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An Approach for Development of Medical Textiles; Safety Issue of Garments (Female) Worker

Md. Rasel[1,*], Sakib Hossain Bhuiyan[2], Md. Shak Sadi[3], Dr. Ishrat Rafique Eshita[4], Rajib Mia[5], Mohammad Tofayel Ahmed[6], Md. Naime Hossain Bhuiyan[1]

[1]Department of Industrial & Production Engineering, Shahjalal University of Science and Technology, Sylhet, Bangladesh
[2]Department of Applied Chemistry and Chemical Engineering, Noakhali Science and Technology University, Noakhali, Bangladesh
[3]School of Textile Science and Engineering, Wuhan Textile University, Wuhan, China
[4]Department of Community Medicine, National Institute of Preventive & Social Medicine, Mohakhali, Dhaka, Bangladesh
[5]Department of Textile Engineering, Southeast University, Dhaka, Bangladesh
[6]Department of Organic Material Science and Engineering, Pusan National University, Busan, Korea

Abstract The Safety for the worker is mandatory to maintain in all the organization. Garments workers are most driving key of industry for the economical success which totally depends on their comfort ability, good environmental and working places. The aim of this study is the investigation of the garments female workers life hood during menstrual periods time and what is the main issues for their adverse life lead during such vital time. Aim of this study is collection their wearable (Jhut) fabrics then investigated fabrics with several chemical and physical tests. Bacterial contamination is one of the drawbacks from TEXTILE materials during contact of skin with material which may cause hazardous problems with nosocomial infection for long time use both work place and home. Avoiding bacterial contamination or infection from surface during the use of under garments by preparing active antibacterial materials is an accurate solution. My target of this study is the development of such textiles fabrics (viscose) with antibacterial surface using chitosan encapsulated iodine treatment of fabric to avoid bacterial attack by chemically surface modification of viscose fabric. Both antimicrobial and anti-oxidative test done against bacterial comparing with standard (ISO 20743-2007, bio-chemical reagent). The developed fabric provided not only good antibacterial, anti-oxidative surface but also signal of may better sweating control, healthier and well-being life of such medical textile wearer.

Keywords Safety, Menstrual periods, Medical textile, Viscose fabric, Contamination, Chitosan, Iodine

1. Introduction

In Bangladesh readymade garments industry are most popular both male and female worker but they are not concern about their health, right & demand of colorful life without managing only food to sustain by fighting with poverty and unhealthy life. From the author practical job experience at different garments industry beside Dhaka and center of Dhaka area it has been observed that, most of the garments industry don't show much concern about the basic safety issue of garments worker. For this reason, many unexpected accidents occur frequently and cause huge losses of both workers and to owners also [1]. RMG Employers prefer female workers for more vulnerable, docile and manageable than male workers. More than 3.2 million Female workers are working in the RMG sector of Bangladesh, which is 80% of total employment of RMG sector [2]. In this study we have investigated garments cutting solid waste which is locally called Jhut [3] from cutting section of the garments those are used by the female workers during their menstrual periods. Not all women will experience noticeable symptoms of infection such as Vaginal itching, Fever, shoulder pain, Pain when urinating or having sex, Vulvar inflammation (redness, swelling, rash) etc. but if the infection is mild, the symptoms might also be very subtle. The exact cause of bacterial as yeast infection is difficult to determine. Therefore, it can be quite difficult to prevent but consciousness is better than prevention where attempt to use a product that can stimulate the growth of good bacteria and protect the vaginal flora from bacterial as yeast invasion. Finally avoiding synthetic, tight clothing especially before and during menstruation, since these garments can promote yeast growth and increase the risk of infections but Some women benefit from good hygienic habits to keep the vagina balanced and healthy. According to the Centers for Disease

