

DE-ACIDIFICATION OF PAPER - A NEW APPROACH

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The difficulty and unpredictability of de-acidification methods for paper artifacts are discussed and a new and simpler process introduced. Six easily available products were tested for their ability to neutralize acid and the results are expressed in tabular form. Several new directions in de-acidification research are indicated.

1 Introduction

In recent years considerable attention has focussed on the rapid decay of many 19th and 20th century books and manuscripts. It has generally been assumed by conservators and archivists alike that the decay is the consequence of residual acids retained within the paper following sizing with alum. The destructive influence of sulphuric acid upon the cellulose fibres of paper is well documented in the literature (1) and a number of different methods have been proposed whereby "deacidification" might be achieved. Of these, only a handful have yielded promising results and even then such measures have proved very time consuming and costly (2). If paper deacidification is to be seriously considered as a conservation treatment on a large scale an entirely new approach must be taken. Also, because more small museums, archives and historical societies are being encouraged to do their own simple conservation treatments, an easily available and cheap alternative is especially desirable.

In recent years tremendous strides have been made in the pharmaceutical industry, particularly with regard to the development of the so called "ant-acids".* Given the effectiveness of such preparations for relieving acid indigestion it had occurred to this author that the ant-acids might well prove a viable alternative to conventional deacidification methods for archival material in general. In the following work effectiveness of various commercially available ant-acid preparations for deacidifying paper is studied.

* Not to be confused with the other ant acid, formic

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2 Experimental

The following ant-acids were tested:

- Alka Seltzer
- Tums (cherry flavoured)
- Pepto Bismol
- Diovol Ex (with anti-flatulent)
- Roloids
- Milk of Magnesia

Strips of paper were fully immersed in 500ml distilled water in separate beakers. To each of the above was added the recommended dose of ant-acid (consult your physician). The pH of each paper was measured with a flat head electrode (Orion Instruments) every 5 minutes for a period of 48 hours.

3 Discussion

In general, the pH of all test papers increased following the addition of an ant-acid to the wash solution (Fig. 1). The extent to which this occurred and the duration of its effect, however, differed markedly amongst the chemicals tested (Fig. 2). The other criteria tested were: cockling, runs, stickiness, colour change and belching. These results are shown in Table 1.

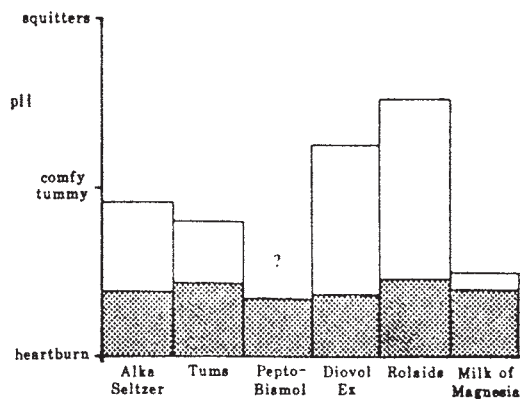


Figure 1 The comparative effectiveness of the ant-acids plotted against pH, before and after testing.

	pH rise	cockling	runs	stickiness	colour change	belching
Alka Seltzer	✓	X	X	X	X	✓
Tums	✓	X	✓	✓	✓	X
Pepto-Bismol	?	X	X	✓	✓	X
Diovol Ex	✓	✓	X	X	X	!!!
Rolaids	✓	X	X	X	X	X
Milk of Magnesia	X	?	?	?	?	?

Table 1 (or 1,000,001 for that matter; it's the only bloody table in the whole Journal) The six anti-acids tested against the selected criteria.

3.1 Alka Seltzer

Deacidification was almost immediate in the case of those papers treated with Alka Seltzer. However, its long-term effect was almost negligible. Papers treated with Alka Seltzer gradually resumed their original acidity over the course of several hours. The loss of effectiveness appeared to coincide with the evolution of small gas bubbles in slow, irregular bursts from the surface of the paper.

3.2 Tums (cherry flavoured)*

While effective in reducing acidity, paper treated with cherry flavoured Tums was rendered sticky and scented, thus promoting mold growth and insect infestation. In addition, the ink script had a tendency to develop "runs" upon prolonged exposure. One advantage of Tums for the treatment of books was that the pages tended to stick together, and thus the pink stains from the cherry flavour were quite invisible.

