

TOP 13 REASONS WHY WE DON'T USE LEATHER DRESSINGS AT THE ALASKA STATE MUSEUM

By Ellen Carrlee, Conservator

1. FATTY SPEW (or “spue”) is the name given to white bloom or haze on the surface of the leather. When analyzed, this moldy-looking white or yellow substance is usually made of saturated fatty acids like stearates and oleates that come from the chemical breakdown of animal products like Neatsfoot oil. This is illustrated in Tlingit hide armor that was dressed by professionals at the National Parks Service in the late 1960s. The appearance was fine until the 1990s, when snowflake-like white spew appeared all over the surface. This occurred in spite of appropriate environmental conditions.



← While dressing leather was a widely accepted museum practice in the 1960s and 70s, results like this made museums reconsider.

→ Detail of snowflake-like fatty spew on the surface of hide armor treated with leather dressing.



2. MOLD and other biological deterioration such as bacterial activity and fungi feed on animal fats in many dressings. Remember that mold thrives in conditions of over 70% humidity and 70°F. If dressing traps too much moisture in the leather, mold will be a problem.



← Not only does fatty spew sometimes look like mold, leather dressing can also promote mold growth. The interior of this kayak has various problems related to repeated oiling with Wesson cooking oil in the 1960s and there is concern some of these substances may be mold.

3. STICKINESS can result from dressing when oils migrate to the surface as a gummy goo. This can cause damage to nearby artifacts as well as attract dirt and dust that is difficult to remove. One Alaska museum was given advice in the late 1960s to apply Wesson oil to a baidarka as part of regular maintenance. More than forty years later, the skin boat suffers strange-colored sticky patches, crusts, and a rancid odor.

→ Sticky exterior of a kayak treated with Wesson oil in the 1960s.



4. STAINING and darkening of light-colored leathers:— for some kinds of deterioration, like red rot, dressing will not solve the problem and will make the areas even darker.



← Museum conservators often suspect leather dressings or oils have been applied when gutskin appears very dark and brittle.

5. PUSHING DIRT DEEPER: Leather is an irregular tangle of collagen fibers, similar to unwoven fabrics like felt. Typically it is quite porous and absorbent. Dressings are sometimes promoted as cleaners as well as humectants, and they will often remove some surface dirt,

but some of the dirt is also driven further down into the leather because it is so absorbent.

6. CONTAMINATION of the leather with substances that could interfere with future scientific analysis. What if a researcher wants to analyze historical use? Many leather dressings are proprietary materials, meaning the manufacturer keeps the ingredients a trade secret. These sometimes include dyes, abrasives, silicone and other undesirable materials.

7. HARD TO REMOVE substances may be included in leather dressings that can limit your future treatment options. The worst are products containing silicone. Once you use silicone, it will not come out, and most other materials will not stick to it, making future repairs very difficult. Even relatively pure leather dressings are difficult to remove.

8. DAMAGE to nearby materials, especially corrosion on metals is seen most commonly as the crusty green corrosion on brass, bronze, and copper hardware or decoration. Staining and weakening of paper from dressing wicking out of books is also a serious problem.



← Green corrosion is often seen when copper alloys touch leather due to oils in the leather. This reaction is exacerbated by leather dressings.

9. DRY and STIFF leather often results from heavy-handed dressing. How could that be? Oils and fats alone do not make the leather more flexible. Water is part of the process as well. If the oil or fat is more than about 3% of the weight of the leather that is oily, water is repelled and cannot help do the job. This causes the leather to dry out. If excess moisture is trapped, it may cause the fibers to rot. Determining how much oil is already in the leather requires scientific analysis.

10. SWELLING and deformation the leather can damage surface finishes or paint. On the microscopic level, swelling can weaken the aged collagen fibers.

