

## “DESIGN AND PRODUCTION WOVEN FABRICS USED IN SURGICAL ROOMS”

Metwaly, F., A., Ibrahim, G., E., & Abdel-Tawab, H., K.,  
Science & Arts 2008

### Abstract

#### **-Operating room woven apparel**

Normal operating room apparel comprises a scrub suit, consisting of trousers and short sleeved tunic, or a dress; which is clean but normally sterile and will normally be worn all day. Woven cotton has the advantages of being easy to launder and sterilize and relatively comfortable to wear, all fabric used for operation – room apparel must have antistatic properties.

#### **-Nurse’s apparel**

Nurse’s apparel is made of conventional fabrics since no specific requirement is needed other than comfort and durability. These fabrics consist of tissue reinforced with a polyester or polypropylene spun- laid web.

#### **-durable Gowns**

Woven cotton fabrics are traditionally used in some surgical gowns because cotton does not produce static electrical charges that can build up and produce electric sparks, however it may release particles from the surgeon and also generate high levels of dust. The general requirements for surgical gowns include liquid repellency, bacterial barrier properties, and flame resistance, static safety and toxicity . The fabrics should also be sufficiently flexible, adequate strength, tear resistance and comfort

#### **- Drapes**

Drapes are used in the operating room to cover patients and the area around him to reduce the risk of the wound becoming contaminated. Drapes are made from woven cotton or linen, and usually supplied cut to a variety of different shapes appropriate to different surgical procedures and contain an opening according to the position of the surgical site. The general requirements for surgical drapes include liquid repellency, bacterial barrier, conformability, tactile softness, strength, lint propensity , abrasion resistance, flame resistance, static safety and non toxicity .

#### **- Bedding**

The bedding is used in the sence of body whose breath is large in comparison with its thickness, the flexible web may be woven or laid down as a nonwoven fabric. It is preferred that the web be permeable to aid the deposition besides that it can allow access of air to the encased limb . The web most preferably has a porous structure and in the case of woven or non- woven fabrics, the porosity of the web may be conditioned by the method of manufacture, so that this particular characteristic may be predetermined to insulate the burned tissues of the patient form being exposed to air and become contaminated.

### -Surgical swabs

A swab is an absorbent textile pad used in general surgery to prepare the site of the operation, to absorb excess blood and body fluids, to pack body cavities during surgery and to clean the incision prior to suturing. The traditional swab which is made of cotton gauze suffers from disadvantages despite its widespread use. The advantages of traditional swabs, in particular are their high absorbency and non linting properties

### -Surgical towels

Towel must have high absorptive capacity and excellent drying ability with minimum of moisture strike through. Surgeon may have from about 15 to about 30 grams, of water remaining on his hands and arms after the scrubbing operation, this towel has an absorptive capacity of about 4 to about 7 grams of water and weights. The towel must be demonstrating excellent abrasion resistance, strength, sturdiness and at the same time it must be soft

### The experimental Work

This research concerns with producing fabrics suitable for surgical rooms. All samples in the research were produced with cotton yarns using three woven structures ( plain weave 1/1, regular hopsack 3/3 and mock leno). Three weft sets were also used (22,26 and 30 pick /cm), using two different yarns counts (30/1 and 40/1 English)

### Finishing treatment

The produced fabrics were undergoing special treatments before being used. These treatments include coating with Tinosan cell as following.

The fabric samples were padded in an aqueous solution containing 0 %, 5%, 10 % and 15% Tinosan cell which is nonionic wet ability substance (ejetol) and then squeezed to a wet pick up 100 %. The fabric samples were dried at 40 0 C for 20 min, then thermo-fixed at 110 0 C for 20 sec.

In this study, antibacterial finishes was applied to the samples. All samples were treated with Tinosan cell with various concentrations, 0 %, 5 %, 10 % and 15 % concentration. Antibacterial finishes were applied to fabrics to prevent the growth of microorganisms exposed to the fabrics during surgical operations.

### Results and Discussion

Results of experimental tests carried out on the produced samples were statistically analyzed and presented in the following tables and graphs.

#### Antibacterial test

Samples were treated with Tinosan cell at concentration 0 %, 5%, 10 % and 15 %, it can be seen from tables that there is a direct relationship between Tinosan cell concentrations and antibacterial effect. it could be stated that the efficiency of the antibacterial finish is not affected by the repellent finish, but the effectiveness of the repellent finish varies with the add-on level of the antibacterial finish.

1- Treatment of fabrics with Tinosan led to improvement in properties of the anti-microbes.

2- It was found that treatment of the fabrics with cellulose-based substance with Tinosan cell provided good microbe resistance and it increases with the increase in concentration. Concentration of 15% of Tinosan cell has recorded the highest resistance rate against microbe.

#### Air permeability test

It is clear from the diagrams that regular hopsack 3/3 has obtained the highest rates of air permeability, whereas plain weave 1/1 has obtained the lowest rates, and this is for sake of the increase in the pores for the fabrics produced to hopsack 3/3 weave , lead to produced fabric to be less compacted cause increasing of air spaces in the fabric, causing the increase in the air permeability.

It is also obvious from the statistical analysis of the air permeability results that there is an inverse relationship between number of picks per cm and air permeability. I can report that the increasing in ends and picks cause an obstruction in air passage, causing decreasing in air permeability.

From tables and figures it can be noticed that there is an inverse relationship between tinosan concentrations and air permeability. Where it could be reported that the increase in concentration causes a decrease in fabrics pores (blocking of the surface) and so the fabrics become more compacted, and thus decrease in fabric air permeability.

#### Water permeability test

It is obvious from the diagrams, that plain weave 1/1 has recorded the lowest rates of water permeability, whereas regular hopsack 3/3 has recorded the highest rates. I can report that this is because plain weave 1/1 has more intersections than regular hopsack 3/3 and mock leno, leading the fabric to be more compacted, and spaces in the fabric to be decreased causing decreasing in water permeability.

It is also clear from the diagrams that there is an inverse relationship between number of picks per cm and water permeability. This is for sake of that the increase in number of ends and picks, cause fabrics to be compacted and so prevent the passage of water.

We can also notice that samples made of 30/1 English have obtained the lowest rates of water permeability, whereas samples made of 40/1 English have obtained the highest rates.

This is probably due to that the more diameters the yarns get the less porosity the fabric become and this is because of the increasing of the cover factor

From tables and figures, it can be seen that there is an inverse relationship between tinosan concentrations and water permeability. Where it could be reported that the porosity of the samples has been occluded by the tinosan and so water was prevented from passing.

#### Fabric handle test

In fabric handle test , the less angle value ,the more smoother the fabric become .According to this ,it is clear from the diagrams that regular hopsack 3/3 is considered the most smooth fabrics among all woven fabrics followed by mock leno , and then plain weave 1/1.This is probably because regular hopsack weave have the advantage of containing long floats and less intersections besides that it has ridges and hollows and so reduce the friction between the body and fabrics, besides that the warp and weft threads float freely on both sides, so that frication points between the tested fabrics and the standard woolen fabric ,used in the test are minimized allowing easily sliding of fabric down the slope. After antibacterial treatment the fabrics smoothness is less because the treatment made in alkali and high temperature, these factors cause decrease in fabric smoothness.