To order reprints or e-prints of JDD articles please contact sales@jddonline.com

doi:10.36849/JDD.5877

Expanding Use of Deoxycholic Acid for Body Contouring: An Experimental Model for Dilution

Shauna M. Rice BS,[a] Joseph Caravaglio MD,[b] Renata Dalla Costa MD,[b] Arianne Shadi Kourosh MD MPH[a,c]

[a]Massachusetts General Hospital Department of Dermatology, Boston, MA
[b]Brown University Department of Dermatology, Providence, RI
[c]Harvard Medical School, Boston, MA

INTRODUCTION

In the years since injectable lipolytic agent deoxycholic acid (DCA) was FDA-approved for reduction of submental fat, its off-label use on the body, eg, bra-line lipolysis, treatment of lipomatous tumors, and body contouring are being increasingly explored.[1] The growing interest in its applications for larger treatment areas on the body however is somewhat limited by the maximum of 10 mL of product that can be administered per treatment.[2] Development of dilution protocols of DCA for distribution over larger surface areas while maintaining efficacy could meaningfully expand the arsenal of safe in-office body sculpting techniques.

In dermatology, there are multiple successful precedents for dilution of products originally used for the face when repurposed for applications on the body. Injectable poly-L-lactic acid and calcium hydroxyapatite, for example, required significantly more dilution to mitigate risks when transitioned to the body. Similarly, DCA, if diluted with lidocaine for example, could allow for treatment over larger areas with reduction in pain.[3] To our knowledge, dilution beyond 0.3 cc lidocaine to 2 cc DCA has not been reported which may reflect concerns regarding the risk of altering the pH of the product due to a more acidic resultant solution. In anticipation of clinical studies, we demonstrate an experimental model for changes in pH with varying dilutions (Figure 1).

Using pH test strips, we tested different dilutions of DCA: with lidocaine, with lidocaine and epinephrine, and then both with sodium bicarbonate to mitigate injection pain and raise the pH of solution to closely approximate DCA (pH 8.3), as this basic pH is theoretically necessary to maintain the efficacy of the reaction.[4] For comparison, DCA was also diluted with normal saline (Figure 2). Although the internal buffer in DCA, anhydrous disodium phosphate, is theoretically resistant to large pH changes, dilution of DCA with plain lidocaine should not go beyond a 2:1 ratio for risk of large pH shift (pH 6.5–7 in this case). Dilutions beyond this appear to overcome the internal buffer and significantly alter the pH. Adding epinephrine (pH 2.2–5) only furthers the pH drop. Addition of 8.4% sodium bicarbonate to 1% lidocaine with 1:100,000 epinephrine (approximately 1 mL:10 mL ratio), however, restored the target tissue pH around 7.5, which is close to the pH of DCA. Greater dilutions with saline may be possible given the pH effects were of less impact.

FIGURE 1. Experimental model for changes in pH with varying dilutions.

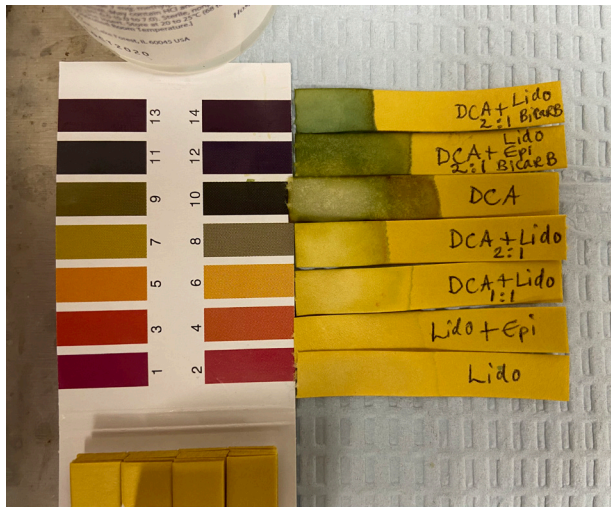
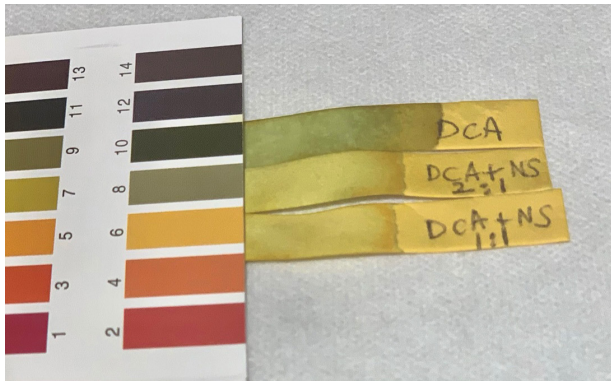


FIGURE 2. For comparison, DCA was also diluted with normal saline.



The addition of lidocaine with epinephrine may offer the added benefit of enhanced lipolysis, as catecholamines stimulate the lipolytic pathway via binding of beta adrenergic receptors on adipocytes.[4] Therefore, we postulate that a mixture of DCA

This document contains proprietary information, images and marks of Journal of Drugs in Dermatology (JDD).
No reproduction or use of any portion of the contents of these materials may be made without the express written consent of JDD. If you feel you have obtained this copy illegally, please contact JDD immediately at support@jddonline.com

To order reprints or e-prints of JDD articles please contact sales@jddonline.com

doi:10.36849/JDD.5877

with lidocaine with epinephrine and sodium bicarbonate should enhance adipolysis via two distinct mechanisms, with DCA causing cytolysis (adipolysis) via destruction of the cell membrane and the epinephrine stimulating the lipolytic pathway, given that the pH impact of epinephrine is addressed to avoid undermining one of these mechanisms.

Further research is required to determine if the addition of epinephrine could net enhance the adipolytic effects of DCA via the aforementioned mechanisms in clinical studies, particularly if measures are taken to neutralize its impact on the pH of the solution. This experimental model suggests the possibility of dilutions of DCA (2 mL), lidocaine with epinephrine (1 mL), and bicarbonate (0.2 mL) that could maintain a neutral/alkaline pH while mitigating injection pain, allowing product to be used effectively over larger surface areas, and potentially augmenting the efficacy of injectable DCA.

DISCLOSURES

The authors have no conflicts to report.

REFERENCES

1. Sung CT, Lee A, Choi F, Juhasz M, Mesinkovska NA. Non-submental applications of injectable deoxycholic acid: a systematic review. *J Drugs Dermatol.* 2019;18(7):675-680.
2. Kybella [package insert]. Westlake Village, CA: Kythera Biopharmaceuticals Inc; 2015.
3. Pollock S, Nathan NR, Costa RD, Kourosh AS. A novel injection technique for the use of deoxycholic acid to mitigate pain while maintaining efficacy [published online ahead of print, 2020 Jul 21]. *J Am Acad Dermatol.* 2020;S0190-9622(20)32261-1. doi:10.1016/j.jaad.2020.07.061
4. Chernick SS, Spooner PM, Garrison MM, Scow RO. Effect of epinephrine and other lipolytic agents on intracellular lipolysis and lipoprotein lipase activity in 3T3-L1 adipocytes. *J Lipid Res.* 1986;27(3):286-294.

AUTHOR CORRESPONDENCE

Arianne Shadi Kourosh MD MPH

E-mail:..... shadi@mail.harvard.edu

This document contains proprietary information, images and marks of Journal of Drugs in Dermatology (JDD).
No reproduction or use of any portion of the contents of these materials may be made without the express written consent of JDD. If you feel you have obtained this copy illegally, please contact JDD immediately at support@jddonline.com