→ This model kayak, ASM III-O-908, had been extensively restored before it came into the ASM collection. It was signed by attendees of an 1898 meeting at the Healy Hotel near St. Michael's, establishing new trade routes to the Bering Sea and up the Yukon River for the North American Transportation and Trading Company. Heavy handed treatment interventions and fatty spew obscure many of the nearly 70 signatures.



11. OXIDATION that breaks down the fats and oils can also cause damage to the collagen fibers of the leather. The Alaska State Museum has various jars of dressing going back more than 30 years. Some of those jars of dressing look disgusting on the shelf, prompting unpleasant thoughts of what these substances are doing in artifacts.



← Science experiment in my conservation laboratory cupboard. Many dressings look lousy in the jar after 30 years.

12. POOR TRACK RECORD:

In many cases, long-term preservation has been compromised for short-term gain of temporary flexibility.

→ Records for a model kayaker indicate his gutskin parka was treated repeatedly in the 1970s and 80s. A 1986 record states the gut is stiff, but not torn. Now the skin is torn.



13. MUSEUM OBJECTIVES for the care of leather differ from requirements of active use in daily life. The proper household maintenance techniques for car upholstery, baseball gloves, horse tack, and the fancy shoes in your closet are developed with the useful lifespan of a utilitarian possession in mind. Museums have a different goal: let's preserve this artifact for 500 years or longer in a condition as close as possible to its unadulterated original condition.

Does this mean no one in heritage preservation ever uses leather dressings or lubricants on collections anymore? The use today is very limited. There is generally consensus that leather dressings are only useful when repeated flexibility is required, such as the opening and closing of a book. Therefore, the most frequent use of dressings today is for old leather-bound books in library collections. For ethnographic collections, most conservators avoid the use of lubricants or dressings unless there is a specific artifact that is deformed, needs reshaping for treatment, and humidification alone is not enough. If treated, the kind of tannage, the deterioration of the leather, and the history of previous dressings must be taken into account before the type and amount of dressing is selected. For historical artifacts, there has been a strong shift away from dressings after aggressive attempts in the 1960s and 70s to identify the perfect recipe of ingredients. In general, conservators were discouraged to see the untreated artifacts fare better than the treated ones, and some of the treated ones suffer serious problems as described on the list above. In a proper museum environment, leather that was in good condition didn't need dressing, and leather that was already deteriorated seemed not to benefit. Commercial products are not used on museum artifacts unless all the ingredients are known and the conservator understands how each ingredient interacts chemically with the specific kind of tannage and treatment the leather has undergone. Sound complicated? It is.

Consider the minimum accepted practice in the AIC Code of Ethics regarding conservation treatment material and methods:

"Materials chosen must be chemically and physically compatible with the cultural property; distinguishable from the materials of the cultural property; removable with the least damage to the cultural property when removing the material becomes necessary; the most chemically and physically stable of those appropriate; and should not preclude retreatment or future analysis of the cultural property."

In general, leather dressings fail to meet those criteria, and as such are not part of the treatment protocols currently used or recommended by the Alaska State Museum.

Bibliography:

Allardt O'Donnell, Alexandra. 1997. "No Object is Frozen in Time: Revisiting Traditional and Nontraditional Leather Treatments as a Collaborative Effort" Object Specialty Group Postprints: Vol. 5. AIC. Washington, DC. pp. 142-151.

Bourgeat, P. and N. Bourgeat. 1976. "Lipids in ovine skins." Technicuir. Vol 10. No 2. February 1976. Pp 14-23.

AATA Abstract: The present study was carried out with several aims in view: to test the efficiency of degreasing in relation to the main states of skin preservation; to ascertain the evolution of the waste grease fraction and deduce the changes it can eventually undergo; to ascertain with the help of ageing cycles whether the non-extracted grease and fat continue to decompose and take part in the forming of fatty spues at the finished leather stage. The results show, among other things, the overwhelming influence of means of preservation and show that even before storage, skins often contain all the elements conducive to fatty spues.

