Finding a New Standard for Rolled Cotton in North American Paintings Conservation

Abstract

When Johnson & Johnson discontinued the production of the 6026 Red Cross Cotton Roll in 2004, many in the paintings conservation community were at a loss. An informal survey on several cotton brands was taken by the National Gallery in Washington, D.C. and distributed on the Conservation DistList and in the *WAAC Newsletter* after this product was discontinued. This cotton product was a preferred cotton for surface cleaning and varnish removal, famous for its sterile quality, long fibers, and handling properties. Paintings conservators have been searching for a suitable replacement, even to the present day.

This research project compared those characteristics that had made Johnson & Johnson's 6026 Red Cross Cotton useful in the conservation community. A small amount of this remaining cotton was compared against selected cottons, chosen from art conservation suppliers and a local drug store brand, to determine their effectiveness in painting conservation. Also tested was a sample of cotton from Robinson Healthcare of Chesterfield in the United Kingdom that had similar properties to the Johnson & Johnson cotton.

The Samples

A summary of the cotton samples, including where and when they were purchased, is found in Table 1.

Sample 1 is a non-sterile cotton and its fiber length is shorter than the requirements for purified cotton, a system of organizing cotton quality standards. This cotton is in use at the Queen's University art conservation painting's laboratory.

Sample 2 was manufactured in Montreal, Quebec by Mansfield Medical Distributers Ltd, www.mansfieldmedical.com.

Sample 3 is a non-sterile grade cotton manufactured for CCS. It is labeled to have long fibers but not to be used for wound-care or personal hygiene.

Sample 4 is non-sterile and is the premium cotton sold by Talas. The cotton is lump free and of high USP grade quality.

Sample 5 is 100% pure non-woven compressed cotton in pad form. The pads are 8 x 4 inches and folded in half and sold in packs of 100 pads. This particular sample was found in the Queen's University art conservation painting's laboratory cotton supply drawer.

Sample 6 is a sterile, 16oz. cotton, which was discontinued in 2004.

Sample 7 is a high quality, long fiber, and absorbent cotton wool manufactured and distributed in the United Kingdom. This cotton brand was well known among conservators in the UK (much in the same way as the J & J cotton was). Although the product still exists, its manufacturing has changed.

Experimental

Each sample was characterized by the following tests.

Fiber Identification: using microscopy (normal illumination and polarized light) and Fourier transform infrared (FTIR) spectroscopy.

	Cotton Samples	Supplier	Purchase Date
1	Practical Cotton brand	Talas Brooklyn, NY	January 2009
2	Mansfield Absorbent Roll 100%, Code: Roll 1	Lovell Drug Store Kingston, Ontario	November 2011
3	Conservation Support Systems (CSS) brand	CSS Santa Barbara, California	November 2011
4	PADCO	Talas Brooklyn, NY	January 2012
5	Webril Handi-Pads	Carr McLean Canada	September 2009
6	Johnson & Johnson 6026 Red Cross Cotton	Johnson & Johnson	Approx. earliest date c. 2001
7	Best No. 6, 20850	Robinson Healthcare Chesterfield, UK	c 1998

Fiber characteristics: including texture, tear ability, trash and nep content (debris and entangled cotton fibers), colorimetery using the CIELAB L*a*b* System (focusing on L* and b* measurements), and the length and length uniformity of cotton fibers.

Metallic contamination testing: using inductively coupled plasma optical emission instrument (ICP-OES, also known as ICP-AES) to detect the presence of 30 metals (detects trace amounts in parts per billion).

Absorbency: by testing seven swabs from each sample for their ability to absorb distilled water. Swabs were weighed using an analytical balance before absorption, rolled onto a bamboo stick, dipped in distilled water, then rolled five times on a lab grade paper towel to remove excess water, then weighed after absorption using an analytical balance. Residual water left on the balance after the wet swab was removed was also weighed.

Usability: by using the swabs and mineral spirits to remove varnish from painted surfaces. Each cotton sample was tested five separate times on two different canvases (one textured and one smooth) to determine the varnish removal capabilities and determine the number of cotton fibers left behind on the painting's surface. Test canvases were pre-primed commercial canvases painted with Golden carbon black acrylic paint and spray varnished with Liquitex Soluvar® Gloss Varnish in mineral spirits (30%). Varnish removal was performed with pre-weighed swabs and mineral spirits. Before applying to the canvas, each swab was rolled three times on a lab grade paper towel to remove excess solvent. Each of the ten tests was limited to a canvas area of 1.5 square inches.

Results

All of the samples were cotton, containing a mixture of both mature and immature cotton fibers. Each sample also contained trace amounts of metals found in nature, had similar absorbencies, and all had a high visible nep content. They also had similar color brightness and showed loose fibers on swabs during varnish removal.

Samples 1 and **4** performed similarly in all tests, with middle ratings, for example for leaving fibers behind during usability testing. The samples had a long average fiber length. The fibers on Sample 1 became easily unadjusted when removing excess solvent. This is something that conservators do during use, and this was the only sample tested that was more prone to this occurring. Also, Sample 4 was very dense and smooth, but not soft.

