# PHYSICOCHEMICAL STABILITY OF FIVE BETA-LACTAM ANTIBIOTICS UNDER SIMULATED REAL-LIFE CONDITIONS IN OUTPATIENT PARENTERAL ANTIMICROBIAL THERAPY (OPAT)

López-Cabezas C[1], Clares P[2], Gotor G[2], Báguena J[2], Ballesteros G[1], Ruiz S[1], Ceamanos S[1], Barrantes M[1], Soy D[1]

[1]Pharmacy Service. Division of Medicines. Hospital Clínic de Barcelona - Universitat de Barcelona

[2]IQS School of Engineering – Universitat Ramon Llull, Analytical and Applied Chemistry Department. Barcelona, Spain

## Background and Importance

- The use of OPAT is growing exponentially due to its advantages for both patients and healthcare systems. However, one of its major challenges is ensuring drug stability under the variable conditions encountered in outpatient settings.

## Aim and Objectives

To evaluate the physicochemical stability **of five beta-lactam antibiotics** in **two different containers at three different external temperature** conditions.

## Materials and Methods

| Antibiotics studied | |
|---|---|
| Meropenem | 12 mg/mL |
| Ceftazidime | 24 mg/mL |
| (+ degradation product pyridine) | |
| Cefta/avibactam | 24/6 mg/mL |
| Cefiderocol | 10 mg/mL |
| Ceftarolina fosamil | 6 mg/mL |
| (all in 0.9% saline polyolefin bags) | |

**1)** Evaluation of **Physical characteristics**, **pH** and antibiotic **concentration** (UHPLC). All samples were analyzed in triplicate at four storage temperatures: **< 10°C, 15°C, 23°C and 30°C**.

**2) Temperature evolution** inside portable thermal bags and polystyrene foam boxes was monitored for 24h at three different external temperatures: 23 °C, 30°C and 40°C.

**3) Antibiotic stability was correlated with the temperature inside the portable coolbox** to define the maximum stability time for each antibiotic under specific external temperature conditions.

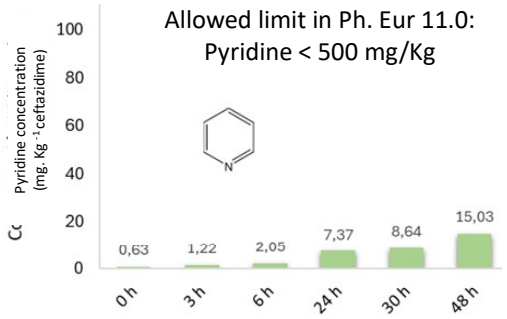
## Results

**1a) Maximum stability time for each antibiotic at four storage temperatures.**

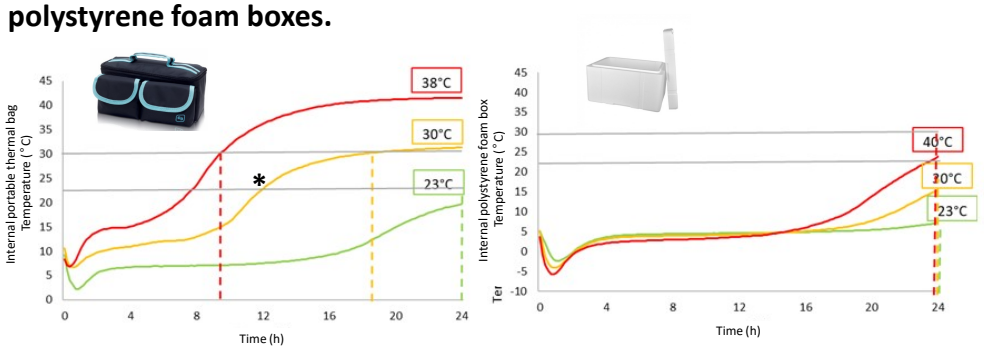
| Temperatura interior (°C) | Meropenem | Ceftazidima | Avibactam | Cefiderocol | Ceftarolina fosamil |
|---|---|---|---|---|---|
| 3 - 10°C | 72 h | 72 h | 72 h | 72 h | 72 h |
| 15 ± 2 °C | 24 h | 48 h | 48 h | 48 h | 48 h |
| 23 ± 2 °C | 24 h | 48 h | 48 h | 48 h | 24 h |
| 30 ± 1 °C | 10 h | 30 h | 30 h | 30 h | 8 h |

All ATB and pyridine were analyzed by UHPLC-PDA, and by UHPLC-QDA for avibactam, using validated chromatographic methods.

**1b) Pyridine concentration in ceftazidime samples.**




**2) 24 h-temperature evolution inside portable thermal bags and polystyrene foam boxes.**




Two ice accumulators were placed in the containers with a temperature sensor.

(*) Note that at 30ºC (external temperature), if the ice accumulators were changed b.i.d., temperature inside the bag would be kept under 23ºC for 24h.

## Conclusion and Relevance

- All antibiotics studied remained stable for at least 24h, even at the highest temperature tested, when stored in a polystyrene foam box. When stored in a portable thermal bag, all antibiotics were stable for at least 24h at 23°C. However, at 30°C, only ceftazidime, ceftazidime/avibactam, and cefiderocol remained stable for 24h. At higher temperatures, a more hermetic container would be recommended to ensure 24-hour stability.



mclopez1@clinic.cat