Calnan, Christopher and Betty Haines. 1991. Leather: Its Composition and Changes with Time. Leather Conservation Centre. Northampton, United Kingdom.

BCIN Abstract: *Presents the proceedings of the first conference held by the UK Leather Conservation Centre in August 1986 at Nere College, Northampton, England. The papers provide a comprehensive scientific background on the structures, properties and preparation of leather as well as some insight into the forms of deterioration which leathers undergo. Includes skin structure and leather properties; the structure of collagen; the principles of*

tanning; leather processing from the mediaeval to the present time; vegetable tanning; mineral, alum, aldehyde and oil tannage; lubricants; surface coatings and finishes; ageing of vegetable tanned leather in response to various climatic conditions; taxidermy treatments and their effect upon tensile properties of skin; some aspects of the photochemistry of fibrous protein; natural ageing of leather in libraries; acidic deterioration of vegetable tanned leather; and deterioration under accelerated acidic ageing conditions.

Chahine, Claire, Léon-Bavi Vilmont, and Christine Rottier. 1989. "La Lubrification: Comportement Physico-Chimique du Cuir = Dressing: the Physicochemical Composition of Leather." ICOM Working Group, Leathercraft and Related Objects. Internationale Leder- und Pergamenttagung = International leather and parchment symposium, May 8-12, 1989. Deutsches Ledermuseum; Deutsches Schuhmuseum. Offenbach am Main. Germany. pp. 26-42

BCIN Abstract: Reports on tests of 13 different leather dressings, three of the solution type (oils, fats, and/or waxes dissolved in a white spirit, hexane, or another solvent) and 10 of the emulsion type (these substances emulsified in water) that were applied on tanned calf leather that had been artificially aged (105°C, three weeks) and degreased using dichloromethane. To evaluate the effect of the dressings, tensile strength, stretch to break, tearing resistance, flexibility, water content, pH, content of volatile and water-soluble compounds, etc., were checked. In conclusion, a slight superiority of some emulsion dressings was found, e.g., of the modified Netherland formula: neat's-foot oil, lanolin, and a nonionic emulsifier called Arcopal in 89 per thousand water.

Daniels, Vincent. 1991. "Leather Dressing at the BM." Conservation News. United Kingdom Institute for Conservation of Historic and Artistic Works. Vol 44. Pp. 31-33

BCIN Abstract: A report on content and availability of leather dressings bearing the name of the British Museum, or made to a similar formula.

Dephilipps, Henry A. and Michele L. Mader. 1995. "Identification of Spue on Leather-Bound Library Books in the Watkinson Library of Trinity College, Hartford, Connecticut." Leather Conservation News. Vol 11. No 1-2. pp. 8-10.

AATA Abstract: A white creamy material was collected from several volumes of leather bound books in Trinity College's Watkinson Library and analyzed by Fourier Transform Infrared Spectroscopy (FTIR), Mass Spectroscopy (MS), and Liquid Chromatography (LGC). The spue was identified as a mixture of palmitic and stearic acids.

Dumka, Heather. 1991. "The Conservation Treatment of Three Gutskin Parkas." Journal of the International Institute for Conservation, Canadian Group. Vol. 16. pp. 17-22.

AATA Abstract: Describes the conservation of three Alaskan gutskin parkas. One of the parkas was washed and all three parkas were reshaped by temporarily relaxing the gut with water. Two of the parkas had tears and were repaired using patches made from natural hog sausage casings. Although dry gut can be quite brittle, the addition of a lubricant or humectant would change the nature of the parkas which were never supple. Storage containers were made for their safekeeping and handling.

Haines, Betty M. 2002. Surface Coatings for Binding Leathers. Leather Conservation Centre. Northampton. United Kingdom

BCIN Abstract: The monograph reviews the types of dressings that are currently in use by book conservators and bookbinders, such as Klucel G (a hydroxy propyl cellulose), SC6000 (an acrylic wax mixture) and Marney's Conservation Dressing (a solvent-free mixture of oils and waxes). The materials used in the trial are a combination of those in current usage and a variety of coatings used as finishes in the shoe and leather industries.