* Corresponding author:
raseltex888@gmail.com (Md. Rasel)
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Control (CDC), about 75% of women get at least one yeast infection during their lifetime and 40-45% will have two or more. Women of all ages can get yeast infections because Tampons and sanitary pads used during menstrual cycle are other factors leading to bacterial as yeast infections. [4-8] but Depending on the clinical situation, bacterial infections represent a great risk for the patient, an antibiotic therapy can be life-saving but has adverse effect on patients e.g. toxicity, side effects, and allergy [9, 10]. My aim of study is developed one important sensitive issue which they are neglecting after month by month to their struggle life which is used of textile jhut during their periods time and its final effects to their life but also work production is totally hazardous. I have investigated and collected data from several garments industry to various areas about this issue then attempt to developed cost effective medical textiles for application such materials as under garments to protect infection from bacterial attack which can also be used longer. 'Antibacterial' is an agent that either destroys various bacteria or slows down their growth where antibacterial agents may inhibit bacterial growth; for example, by cell wall damage, inhibition of cell wall synthesis or inhibition of the synthesis of proteins and nucleic acids [11], Whereas our attempt is to coated TEXTILE VISCOE via antibacterial agent that may the most long-lasting solution for this issue. The main achievement of textile fabric development especially depends on their surface functionalization properties. Nowadays Textile materials have larger application not only for conventional dress but also smart applications e.g. both natural cellulosic polymer(cotton) surface modified as antibacterial, antioxidative virus filter etc. properties [12, 13], Protein polymer modified for antibacterial, anti-oxidative etc. [14, 15] and medical textile [16], Regenerative Viscose for gynecologic [17], Bamboo fiber as lignin with a claim for its antimicrobial, UV blocking properties [18, 19] and synthetic polymer such as PCL Electro spun for tissue engineering [20], PEEK for textile solar, aeronautical orthopedic implant etc. [21], PET for UV, antibacterial etc. [22]. On the other hand beside above modified, metals and ceramics and polymeric biomaterials widely used due to their superior physicochemical properties, adequate mechanical properties, low cost, easy processability, and ability to get produced in specific shapes [23-25]. However, nowadays iodine is the most popular antiseptic agents [26, 27] and direct application of iodine onto sensitive skin/mucosa there is still some risk for eczematic reaction but may avoid such reaction due to Nano-encapsulation of iodine [28]. Chitosan is not only antimicrobial but shows good adhesiveness, biodegradability, hydrophilic/moisturizing effect, etc. [29]. chitosan nanoparticles have wider application also such as drug delivery system e.g. for administration in the ocular, nasal, oral, vaginal and colonic routes [30, 31]. Chitosan nanoparticles have been used as formulations for the delivery of DNA and siRNA also [32].

2. Experimental

2.1. Materials

During this work we have been used (Table-5), we have collected viscose fabric from DIRD TEXTILES due to study purpose and then bought iodine, chitosan etc. chemicals from markets.

2.2. Methods

We have prepared samples and checked perfectly with careful. jhut Fabric Collected from various factory then started Fabric test (microscopic, formaldehyde/azo etc. test) for Fabric Quality ensure.

On the other hand, we have stared (en-capsulated) samples preparation 1st of all collected Viscose Fabric then factionalized via chitosan nanoparticle dispersion to the chitosan solution (0.5%). To do Functionalize fabric surface oxidation and non-oxidation done Following wet surface chemistry [33]. Antibacterial and antioxidative surface ensures by testing (ISO 20743-2007) against bacterial and biochemical reagent which is discussed shortly in result parts. On the other hand, AZO test is done following (ISO 14362-1:2012, ISO 14362-3:2012) analyzed by GC-MSD and Formaldehyde (ISO 14184-1:2011).

3. Result & Discussion

3.1. Fabric Contamination Test

Table 1. Report of Azo/Formaldehyde

Contaminants	Requirement	Result	Comment
Azo	30mg/kg	>30mg/kg	Not good for health both direct or not direct skin contact.
Formaldehyde	<75mg/kg	>75mg/kg	
	<300mg/kg	>300mg/kg	

During this study at different textile industries we have found a lot of buyer requirement for various finished fabrics but never found bacterial /microbial free etc. fabrics to their order sheets but I had query to ensure about their present to products. Finally, during my study, we have collected jute fabrics which also used garments worker during their problems and obtained on the basis of microscopic appearance of the microorganism, Microbial quality of the samples has been determined also. On the other hand, formaldehyde, azo etc. also present to the most of the jute garments which we found by test which are excessive than acceptable range collected from Multinational testing lab but those contaminations may create infection or hazardous health problem such as eczema, skin problems etc.

