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Preventing Hide Deterioration Prior to Tanning or Salt Curing

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A hide starts to deteriorate as soon as it is removed from an animal because of the action of bacteria normally present on the animal skin as well as the natural, self-destructive, enzymatic decomposition of tissue cells (autolysis). This rapid deterioration, which occurs between the time the hide is removed from the animal until it can be properly salt cured or tanned, lowers the quality of the leather, with the consequent loss of millions of dollars to the industry. In many situations, freshly flayed hides (or skins) need to be preserved only for a brief period to prevent this deterioration. In some cases, small slaughterhouses, meat packers and locker plants may lack refrigerated storage space to keep the hides until they can be collected or sold. Even if a hide is placed in a cooler, many people are not aware that the excellent insulation properties of the skin may not permit the temperature to be reduced fast enough to prevent damage. Furthermore, even the large hide brokers, packers and tanners need a safety factor against delays in processing caused by collection difficulties, mechanical breakdown, labor problems, long hauls, holidays, scheduling and other unforeseen factors.

The objective of the curing process is to convert the hide into a stable product which is at least temporarily not susceptible to putrefaction or rotting. Today, brine (salt) curing is the most widely used method to prevent spoilage of fresh hides until they can be tanned. Proper salt preservation dehydrates a hide, making it unavailable as a food for microorganisms. Preservation with solid salt is labor intensive, and, if the salt is spread unevenly, bacterial growth could result in downgraded hides. Brine cured hides can be stored for long periods of time, but they still need controlled storage temperatures. In brine curing, biocides are often added to control microbial build-up in the brine and to prevent any degradation of the hide until the salt can effect preservation. Eventually the salt must be removed by soaking and extensive washing to rehydrate the hide and return it to a condition suitable for tanning. This preservation method will continue to be used unless an alternative is found or it becomes uneconomical because of more stringent environmental regulations which might someday require that tannery effluents be treated to remove the dissolved salt.

Simple, practical, economical procedures that can prevent deterioration of hides for a minimum of seven days have been developed by scientists David G. Bailey and William J. Hopkins at the Eastern Regional Research Center in Philadelphia. The concept involves the use of sulfite salts under acid conditions in much smaller concentrations than required with the commonly used sodium chloride (salt).

One procedure that can be used in tanneries involves agitation of the hides in 1% acetic acid, 1% sodium sulfite and 20% water (based on the hide weight) in a tannery drum for 1 hour at 10 revolutions per minute. The treated hides may be stored for seven days with the float in covered plastic containers.

Since many small slaughterhouses cannot justify investment in conventional drumming equipment, we have developed four other methods of application of the acid sulfite treatment, requiring little capital investment. They vary in chemical costs, equipment requirements and final shipping weights and provide a choice based on local situations.

Method 1. Immerse an appropriate number of hides in a 50% float of 1% sodium sulfite, 1% acetic acid and a surfactant such as 0.03% Tergitol*. The float may be in a coated or plastic lined 55 gallon drum or a polyethylene bag lining a plastic trash container. Each hide must be pushed down into the float with a wooden

paddle to overcome the buoyancy caused by trapped air. The bag or container must be sealed. The hides will be preserved for at least seven days in this manner. For shipping, the hides will maintain their quality for at least two days if they are removed from the float and placed in a sealed plastic bag or a closed container.

Method 2. Immerse an appropriate number of hides in a 20% float or 1% acetic acid and 1% sodium bisulfite. The float should be in a coated or plastic lined 55 gallon drum. The drum must be sealed and rotated at about 15 rpm for 1.5 hours on a simple drum roller. The hides may then be held in the sealed drum for seven days.

Method 3. Sprinkle two pounds of solid sodium bisulfite per 100 pounds of hide on the flesh side to roughly cover the whole surface lightly. Fold the hide and place it in a polyethylene bag, then seal the bag. The hide is preserved in this manner for at least seven days.

