Clarithromycin

General sectors: Pharmaceutical

(CAS numbers: e.g. 81103-11-9, EC number: 617-200-4
/ Entry number in HELCOM list of priority substances: 10)

DRIVERS | ACTIVITIES | PRESSURES | STATE | IMPACTS

Why a HELCOM priority?

Main evidence

S Concentrations of Clarithromycin exceed the applied threshold value in **7** of the 21 examined areas (assessment units) of the Baltic Sea. The threshold is exceeded in both coastal and off-shore areas (**1**/2 assessed off-shore areas). In these 7 areas, on average **62%** of the assessible samples in **water and/or sediment** exceed the threshold value. This is based on monitoring data for the period 2015-2023 as reported by Contracting Parties (CPs) as response to a data call organized by HELCOM, as well as in scientific articles/reports[1]. A total number of 480 data points were possible to evaluate for Clarithromycin.

By further considering how much above or below the threshold each concentration is, and how often the substance is detected, Clarithromycin scores **7.1/10** (confidence range: **7.1 – 7.6**) in the scale established when assessing the criticality/significance of current levels in the Baltic Sea pose, where 5 indicates concern and 10 extreme risk, and the range reflects the level of reliability and representativeness of concentrations and the thresholds.

The threshold values for Clarithromycin, for water and sediment, were acquired respectively from the EC proposed Directive amending WFD and EQSD[2] and the ecotoxicology database of the NORMAN Network[3].

I Current levels in the Baltic Sea indicate potential negative impacts on sediment dwelling biota and pelagic biota.

Supporting evidence

P Approximately **1-2 tonnes of Clarithromycin** are estimated to enter the Baltic Sea every year via WWTPs/rivers (WATERBASE[4]; Undemann et al, 2022[5]). Given that the substance is **suspect as very persistent and is very toxic**[6] (according to the EU WFD/EQSD update proposal, it also tends to accumulate in sediment and/or biota[6]), current inputs are considered as likely significant, in terms of risk they pose for the Baltic Sea and its ecosystem services. As mentioned above, levels in Baltic Sea have already exceeded thresholds, due not only to current but also the historical inputs.

A With sales in CPs of ≥1.5 – 2.7 t/y (2015-2022[7]), the predicted (conservative) river concentration at the proximity of WWTP effluents by using the guidelines of Phase I ERA is around the threshold value for freshwater (0.6 – 1.2 , or 0.6 when using the sales figure from 2022).

I Clarithromycin has an elevated potential for the selection of antimicrobial resistance compared to other antibiotics[8].

Overall assessment

When assessing current levels in the Baltic Sea, current inputs, and the severity of the relevant toxicity mechanism, Clarithromycin scores **57-74/100** in the scale established for assessing the overall risk for impacts/threat for the Baltic Sea, where 50 indicates concern, 100 extreme risk, and the width of the span outlines the uncertainty in the assessment.

Facts relevant for management considerations

Causal chain and pathways

A It is a macrolide antibiotic[9], authorised only for human use[10]. While reserved for human use, there are examples that it has been used in veterinary applications, e.g., for companion animals (dogs and cats) and for foals[10]. It is, in combination with other antibiotics, the first choice antibiotic for severe community-acquired pneumonia in hospital settings[8]. The amount of sales was mentioned above and has a decreasing trend. Specifically for Finland, according to expert information provided sales have decreased drastically (80%) over the last 20 years.

P Based on available estimations[4,5], WWTPs likely contributes equally to riverine and direct inputs to the Baltic Sea.

Relevant policies (existing or planned measures)

M (on A/P)

- Listed in the first and second **EQSD Watch Lists**. And also as priority substance in the **EU WFD** update proposal.
- It is one of the 'Category 1' substances (substances that can be very easily treated) in the updated Directive on urban wastewater treatment.

References:

1. 2. 3. 4. 5. 6. 7. 8. 9. 10.

[Note: Listing of detailed references will be provided in an upcoming update of the fact sheet – for a listing of the most common references among the different substances see the section at the end of the consolidated document which includes all the fact sheets]