Obtained test reports states that direct contact with skin or not direct skin such materials are hazardous for our garments or health because unfriendly and unhealthy to wear.

From various contaminant we have tested 2 only but those are present most of garments both local and export where

export quality goods are may tolerable according to buyer demand but not for all the buyers.

Table 2. Data of contamination

Contaminants	Local garments	Export garments	Remark
Formaldehyde present	99%	99%	Can cause Hazardous health problems e.g. skin and other body parts problem.
Azo present etc.	10-15%	5-7%	

Table 3. Contamination present in textiles

Microscopic test	Microbial quality (Present)	Effect	Materials source
aerobic heterotrophic	bacterial count (TVBC)	May be introduce Infection or skin disease etc.	Textile finished materials or Jute fabrics from garments.
coliform,	total coliform count (TCC)		
fecal coliform	total fecal coliform count (TFCC)		
staphylococcus aureus	total staphylococcus count (TSC),		
Fungi etc.	total Shigella-salmonell ae and total fungi count (TFC)		

Most of contaminants are not good for health which may not much bring happiness after wearing such goods both man and women.

3.2. Data Collection from the Industry

We have collected data face to face questioner from each and every sewing line of garments workers and several areas then converted collection *data* to percentages where workers have been used as cut of piece called jute fabric to garments. Salary structure is mainly liable for used such unhealthy goods or waste also finding.

Table 4. Data of jhut user

SL	Factory	Location	Used Materials	Comments	Rest% Used
1	Local	Dhaka, Gazipur and Savar Area	Jhut	95%	Low cost goods but not healthier
2				88%	
3	Export				
4					
5	Mini Local			97%	

Near about 93% female workers do not use healthier protective products we have found during our short study to several areas according to some local to export standard industry.

3.3. Antibacterial and Anti-oxidative Surface

We have prepared samples (Chitosan-iodine coated) by enhancing adsorption properties producing negatively charge Carboxyl group onto viscose fabric. Finally, with or without oxidization viscose fabric was dissolve into the chitosan solution of 0.5% to attached or coated with encapsulated Chitosan-iodine on surface of viscose fabric, chitosan nanoparticles act as a reservoir for iodine avoiding extensive irritation by longer periods of use but due to its proliferative and moisturizing effect on skin/mucosa, it acts in a friendly and nonirritating manner whereas there is no negative chitosan–iodine interference, since chitosan does not block iodine antimicrobial activity and acts as a suitable iodine vehicle (et. al). Antioxidative properties introduced also to the surface of materials during this treatment where viscose (non-oxidative) treated with iodine is excellently antioxidant active, the reference viscose treated with chitosan particles in combination with iodine shows very poor antioxidative such antioxidative properties may also contribute to the anti-inflammatory effect [31]. After 25-30min treated samples are ready to ensure antibacterial surface activities and finally antibacterial and antioxidative testing was performed against bacterial. Antibacterial activity was checked against Staphylococcus aureus and Escherichia coli strains and results revealed that prepared surfaces were more effective against E. coli than S. aureus especially followed (ISO 20743-2007) procedure [34], but Anti-oxidative activity was determined using a biochemical reagent (ABTS).

Table 5. Result of the work

SN	Materials	Technique	Produced:
1	Chitosan	Modification surface via surface chemistry by developing adsorption properties and encapsulate.	Introduced Antibacterial and antioxidative surface compare with standard.
2	HCL, water		
3	TPP		
4	Iodine		
5	Viscose fabric etc.		

4. Conclusions

We have gained antibacterial textile after surface modification of Regenerated viscose fabric to use as under garments which may both healthier and eco-friendly to the wearer. It may make happy to female to use such vital bioactive antibacterial textile to their sensitive skin or body during menstrual periods. But cost effective is the burning issue to all sections of peoples to catch it eagerly also. Another query is proliferation or activeness of antibacterial coating onto material during contact of skin is longer without any adverse effects as chitosan blocke iodine co-polymer by encapsulated. Finally, we can say most of textiles are contaminated by bacterial etc. and they should avoid this jhut fabric for safe from adverse problems. So, we will try to figure out the beneficial economical of Multifunctional e.g. UV protective, Antibacterial etc. functionalized textile materials production with cost effective eco-friendly surface treatment compare to conventional textiles.

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