Newsletter #2

for project MEDWwater

March, 2022

The second period of MEDWwater is over and the project is in its middle phase. In this newsletter you will find information about activities carried out during 2nd period and the latest information about the project related topics.

Interreg Latvija–Lietuva
European Regional Development Fund

EUROPEAN UNION

MEDWwater

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CONTENT

Project LLI-527

"Pharmaceuticals in wastewaters – levels, impacts and reduction" MEDWwater

Project aims to increase the efficiency of pharmaceutical substances pollution management and to increase cooperation between governmental institutions and wastewater treatment plant operators.

Total projects size
673 773 EUR

Out of them co-funding of European Regional Development Fund
572 707 EUR

Project duration:
February 1, 2021 – December 31, 2022

PROJECT PARTNER:

- Latvian Institute of Aquatic Ecology Agency of Daugavpils University, ***www.lhei.lv***
- Kurzeme Planning Region, ***www.kurzemesregions.lv***
- Latvian Environment, Geology and Meteorology Centre, ***www.videscentrs.lvgmc.lv***
- University of Klaipeda, ***www.ku.lt***
- State Agency of Medicines of Latvia, ***www.zva.gov.lv***
- State Medicines Control Agency under the Ministry of Health of Republic of Lithuania, ***www.vvkt.lt***

Project is co- financed by

Interreg V-A Latvia – Lithuania Programme 2014-2020
www.latlit.eu

Nature Needs No Pill

LATVIJAS HIDROEKOLOĢIJAS INSTITŪTS
KURZEMES PLĀNOŠANAS REĢIONS
LATVIJAS VIDES, ĢEOLOĢIJAS UN METEOROLOĢIJAS CENTRS
Klaipeda University
Zāļu valsts aģentūra
STATE MEDICINES CONTROL AGENCY

Consumption data on 25 selected APIs have been compiled in both Latvia and Lithuania for the period 2018 to 2020

In first project period 25 most relevant active pharmaceutical ingredients (APIs) were selected out of more than 200 APIs for further investigation including chemical analysis and environmental risk analysis.

- *Aciclovir*
- *Amoxicillin*
- *Atorvastatin*
- *Azithromycin*
- *Betahistine*
- *Carbamazepine*
- *Ciprofloxacin*
- *Clarithromycin*
- *Diclofenac*
- *Erythromycin*
- *Hydroxychloroquine*
- *Ibuprofen*
- *Meldonium*
- *Metformin*
- *Metoprolol*
- *O-desmethylvenlafaxine*
- *Oseltamavir*
- *Paracetamol*
- *Perindopril*
- *Ramipril*
- *Rosuvastatin*
- *Sulfamethoxazole*
- *Telmisartan*
- *Trimethoprim*
- *Venlafaxine*

see the first newsletter

Now, together with project partners the State Agency of Medicines of Latvia and the State Medicines Control Agency under the Ministry of Health of Republic of Lithuania, consumption data (in terms of sales data) is compiled for the period 2018 to 2020. As a result, it can be concluded that both countries have similar API consumption patterns. From the selected 25 APIs the most consumed API is **metformin** (metabolic disease medication) that during the 3-year period was sold in the amount of more than 100 thousand kilograms. It was already previously known that it was mostly used in oral antidiabetic medication. The daily dose can be as high as 3 g per day, and type 2 diabetes is a common condition, which explains the rather high overall consumption. 2nd and 3rd most consumed API is **ibuprofen** and **paracetamol** (non-steroidal anti-inflammatory drugs and analgesics) that during the 3-year period was sold in the amount of more than 60 thousand kilograms. Both also previously identified high in consumption in European countries. Paracetamol is the first recommended medicine for pain and fever in children, pregnant and elderly, and in long-term conditions such as arthritis. Paracetamol is available individually and in combination. 4th and 5th most consumed API was antibiotic **amoxicillin** and metabolic disease medication **meldonium** that during the 3-year period were sold in range between 10 – 20 thousand kilograms depending on the country. Amoxicillin is used to treat a wide variety of bacterial infections. It is a penicillin-type antibiotic that works by stopping the growth of bacteria. This antibiotic treats only bacterial infections. It will not work for viral infections (such as common cold, flu). Meldonium is pharmaceutical, developed in 1970 by Ivars Kalviņš at the Institute of Organic Synthesis of Latvian SSR, and manufactured by the Latvian pharmaceutical company *Grindeks* and several generic manufacturers. Meldonium has been shown to have beneficial effects in cardiovascular, neurological and metabolic diseases due to its anti-ischaemic and cardioprotective properties, which are ascribed mainly to its inhibition of ß-oxidation and its activation of glycolysis. Despite its widespread use, there are only few clinical studies or clinical trials available. Meldonium is registered in most Baltic countries and is easily accessible through the internet with no serious adverse effects reported by the manufacturer so far. It is primarily distributed in Eastern European countries as an anti-ischemia medication. It is also one of the metabolic drug whose inclusion in the 2016 List of Prohibited Substances and Methods followed the analysis of data collected under the 2015 World Anti-Doping Agency Monitoring Program.