Haines, Betty M. 1987. "Ground Substance: Its Relationship to the Tanning Process." Leather Conservation News. Vol 3. No 2. Spring 1987.

Ground substance is everything in the raw skin that is not collagen: plasma proteins, albumins, globulins, and a glycosaminoglycan-hyaluronic acid. Along with water, ground substance lubricates live skin. It cannot lubricate leather, however, and is removed in the tanning process. To prevent collagen fibers from sticking together and making the leather stiff, some sort of fat or oil is introduced during tanning while the leather is still wet to make a film over the fibers and serve as a lubricant for the service life of the leather.

Haines, Betty. 1985. "Oils and Fats in Leather" Recent Advances in Leather Conservation. Proceedings of a refresher course, June 1984. Editor: Sonja Fogle. The Foundation of the American Institute for Conservation. Washington DC. pp. 36-41.

BCIN Abstract: The various types of lubricants used on leather and their methods of application are described. Before 1900 currying was the most common, then emulsions, and after the 1920s self-emulsifying oils (e.g. Castor oil, turkey red oil), also known as sulphated oils. After world war ii sulphited oils were developed. The properties of the various oils found in leather affect its properties and the problems which are encountered. Neat's foot oil, one of the most satisfactory in use, should however, be well-cooled first to precipitate solid triglycerides. Vegetable, fish and synthetic oils have also been used, but they are less satisfactory than the animal oils. Spewing is the exudation of solid triglycerides: possible treatments are discussed before considering relubrication. The discussion centres on this last point, then on practical problems.

Hallebeek, Pieter. 1985 "Leather Lubricants and Buffers." Recent Advances in Leather Conservation. Proceedings of a refresher course, June 1984. Editor: Sonja Fogle. The Foundation of the American Institute for Conservation. Washington DC. pp. 42-46.

BCIN Abstract: At the central research laboratory, amsterdam, before lubricating or buffering leather, it is necessary to determine both the ph and the fat content, as these values govern what is chosen for use. The emulsions are preferred; the recipe is given for one that contains lanolin, neat's foot oil, arkopal n 100 and water. Imidazole can be added but not more than 1% in concentration. Solvent leather dressing can also be used; the one used at the crl contains neat's foot oil, lanolin, white spirit plus imidazole organic buffer in iso-propyl alcohol. The need for a buffering agent is explained. Potassium lactate and sodium citrate are not advisable because insufficient could be added to counter the acidity present. A water solution is also inadvisable. Imidazole is much preferred; its mode of action is explained. It is claimed also to block the action of iron which may be present. The discussion covers buffering and lubrication and how to calculate the quantity of lubricant to add.

Hollstein, M. 1979. "On the Problem of Fatty Spews on Leather" Das Leder. pp. 40-46.

AATA Abstract: Potential spew forming substances are fats with a high content of saturated fatty acids. Therefore fat-liquoring should be carried on with vegetable or animal oils containing unsaturated fatty acids such as sperm oil, neat's foot oil, fish oil, etc., or synthetic fat-liquors. The main precaution in avoiding spews is twofold: 1. The pH value should be kept higher than 3.5. 2. Fungicide should be added to the fat-liquor so that cleavage of the unsaturated fatty acids by fungous attack is guarded against.

Knuutinen, Ulla; and Laura Sallas. 2005. "Leather Spue: a Problem with Lubricants." ICOM Triennial meeting (14th), The Hague, 12-16 September 2005: preprints. James & James. London. pp. 249-254.