3.3 Pepto-Bismol

All attempts to measure the pH of papers treated with Pepto-Bismol proved futile. It tended to coat the surface of the paper as well as the pH electrode with a pinkish film, thereby yielding rather spurious, if not totally inaccurate, results. Furthermore, its noxious colour and syrupy consistency presented numerous difficulties with regard to its handling and practical application. (Though the TLV of Pepto-Bismol is in fact quite high, and there is no evidence to suggest that it is carcinogenic, a number of cases have been reported in the literature

where the mere sight of it has induced severe nausea and convulsions (3). Moreover, in large amounts it is a potential hallucinogen (4).)

3.4 Diovol Ex (with anti-flatulent)

Diovol Ex proved very effective in reducing paper acidity. Unlike the other anti-acid preparations tested, papers treated with Diovol Ex tended to cockle following deacidification. This may well be attributed to the presence of an anti-flatulent. The identity of this anti-flatulent has yet to be determined. All attempts by the author to contact the manufacturer of Diovol Ex with regard to this matter have been unsuccessful. The use of Diovol Ex can therefore not be recommended until such time as the precise chemical composition, and the long-term effect of the addition of an anti-flatulent upon the mechanical properties of paper, can be determined.

3.5 Rolaids

Of all the anti-acids tested Rolaids proved most effective, consuming nearly 47 times their own weight in excess acid.

3.6 Milk of Magnesia

Milk of Magnesia is most effective against heartburn caused by over-indulgence, particularly in fatty foods, spices and strong alcoholic beverages. As paper is rarely over indulgent in quite this way the results produced may not have much bearing. However, for what they are worth, Milk of Magnesia proved useless as a deacidifying agent for paper - the pH hardly rose at all. No other adverse effects were noticed on the paper, aside from its complete disintegration.

* Fer yer tummy, Charlie

De-acidification of paper - a new approach

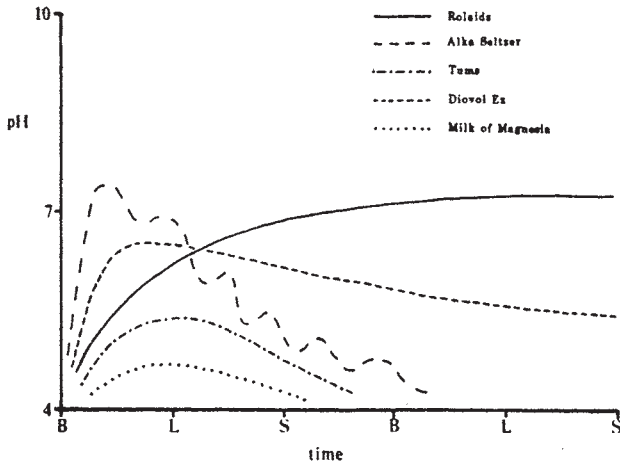


Figure 2 The pH of samples plotted against time (B breakfast, L lunch, S supper) showing the relative longevity of effect. Pepto-Bismol has been excluded due to the useless results.

4 Conclusion

Of all the ant-acids tested Roloids proved most effective in reducing paper acidity. Further study is warranted so as to determine optimum conditions whereby deacidification with Roloids may be attempted on a large scale. A pilot plant is presently under construction in a board-room in Asticou, Quebec awaiting the first experimental trials on deteriorated paper documents.

Since conducting these experiments the author has been told (5) that one can take years off the apparent age of documents with certain Grecian Formulas and it is clear that these need further testing.

5 References

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5. Faraday, M., personal communication to the author, 1983.

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Résumé - On discute la difficulté d'entreprendre les méthodes de dé-acidification du papier et d'en prédire les résultats. Un nouveau procédé plus simple est décrit. Six produits ont été mis à l'épreuve pour déterminer leur aptitude de neutraliser les acides. Les résultats sont présentés sous forme de tableau. Des nouvelles directions de recherche dans le domaine de la dé-acidification sont envisagées.

Auszug - Die Schwierigkeiten und Unberechenbarkeit von Ent-säuerungsmethoden für Papier werden besprochen, und neue und einfachere Prozesse eingeführt. Sechs im Handel leicht erhältliche Produkte werden auf ihre Neutralisationsfähigkeit hin geprüft und die Ergebnisse in Tabellen veranschaulicht. Mehrere neue Richtlinien in der Entsäuerungsforschung werden angedeutet.

A real rejection slip -
aspiring authors please
note,
Ed.

*Rejected - I cannot accept that Roloids are
that much better than Milk of Mag. More
testing is required before such sweeping
conclusions can be drawn. Also
publication in advance
of testing of Grecian
Formulas is premature
AJP
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