INFORMATION PREPARED BY
Ieva Putna-Nīmane, researcher at LIAE

The sampling campaigns successfully completed

In the first reporting period the selection of wastewater treatment plants in 16 largest towns were finished and sampling procedures were agreed upon. In total 8 WWTPs from each country, where some of them belong to the shared Latvian-Lithuanian Venta and Lielupe river basin districts (see the first newsletter). The sampling campaigns were organised as planned in our Project Application - in July 2021 and December 2021 in order to obtain seasonal differences in APIs concentrations. Water/wastewater samples were taken in influents and effluents (24-hours integrated samples) of WWTPs and receivers – upstream and downstream, additionally 16 sludge samples were collected (one sludge sample from each WWTP). All samples were frozen and delivered for chemical analyses of APIs at Klaipeda University and for ecotoxicity at LIAE.

December sampling in Dobele WWTP (waste waters)

24 h sampling at wastewater treatment plants (WWTPs) in influent and efluent of wastewater is necessary to know how many active pharmaceutical ingredients (APIs) are there to calculate the efficiency of the WWTP in the treatment of these substances; the 24-hour integrated sample shows more accurately a one day situation.

Sludge sample from Talsi WWTP (December sampling)

It is important to take a sludge sample in order to know the amount of API concentration in the wastewater sludge. Later they could end up on agricultural land if the sludge is used for fertilizing the soil.

Sampling in River Bērze (December sampling)

River sampling upstream and downstream of WWTP is necessary to understand how many APIs have survived in the river from the upper sources of pollution and how many have been present with WWTPs effluent.

An overview of the existing strategies, planning documents, legislation regarding existing requirements for cleaning technologies of pharmaceuticals from wastewater identifying possible areas of improvement is in finalizing stage.

The aim of this document is to give an overview of the existing strategies, legislation, planning documents regarding monitoring and impact to environment, and possible reduction of active pharmaceutical ingredient (API) impact on environment. The report will further be used in preparation of the next output of project – D.T3.3.1 "Recommendations for wastewater treatment plants for safe removal of pharmaceuticals and list of pharmaceuticals to be monitored" as a summary of existing practices. The main emphasis of this report is on the main source of API in environment: municipal wastewater treatment plants (WWTP) (UNESCO and HELCOM, 2017), which is the main subject of project MEDWwater. Take-back and disposal of unused pharmaceuticals and other pharmaceutical waste are also briefly summarized, as it also impacts loads of API to surface water.

WWTPs nowadays work in frame of existing European and national legislation, that requires removal rates and emission limits for such parameters as suspended solids, chemical oxygen demand (COD), biochemical oxygen demand (BOD), total nitrogen and total phosphorus, but not API yet.
Examples of good practice in reducing API substances at source are also briefly mentioned in this report, because it helps to reduce the load of API that reaches the WWTP.

The report will be published on Project partners web pages after Advisory board's recommendations and comments in March.

INFORMATION PREPARED BY
Maruta Vehi and Anete Kublina, senior specialists at LEGMC

Painkillers dominating in Lithuanian and Latvian waste waters and water bodies

During the summer of 2021 (July-August) first sampling campaign was conducted by the researchers from Klaipėda University Marine Research Institute (LT) and Latvian Environment, Geology and Meteorology Centre (LV). Sampling procedures were agreed upon among project partners and associated members: samples of waste water were taken at the WWTPs influent and effluent, water samples taken upstream the WWTPs in the receiving water bodies (surface water not impacted by wastewater spot), as well as downstream of the WWTP outlet (discharge point) at the distance of sewage and receiver water complete mixing point (approximately 500 m distance).

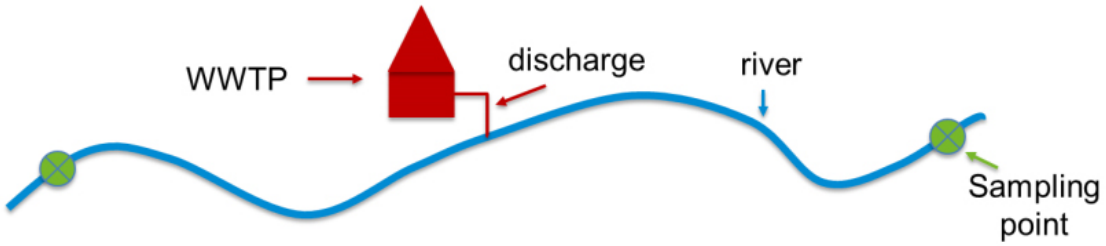


Fig. 1. Schematic overview of samples collection in WWTPs (inlet + outlet) and water bodies (upstream + downstream) in Lithuania and Latvia

Fig. 2. Summer sampling process of the treated waste water at Rokiškis Town WWTP in Lithuania (left) and collection of water sample from River Tenžė, downstream from the Kretinga WWTP outlet in Lithuania (right)

33 samples of waste water from the 16 WWTPs in both countries and 34 samples of water from the selected waterbodies/receivers were collected during the summer campaign and sent to Klaipėda University Marine Research Institute for sample preparation and analysis of the selected pharmaceuticals. By applying the same validated method of analysis to all samples at Klaipėda University increased comparability of data was obtained.
Preliminary results of the chemical analysis revealed absolute dominance of anti-inflammatory and analgesic substances in waste water influents and majority of the analyzed water bodies.