AATA Abstract: The aim of this study was to examine and clean leather-covered books that suffer from leather spue. The study material was provided by the Library of Monrepos, an 18th-century collection in the National Library of Finland. The books had been treated with the British Museum Leather Dressing in the 1970s. The leather dressings from the 1970s and new samples were analyzed with Fourier transform infrared spectroscopy, diffuse reflection spectroscopy, differential scanning calorimetry, and solubility tests. British Museum Leather Dressing is in general not chemically stable, and the cause of spew formation was mainly oxidation of the lubricant. The results of the study helped in writing recommendations for cleaning the books without hazardous solvents.

Liu, Cheng-Kung, Nicholas P. Latona, Gary L. DiMaio. 2002. "Lubrication of Leather with Polyethylene Glycol." Journal of the American Leather Chemists Association. Vol. 97. No. 9. pp. 355-368.

BCIN Abstract: One of the problems associated with leather quality is that traditional lubricants ("fatliquors" consisting of oils and surfactants) are known to destabilize collagen fibers. Moreover, because they do not promote the retention of essential moisture, they make the leather fibers prone to over-drying. We have recently applied an aqueous solution of low molecular weight polyethylene glycol (PEG 400) to leather without using any surfactants. The resultant stiffness was characterized by Young's modulus, initial strain energy and acoustic emission methods. Results showed that leather treated with polyethylene glycol solutions showed a significant reduction in its stiffness, indicating that PEG has a lubricating effect in leather. Efforts were also made to understand how factors affect the absorption of PEG into leather. Observations showed that the rate of adsorption is not constant; therefore Fick's second law of diffusion, dealing with unsteady state processes, was employed to derive a mathematical model for the absorption rate. The effect of temperature on the absorption rate was also included in the model by incorporating a linear equation into Fick's diffusion equation. The resultant model fits the experimental data very well. It not only depicts the mechanism of absorption, but also predicts the absorption rate as a function of key variables.

McCann, Laura and Werner Haun. 2009. "Library Collections Conservation Discussion Group 2009: Library Collections Conservation 2.0—New Directions: New and/or Adaptive Materials, Methods and Technologies Used in the Conservation Treatment and Housing of Library Collections." The Book & Paper Group Annual Vol. 28, pp. 107-114

AATA Abstract: The Library Collections Conservation Discussion Group (LCCDG) of the Book and Paper Group was pleased to present "Library Collections Conservation 2.0—New Directions. New and/or Adaptive Materials, Methods and Technologies Used in the Conservation Treatment and Housing of Library Collections" at the 2009 AIC Annual Meeting held in Los Angeles, California. The theme for the session was inspired by the AIC annual meeting theme, "Conservation 2.0—New Directions." The session co-chairs, Laura McCann and Werner Haun, recruited speakers to present on practical applications of new and adaptive materials and methods in the conservation of library collections. The presentations dealt with soot removal techniques, removal of excess leather dressing, use of rubber cement for facing leather spines, and use of adhesive-coated repair materials. Following the presentations, the co-chairs moderated a lively discussion period. Handouts provided for each of the presentations are published as figures.

McCrady, Ellen and Toby Raphael. 1993. "Leather Dressing: to Dress or Not to Dress." Conserve o gram, 9/1. National Park Service. Washington DC.

AATA Abstract: The dressing of leather is a largely irreversible procedure the value of which has begun to be questioned by museum conservators. The authors summarize some research on leather dressings and list what undesirable and unexpected effects oils and fats, wax additives, and dressing solvents can have on leather.

Mitton, R.G. and K.G.A. Pankhurst. 1957. "A Study of the Mechanism of Fatty Spue Formation-II." Journal of the Society of Leather Trades Chemists. Vol 41. Pp. 161-183.

AATA Abstract: There would appear to be at least two stages in the formation of fatty spue on leather: (1) the migration of fat from the centre to the grain surface, and (2) the crystallisation of the fat on the surface in the form of a large number of minute crystals. It is quite possible that progressive crystallisation of fats on the surface may, in itself, provide part of the motive force causing the fat to migrate from the interior. In the work described below, the presence of dyes, mordants, and detergents is shown to have a marked influence on the formation of fatty spue, as well as such physical factors as the thermal history of the leather, the presence of crystallisation promoters (seed crystals), and mechanical action. Whether the dyes, mordants, and detergents act merely through their effect on crystal growth, or whether they set up a concentration gradient from the centre to the surface cannot be decided from the evidence available. Oleic acid cannot be used successfully as a crystallisation inhibitor.

