

# Systematic Review Snapshot

## *Clinical Synopsis*

### TAKE-HOME MESSAGE

Increasing the pH of lidocaine (buffering) significantly decreases the pain of local injection.

## METHODS

### DATA SOURCES

The authors searched the Cochrane Central Register of Controlled Trials (CENTRAL) to June 2010, Ovid MEDLINE (1966 to June 2010), EMBASE (1988 to June 2010), Latin American and Caribbean Literature on Health Sciences Database (1982 to June 2010), CINAHL (1982 to June 2010), ISI Web of Science (1999 to June 2010), and abstracts of the meetings of the American Society of Anesthesiologists, without language restrictions. References of selected articles were searched, as well as <http://www.controlled-trials.com>, for relevant ongoing trials.

### STUDY SELECTION

All double-blinded, randomized controlled trials were included comparing the use of pH-adjusted (buffered) lidocaine with unadjusted (unbuffered) lidocaine for local injection. The primary outcome was pain intensity on injection. Secondary outcomes were patient satisfaction and adverse events. Both pediatric and adult populations were included, whereas studies with temperature differences (warming) between treatment groups were excluded.

### DATA EXTRACTION AND SYNTHESIS

Studies were independently evaluated by 4 investigators using a

## Does Buffered Lidocaine Decrease the Pain of Local Infiltration?

### EBEM Commentators

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### Results

| Outcome                         | Buffered Lidocaine Pain (95% CI) |                               |
|---------------------------------|----------------------------------|-------------------------------|
|                                 | Crossover Studies (N=7)          | Parallel-Group Studies (N=10) |
| Pain at injection site (0-10)   | -2.0 units<br>(-2.6 to -1.3)     | -1.0 units<br>(-1.4 to -0.5)  |
| Patient preference (odds ratio) | 3.0 (1.2 to 4.2)                 |                               |

N=total number of studies.

Of the 2,067 studies identified, 23 met the inclusion criteria; however, pain intensity data were suitable for analysis in only 7 parallel-group studies (635 subjects) and 10 crossover studies (432 subjects). Overall quality of the trials was good; all were double blinded, had complete outcome data, and were free of selective reporting. Of the 23 studies, 7 were excluded for a high risk of bias because of missing allocation information or lack of allocation concealment. All studies used sodium bicarbonate as the buffering agent, although buffering methods and concentrations of lidocaine were not identical between studies.

### Commentary

The most commonly used local anesthetic in procedures is lidocaine.<sup>1</sup> Although lidocaine offers the benefits

of quick onset, low cost, and safety, it can cause severe pain with local injection, attributed to its lower pH (between 3.5 and 7.0) compared with tissue pH.<sup>2,3</sup> Although results of randomized controlled trials support the benefits of buffering lidocaine to reduce pain, this technique may not be frequently used in busy emergency department settings because of inconvenience and cost. Results of this meta-analysis strongly support the use of buffered lidocaine to reduce pain of infiltration in both parallel-group and crossover studies. Parallel-group studies include 2 independent groups receiving different treatments, whereas in crossover trials, each patient receives both treatments. In studies with subjective outcomes such as pain, crossover studies limit variation between participants and often provide a more valid measure of effect in evaluating different treatments.<sup>4</sup> It has been shown that a difference of 13 (95% confidence interval 10 to 17) on a 0- to 100-point visual analog scale is clinically meaningful.<sup>5</sup> The relative decreases in pain reported in the crossover design studies appear to be clinically relevant, whereas the pain reduction among the parallel-group studies may not be clinically meaningful. Buffered lido-

standard data extraction form. Pain intensity measured using visual analogue or numeric scales were converted to a 0- to 10-point scale, whereas studies using other scales were excluded. In parallel-group studies, the mean pain intensity was extracted and analyzed with a weighted mean difference in a random-effects model. For crossover studies, the mean difference was extracted and pooled with the generic inverse variance method in RevMan.

caine was also found to be preferred by patients and without adverse events. In addition, a recent meta-analysis found similar reductions in pain when both unbuffered and

buffered lidocaine were warmed to body temperature.<sup>6</sup> Emergency physicians should routinely buffer lidocaine and consider warming before local administration.

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3. Steen KH, Reeh PW. Sustained graded pain and hyperalgesia from harmless experimental tissue acidosis in human skin. *Neurosci Lett.* 1993;154:113-116.
4. Louis TA, Lavori PW, Bailar JC 3rd, et al. Crossover and self-controlled designs in clinical research. *N Engl J Med.* 1984; 310:24-31.
5. Todd KH, Funk KG, Funk JP, et al. Clinical significance of reported changes in pain

severity. *Ann Emerg Med.* 1996;27:485-489.

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This is a clinical synopsis, a regular feature of the *Annals'* Systematic Review Snapshots (SRS) series. The source for this systematic review snapshot is: Cepeda MS, Tzortzopoulou A, Thackrey M, et al. Adjusting the pH of lidocaine for reducing pain on injection. *Cochrane Database Syst Rev.* 2010;(12):CD006581. DOI:10.1002/14651858.CD006581.pub2.

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