Impact of syringes type on pH variation of drug solutions stored for intravenous continuous infusion

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Background
In hospital, continuous intravenous drug administration to patients for 24 hours is common. In some wards, such as intensive care units, these infusions may be kept beyond 24 hours.

Objectives
We aimed to assess pH variation of morphine 10 and 100 µg/ml in 10% dextrose solutions stored in three types of 50-ml polypropylene syringes for 72 hours.

Material and methods
3 solutions: A) 10 and B) 100 µg/ml morphine in water for injection and C) 10% dextrose were prepared and divided in triplicate in 2 types of syringes: 1) polypropylene syringes unprotected from light (UPL-syringe\textsuperscript{a}), and 2) light-shielded polypropylene syringes (LS-syringes). LS-syringes provided by two different companies, Manufacturer-1 (LS1\textsuperscript{b}) and Manufacturer-2 (LS2\textsuperscript{c}). Syringes were stored in a climatic chamber (day-light, 30 ± 2°C, RH 65 ± 5%) over the full duration of the study. The pH of solutions in UPL-, LS1- and LS2-syringes was measured at T0, 24h and 72h. At each point time, the pH of each syringe was performed in triplicate.

Results

- **Dextrose 10% injection solution**
  - Figure 1: pH variation of dextrose 10% injection solution in UPL-, LS1- and LS2-syringes.
  - pH variation:
    - UPL-syringe: 4.10
    - LS1-syringe: 4.14
    - LS2-syringe: 6.12

- **Morphine 10 mcg/ml**
  - Figure 2: pH variation of morphine 10 µg/ml solution in UPL-, LS1- and LS2-syringes.
  - pH variation:
    - UPL-syringe: 3.98
    - LS1-syringe: 4.08
    - LS2-syringe: 5.56

- **Morphine 100 mcg/ml**
  - Figure 3: pH variation of morphine 100 µg/ml solution in UPL-, LS1- and LS2-syringes.
  - pH variation:
    - UPL-syringe: 3.98
    - LS1-syringe: 4.82
    - LS2-syringe: 3.99

Conclusions
The pH of identical drug solution varied differently depending on the type of syringe in which they are stored. This phenomenon could be a serious problem in unbuffered solutions of drugs which are stable only in a defined range of pH, administered in continuous during several days.