Morrison, Lynn. 1986. "The Conservation of Seal-Gut Parkas." The Conservator. Vol. 10. pp. 17-24.

AATA Abstract: Describes an approach to the conservation of 19th-century parkas made from strips of dried seal gut sewn together. In museums they have often been stored badly, folded into small packages and crushed, dirty and embrittled. The object of the treatment is to unroll and reshape, clean, repair weakened and damaged areas, and to soften the material if possible. The author has experimented with 11 lubricant/softening solutions. Although she has selected PEG 400 for use, others appeared to give good results. She has also tested a range of adhesives with interesting results, selecting Mowilith DMC2 to repair tears using sausage casing.

Murray, Will 1994. "Conservation of a Pair of Inuit Fish-Skin Boots." SSCR Journal: the Quarterly News Magazine of the Scottish Society for Conservation and Restoration 5, No. 3. pp. 13-14.

AATA Abstract: An account of the treatment of a pair of Inuit fish-skin boots. During storage, the boots had stiffened into a folded position and had an uneven coating of sticky dressing. The dressing was removed through immersion in 1,1,1-trichloroethane. No further cleaning was carried out. The boots were reshaped after exposure to 100% humidity. The restored boots were supported on acid-free tissue.

Nathanson, David and Diane Vogt-O'Connor. 1993. "Care and Security of Rare Books." Conserve o gram, 19/2. National Park Service. Washington DC.

AATA Abstract: Examines considerations for housing rare books—optimal environmental conditions and other preservation measures as well as security measures. The authors describe appropriate shelving furniture and methods, which include a storage temperature between 65 and 70°F with an RH between 40% and 55%. Ventilation and protection from ultraviolet light as well as direct sunlight are important, as are protection from air pollutants, regular inspection, and good housekeeping. The authors warn against amateur repairs with inappropriate materials and the application of leather dressing. They discuss care of bindings, rebinding, and the housing of pamphlets as well as how to deal with ephemera inserted into books and detached plates. Appropriate identifying marks as well as documentation of unique characteristics of an individual copy can be important in reclaiming lost or stolen works. Procedures for reading rooms, including controlling access and documenting usage are briefly described. See also AATA 40-3573 and 40-3575. [Editor's note: As of July 2006, this pamphlet was available online at: <http://www.cr.nps.gov/museum/publications/conserveogram/19-02.pdf>]

Nightingale, Catherine . 1993. "A Comparative Study of Proprietary Leather Dressings for Use on Ethnographic Vegetable Tanned Artefacts." University College London. Institute of Archaeology. England

Papper, J. and F. Pieper. 1978. "Leather Lubricants Based on Chlorinated Natural Fats and Oils." Das Leder. Vol. 29, January 1978 pp. 8-10.

AATA Abstract: By chlorinating native fats or animal and vegetable fatty acid esters, especially those of semi-solid consistency, at room temperature, liquid waterinsoluble chlorination products are obtained which are fast to light and can be used in leather manufacture. They do not cause fatty spew, and inhibit or prevent its formation when combined with other fat liquors tending to cause such spew.