Method 4. Sprinkle 1.5 pounds of sodium bisulfite per 100 pounds of hide on the flesh side, fold once with the hair side out and place it in a coated or polyethylene lined 55 gallon drum. Add one pound of sodium bisulfite per 100 pounds of hide on top of this. It is important to keep the two chemicals separate so they will not react until the drum is sealed. Once the drum is sealed, rotate it at 15 rpm for 1.5 hours on a drum roller. The hide may then be held in the sealed drum for seven days.

Caution — Hides preserved by any of the methods described must be drained and/or rinsed until a neutral pH is obtained. If the hides are still acidic when they reach the unhairing step, hydrogen sulfide may be released.

Hides preserved by these methods were washed, fleshed and put into normal commercial shoe upper leather production. They were then examined in the blue and crust leather stages. No significant differences were observed in area yield, weight, tensile strength, extensibility, temper, veininess or break when compared to leather from brine cured controls. The sulfite treated hides produced leather of a lighter color and less draw than salt cured hides. In addition to shoe upper leather, excellent results have been obtained with treated hides made into leather for upholstery, baseballs, shoe linings, garments and light shoes. The cost of treatment in all cases is considerably lower than that of brine curing if long-term preservation is not a factor.

In addition to economic savings, these preservation methods have several other highly significant advantages. They reduce saline waste from packing plants or brine curing operations by 97 percent — a considerable advantage in effluent treatment, especially where disposal of brine is a problem. Disposal costs may also be lower if based on the total solids content. In any case, the presence of highly concentrated dissolved salt renders water unfit for agricultural, industrial and domestic use, and at present there is no economical way to remove it. For international trade, salt preservation still has two advantages. It provides the long-term protection needed between destinations. It also dehydrates fresh hides, reducing the weight, and thus decreasing the cost of shipping, which, of course, is of considerable importance.

At present, only fresh hides processed under prescribed conditions can be used for food applications. The high salt content and biocide normally present in the brine cure will in most cases prevent the use of trimmings and fleshing for edible purposes. The fat normally present in a hide tends to become rancid in brine and could contribute to off-flavors in foods such as edible collagen or sausage casings made from the hide. The antioxidant properties of the sulfite should inhibit or prevent the fat from becoming rancid and the hide can be handled as if it were fresh. Hides treated by these methods may be processed as a "fresh type hide." Although Food and Drug approval would be needed, we believe the sulfite-acetic acid treated hides could be used for food applications since sodium sulfite, sodium bisulfite and acetic acid are commonly used in the food industry. Sodium sulfite and sodium bisulfite are used in the manufacture of maraschino cherries and wines, whereas acetic acid is the major constitutent in vinegar.

In summary, these methods have a great deal of potential as a nonsalt treatment of hides and skins to maintain hide quality should a delay in processing fresh hides be encountered prior to tanning. Salt curing should be used only if the delay is longer than seven days. Avoidance of brine curing has at least three major advantages. First is reduced costs. Water can be conserved by as much as 85% and time can be saved by eliminating extensive soaking and washing brined hides. Second, the problem of meeting pollution standards will be alleviated by eliminating the dissolved salt. Third, the offal now has the potential for use in human food, animal feed and fertilizer.

These methods are currently being evaluated for use by companies in Canada and the United States, many in cooperation with scientists at USDA's Eastern Regional Research Center. Several packers are successfully using these methods to prepare hides for transport to a central hide curing facility. Economic considerations appear to be favorable. The methods are rapid and simple, and soaking the hides at the tannery to rehydrate them is not necessary, since they remain in a flaccid condition. Where brine curing can be avoided, these seven-day preservation techniques should provide a satisfactory alternative.

Additional details on performance and characteristics of the methods and results of the studies are available from Robert L. Miller, Eastern Regional Research Center, 600 E. Mermaid Lane, Philadelphia, PA 19118.

• The mention of commercial items is for your convenience and does not constitute an endorsement by the U.S. Department of Agriculture over similar items not mentioned.