Samples 1 and 4 are acceptable cottons for conservation use. Depending on conservation preferences, having a stiffer cotton might be appropriate for varnish removal, as opposed to surface cleaning.

Sample 2 had the most consistent and visible trash content. It was also the most coarse and dense cotton; however, it was still able to roll well on the surface and left behind few fibers, despite having the shortest average fiber size. The sample also had the highest rates of metallic contamination but in trace amounts.

This cotton is therefore not recommended for regular conservation use. In a situation where cotton is needed quickly, such as working onsite or when no other cotton is available, this type of cotton will suffice.

Not all drug store cottons are created equal. When purchasing a roll, the best advice is to open the cotton, unroll it several times and then look for visible trash, feel the texture for harshness or smoothness, and try tearing the cotton. If tearing requires much effort, the cotton will not work well in the conservation studio.

Sample 3 handled very well. It was soft, easy to tear and make into swabs, and the swab kept together; however, the sample did leave behind the second most number of fibers during use, with its fibers lodged in the tape border. The sample did have average results in fiber length.

This cotton sample should be tested for varnish removal on a larger area than the 1.5 inches squared.

The most promising was **Sample 5**, which handled very well. The sample left behind the least amount of fibers. This test alone is the most important for many conservators. No one wants to sit for hours and remove cotton fibers from a painting with tweezers (cringe!). Sample 5 had a middle absorbency rate, but the rates for all samples were similar. The sample was soft, compacted, and rolled easily.

The downside to this sample was that the compacted edge from the pad form had to be removed to get the inner cotton fibers. This sample is also available in wipe form, which might not involve so much tearing of the compacted edges.

Sample 6, the Johnson & Johnson 6026 Red Cross cotton roll, did not fare as well as expected, as it left behind the most fibers during varnish removal. The sample also had the second lowest absorbency, and had one of the shortest average fiber lengths. The sample that was tested was older (c. 2001) and was visually clumpy, which may have added to its low performance. One feature to note about Sample 6 was that during swab making, it was easy to add onto the existing cotton swab with more cotton. The two separate cotton pieces melded very well together, which can be very difficult for most cottons.

Sample 7, the Robinson Healthcare of Chesterfield Code No. 20161, fared better than Sample 6. This particular sample, although older (c.1998) was kept intact on its roll until it was donated for testing, which may explain the better physical state of the sample before undergoing testing.

The cotton had the longest average fiber length and handled well, making swabs easily. It is unfortunate that this brand is no longer available at this level of quality.

Conclusion

No one test can ascertain the best quality cotton for use in paintings conservation. This is why each cotton sample was put through several tests, which were a balance of qualitative and quantitative testing. The usability testing was very important, but led to conflicting information. The sample that left the fewest fibers behind was the coarsest and hardest to tear, factors that would potentially keep a conservator from purchasing this product.

The Webril Handi-Pads was determined the best sample of those tested. All of these products are susceptible to future manufacturing changes so it is important for us to keep the dialog open on cotton brands used in conservation. Both anti-microbial testing and sterility (a quality important for medical use) are possible areas of research for future testing, in addition to the wipe form of Webril Handi-Pads.

Acknowledgements

Larry Shutts, Associate and Head Paintings Conservator, Atlanta Art Conservation Center, Atlanta, Georgia
Alan Phenix, Conservation Scientist, Getty Conservation Institute, Los Angeles, California
Dr. Alison Murray, Associate Professor of Conservation Science, Queen's University, Kingston, Ontario
Dr. H.F. (Gus) Shurvell, Professor Emeritus of Chemistry, Queen's University, Kingston, Ontario
Lyndsay Hull, Lab Technician and Overseer for the Analytical Instrument Room, Chemistry Department, Queen's University, Kingston, Ontario
Barbara Klempan, Associate Conservator of Paintings Conservation at Queen's University, Kingston, Ontario
Dr. Allison Rutter, Director and Adjunct Assistant Professor, Analytical Services Unit (ASU), Queen's University, Kingston, Ontario
Mary Andrews, Senior Research Assistant, ASU, Queen's University, Kingston, Ontario
Dr. Graham Cairns, Research Associate, ASU, Queen's University, Kingston, Ontario
Rustin Levenson, Head Conservator, Rustin Levenson Art Conservation Associates, Miami, Florida
Debra Daly Hartin, Paintings Conservator, Canadian Conservation Institute (CCI), Ottawa, Ontario
Wendy Baker, Paintings Conservator, CCI, Ottawa, Ontario
American Institute for Conservation of Historic and Artistic Works (AIC) Specialty Group Paintings Listserv.

To read this research project, contact the Canadian Conservation Institute. Also, this research was presented in poster form at the ANAGPIC 2012 student conference in New York City, New York and at the Canadian Association of Conservation annual meeting in Peterborough, Ontario May 24-26, 2012.