Quandt, Abigail. 1985. "Leather Consolidation with Klucel G" Recent Advances in Leather Conservation. Proceedings of a refresher course, June 1984. Editor: Sonja Fogle. The Foundation of the American Institute for Conservation. Washington DC. pp.79-80

Abstract: A description of the use of klucel g (hydroxypropyl cellulose) as a consolidant for powdering leather bindings. The method of application was developed by a. Cains for use on light-damaged bindings in the library of trinity college, dublin. Used at a concentration of 2% in ethanol, it does not darken red rot deteriorated leather as do water-based solutions. It appears to consolidate the powdery material and block its continued deterioration. Afterwards a leather dressing of beeswax, lanolin, cedarwood oil and neat's foot oil is applied. Losses are infilled with thin pieces of new leather, the material chosen more for its strength than for colour

match. Wheatflour paste is preferred as adhesive to pva, as it is considered more reversible. Aniline dyes are used for toning both vellum and leather; the method used on vellum is described. A 5th century coptic book (shown in slides) is still in better condition than many modern bindings. It is suggested that research into why old leathers have survived could be valuable.

Raphael, Toby. n.d. "Primary Care and Preservation of Leather and Skin Products" MCI

BCIN Abstract: This bulletin is meant to provide general guidelines for collection care practices. The author deals briefly with the following topics: a preservation program; the processing of skin into non-tanned, semi-tanned, native-tanned and fully-tanned products; traditional remedies and recipes; drawbacks of leather dressings; understanding deterioration, and guidelines for object care.

Raphael, Toby J. 1993. "The Care of Leather and Skin Products: A Curatorial Guide." *Leather Conservation News*. Vol. 9

Saddle soap (usually made of neatsfoot oil and cod or sperm oil emulsified with soap in water) tends to push dirt deeper into the leather, be hard to remove completely, and darken lighter leathers. Some commercial brands of saddle soap even contain abrasives and colorants. Sometimes it results in spew. The alkalinity (pH9-10) adversely alters the normal pH for skin (4-6) and is thought to be part of the cause of surface cracking. Leather dressings should NEVER be applied to Native-tanned, semi-tanned, or untanned skin. If more than 3-5% of the weight of the leather is added as dressing, water is forced out, which is also needed for flexibility, causing the leather to become too dry.

Raphael, Toby and Ellen Maccrady. 1984. "Leather Dressing: A Misguided Tradition?" ICOM Committee for Conservation 7th triennial meeting: Copenhagen, 10-14 September 1984: preprints. Diana de Froment, (Editor). International Council of Museums. pp. 186-188.

AATA Abstract: It is evident that the dressing of leather objects of all kinds is a popular and well-established tradition, yet there is a fair amount of experimental and practical evidence that it has little or no effect on leather's rate of deterioration (except for outdoors where water protection is necessary). It can be argued that the routine dressing of leather is hard to justify in terms of conservation principle because 1) it has little or no preventive effect when applied in the customary indiscriminate manner, and 2) there are so many potentially dangerous side effects. As a whole, leather conservation has not kept pace with the advances made in other conservation areas. Conservators working on leather objects must develop procedures which can be justified in conservation terms and treatments that are based both on relevant research and experience.

Scianna, N. 1976. "The Use of Lipids to Protect the Leather of Ancient Bookbindings in Connection with the Action of Micro-Organisms." Soc. Int. Etude Corps Gras. Actes Cong. Mond. 1976 Section H pp. 107-114

BCIN Abstract: After describing the causes of deterioration in leather attacked by microbes (environmental factors, tanning methods) the Author examines the various methods of attack and prevention (fungicides). Particular attention is given to the analysis of various dressings used by restorers, to the problems connected with them, to their perfection with the addition of fungicides and to the precautions to be taken in choosing the various products.

St. John, Kristen. 2001. "Survey of Current Methods and Materials Used for the Conservation of Leather Bookbindings." The Book and Paper Group Annual. Editor: Shannon Zachary. American Institute for Conservation of Historic and Artistic Works. 28th annual meeting Philadelphia. Vol. 19. pp. 131-140.

