Personal protective equipment, biodegradable, jute cellulose based

Country of origin | Bangladesh
Primary function | Prevention
Category | Personal protective equipment

Commercial information

List price (USD): $4[1]

Development Stage: The team has developed the prototype and will soon begin trial among medical professionals for user-friendliness, feasibility, and acceptability. The team performed some tests recommended by WHO and other tests in laboratory but need test verification from accredited independent laboratory.[2]

Brand: International Centre for Diarrhoeal Disease Research, Bangladesh and Bangladesh Jute Mill Corporation (BJMC)[1]

Health problem addressed

The current conventional PPE is often single-use. Single-use PPE contributes to unaccounted environmental pollution globally and leads to more manufacturing of PPE that is often non-biodegradable. In well-regulated countries, incineration is commonly used for terminal medical waste management. However, there is oftentimes injudicious PPE disposal into the environment within ill-regulated waste management systems.[2]

Product description

The jute-based cellulose is liquid proof and air proof. Its molecular composition of cellulose can be altered to withstand fluid for various lengths of time. Jute is a native leafy plant that grows in abundance in Bangladesh and South Asia. Jute holds about 72% - 75% cellulose, of which, 50% - 55% could be extracted.[2]

Product details

Lifetime: Single use[1]

Facility Requirements: Specific temperature and/or humidity range[1]

1 Reported by manufacturer on 4 December 2020
2 Reported by manufacturer on 27 January 2021

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WHO ASSESSMENT

WHO specification comparison

At the time of report creation, WHO technical specifications are not available to compare against for this type of technology.

Regulatory assessment

Pre-market assessment	Proceed with caution
Post-market assessment	Proceed with caution
Quality system assessment	Proceed with caution

Significant work is needed on developing robust pre-market regulatory, post-market regulatory, and quality system plans to ensure this prototype will be able to be successfully brought to market. BJMC and icddr,b should develop their medical device support documentation and data.

Technology evidence assessment

Domains	Evidence assessment: Risk/benefit ratio	Evidence assessment: Impact	Innovation
Medical	→	→	
Safety	✕	→	
Economy	→	!	
Organizational	→	!	
Legal	→	!	
Social	✕	→	
Ethical	✕	→	
Green environment	✕	→	💡

This PPE is based on organic material and can be produced in LMICs at low cost and in low resource settings. The environmental protection is not finally clear as there is no information about the use of needed chemicals during the process of preparing the needed substance. The cost per unit is low. The potential impact could be high. There is the need of support to collect the evidence needed and to assure that the process to develop the product is in line with social, ethical, and environmental goals.

Summary

Transferability	→	Technology readiness level	6
Evidence (according to GRADE)	!	Technology evidence assessment	Recommended with caution

Health technology and engineering management

Domains	Appropriateness	Domains	Appropriateness
Durability	!	Ease of maintenance	!
Ease of Use	→	Infrastructure requirements	→
Positive impact on clinical outcomes	!	Local access to sales support	✕
Affordability	→	Local access to technical support	✕
Engineering resources minimization	!	Local access to training	✕
Cultural and social acceptability	→	Local access to spare parts	N/A
Environmental conditions	✕	Local production	✕
Aesthetics	!	Locations of use within target setting	!
Ease of cleaning	✕		

Target setting: Public and home settings

This innovative product is a personal protection gown made of jute cellulose polymers and shellback natural fibrous materials. The inventor stated that the material is biodegradable and non-toxic offering advantages over chemical-based polymer PPE. Several characteristics of the gown need to be established such as protection offered by the product in extreme environmental conditions such as high humidity and high temperature. In addition, the comfort of the wearer using the product over long periods needs to be established. Evidence to support local production needs to be provided. The advantage of protection to the environment after disposal of the product is noted.