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Red Rot—Rotten to the Core!

What is red rot? Red rot is a commonly found form of acidic degradation that manifests as an orange-red powder on mid-19th to 20th century leather. As the deterioration progresses, it can result in delamination of the leather and partial or complete loss of the outer layer of the skin. The deteriorated leather has decreased thermal stability and tensile strength and a very acidic pH. Red rot is caused by prolonged exposure to high temperatures, high relative humidity, and environmental pollutants that catalyze the acid hydrolysis and oxidation of low-quality leather preparation products. The strong acids known to cause this type of degradation could have been added to the leather during processing or have been formed *in situ* from sulfur dioxide and nitrogen dioxide absorbed from polluted atmospheres. Protecting the leather from air pollutants which cause the hydrolysis reaction can slow the process. Powdery, deteriorated leather is the end-point of acid hydrolysis and is irreversible. However, treatment and proper housing can halt its progression and stabilize the damaged area.

Effects of red rot on surrounding collections. If the red rot in the collection is not controlled, it will spread catalyzing acids and dust to neighboring collections. Leather desiccated by red rot becomes highly moisture sensitive; any contact with moisture will result in severe and irreversible darkening of the leather. Acidic and disfiguring red rot can also be spread to other collections materials by hand. *Always wear gloves when handling materials with red rot and change your gloves before handling clean materials!*

Conservation treatment overview. The goal of using leather stabilizing agents on red rot is to improve the chemical stability of leather. In the past, oil-based leather dressings were a common way to treat leather, but research has shown that they can cause further deterioration of leather. The most common treatment of red rotted leather is local consolidation of the deteriorated area using Klucel G and Cellugel, cellulostic derivatives supplied either in powder form or ready-made respectively. Both products are clear and colorless when suspended in isopropanol. They can cause minor changes in the appearance of the leather and do not reverse or slow the deterioration. In the past decade, a new treatment using aluminum alkoxide and oxazolidine II diluted in white

spirits has been shown to stabilize the collagen and provide a slight buffer against acids, increasing the pH and thermal stability of leather, but this formulation is not yet commercially available. At the very least, items affected by red rot should be housed in a clam-shell box or 4-flap enclosure to prevent the spread of red rot and resulting damage to adjacent leather and paper materials.

Please don't hesitate to reach out to us if you have any question about materials in your collections that have been affected by red rot!

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The Werner J. and Gisella Levi Cahnman Preservation Laboratory