BCIN Abstract: This survey gathered information from twenty-three book conservators on methods and materials used in the conservation of leather bookbindings in laboratories throughout the United States. The conservators work predominantly with special collections, in institutions with older collections, or have treatment responsibilities for special collections materials. The primary goal of this survey was to determine how conservators are treating leather bookbindings. A secondary goal was to determine how new materials and

methods that have been developed or introduced to the field of book conservation within the past twenty-five years are being used in conservation labs. The survey was divided into five sections. The first section asked for background information on staffing levels. The second section questioned respondents about the treatment of existing or original leather bindings. The third section of the survey sought information about rebinding books using new leather bindings. The fourth section covered the use of preparations on leather such as leather dressings, waxes and cellulose ethers. The fifth and final section inquired whether the labs had standardized their procedures for treating leather bindings.

Storch, Paul S. 1987. "Curatorial Care and Handling of Skin Materials, Part I, Tanned Objects." Conservation notes (Texas Memorial Museum. Materials Conservation Laboratory) No. 17

AATA Abstract: This article, like others in the Conservation Notes series, is written for the museum professional without conservation training. It briefly covers the nature of skin and hide in chemical and physical terms, the tanning process, deterioration processes, unsuitable treatments, and problem assessment. A table is provided which can allow the curator or collections care person to diagnose the cause of problems with leather objects in the collection based on visible symptoms and characteristics. Finally preventative maintenance procedures such as controlling the storage environment are detailed, as well as the explanation of a dressing procedure for historic leather.

Tancous, Jean J. 1974. "A Study of Fat Spew by Gas Chromatography." American Leather Chemists Association Journal. Vol 69. No 2. pp 66-84.

AATA Abstract: Fat spews occurring on various types of leather, such as aqueous-degreased pigskin leather, solvent-degreased pigskin leather, and grain and corium splits of steer hide leathers, were analyzed for free fatty acids and ester-type fat by gas chromatography. The natural fat of the skin or hide and the fatliquors used to lubricate the leathers were analyzed by gas chromatography also. The spews were made up of free fatty acids and ester-type fat. The cause of the ester portion of the spew as to whether it originated from the natural fat or added fat could be determined. – CCI

Tello, Helene, Anne Gunnison, and Nancy Fonicello. 2009. "Disrobing : Research and Preventive Conservation of Painted Hide Robes at the Ethnological Museum, National Museums Berlin, Germany." ICOM-CC: Working Group Ethnographic Conservation Newsletter. No. 30. Jan 2009. pp. 8-10.

Werner, Ute; Lyndsie S. Selwyn, Tom Stone, W. Ross McKinnon, Anne MacKay, Tara Grant. 2012. "The Removal of Metal Soaps from Brass Beads on a Leather Belt." Studies in Conservation. Vol 57. No. 1. pp. 3-20.

Wills, Barbara, Yvonne Shashoua, and Dean Sully. 1992. "Approach to the Conservation of a Mexican Saddle and Anquera." Conservation of the Iberian and Latin American Cultural Heritage: preprints of the contributions to the IIC Madrid Congress, 9-12 September 1992. Editors: H.W.M. Hodges, John S. Mills, Perry Smith. International Institute for Conservation of Historic and Artistic Works. London. pp. 179-183.

BCIN Abstract: This paper deals with the approach to the conservation of a Spanish-style saddle and "anquera" (rump cover) from Mexico City and Puebla, Mexico, respectively. The objects were originally bought by an English explorer for a journey and are described in his book. The saddle and "anquera" are made from vegetable-tanned cowhide with punched and embroidered decoration and metal fittings. The condition of the leather was assessed scientifically. It exhibits a number of conservation problems, notably surface deterioration and detachment of several conditions due to acid attack. Previous conservation treatments have caused the leather to become overstuffed with dressing, resulting in a weakening of the substrate. The conservation of the saddle will involve four main stages; removal of excess dressing, stabilization of the leather, consolidation of the friable surface and repair of torn and broken areas. The suitability of various stabilizing agents, consolidants and methods of application was evaluated using mechanical tests alone and accelerated aging and mechanical tests. Naturally aged and degraded leather was used as an experimental substrate. The results were used to formulate the approach to the conservation of the saddle and "anquera."