cornstarch 80: glycerol 20 and rice starch 80: glycerol 20. The sample with the greatest statistically significant (p-value 0.05) elasticity was tapioca starch 80: glycerol 20. Six amino acids were added to the formulas to give the biomaterial an antibacterial quality, and the effectiveness was tested using the Kirby Bauer procedure. 1 gram of amino acid cysteine yielded the largest zone of inhibition.