Extraordinary high inlet concentrations have been measured for **Paracetamol** with concentrations ranging from 953 ng/L (Dobele WWTP) up to 34 393 ng/L (Klaipeda WWTP). High inlet concentrations were found also for **Ibuprofen** with values varying from 1503 ng/L (Bauska WWTP) up to 28 945 ng/L (Klaipeda WWTP). Predominance of painkillers among other investigated pharmaceutical substances is typical for all 16 WWTPs.

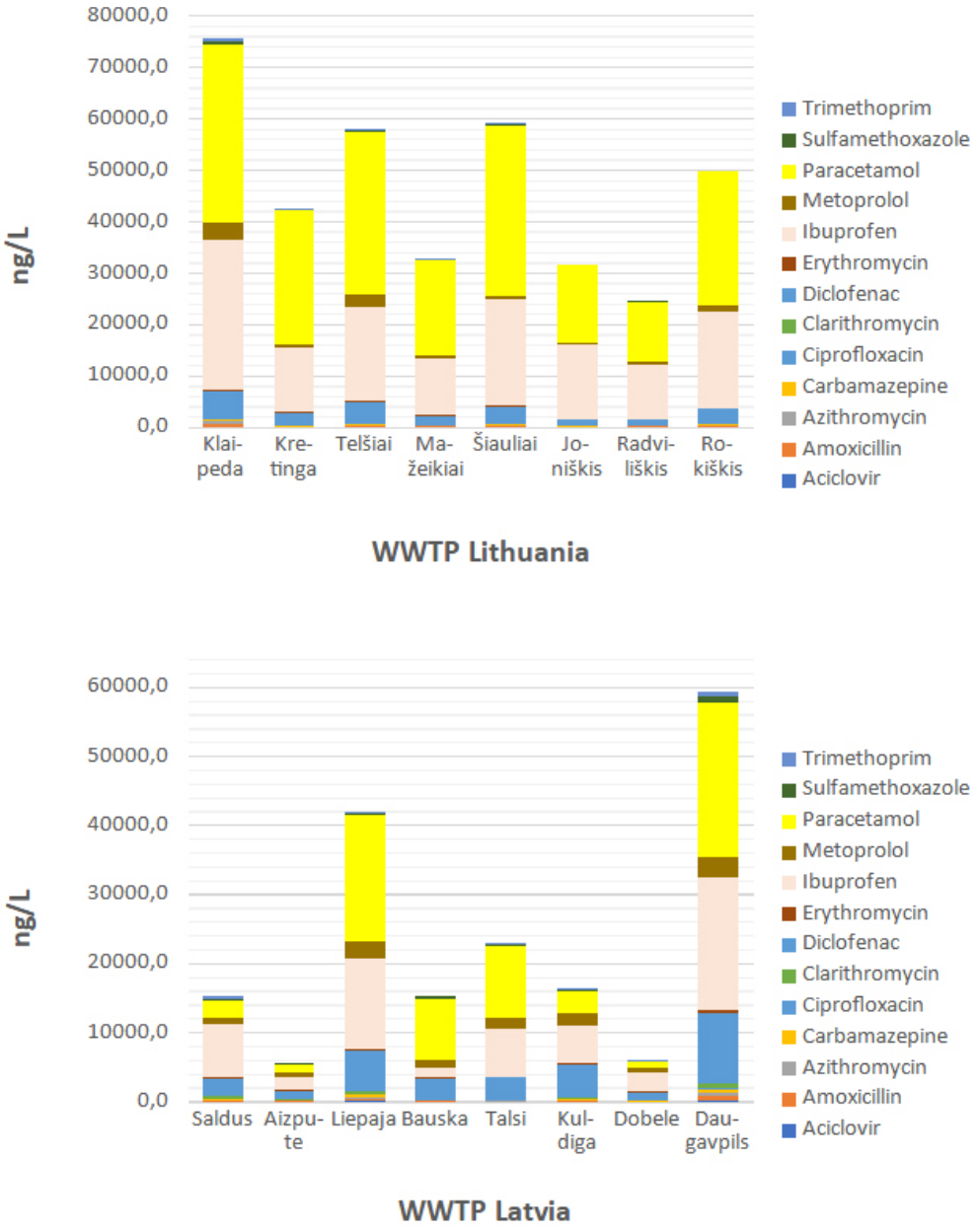


Fig. 3. Proportions of analyzed pharmaceuticals (n=12) in the influents of investigated waste water treatment plants (MEDWwater 2021 summer sampling)

The highest concentration of any medication found in the investigated water bodies typically was of **diclofenac**, with maximum values in Lithuania characteristic for small Svaige stream (21.9 ng/l) near Telšiai WWTP as well as area of Klaipėda strait near Klaipėda (18.9 ng/l), while in Latvia the highest values of diclofenac were observed in River Daugava near Daugavpils (23.8 ng/l) and upstream Saldus WWTP (18.7 ng/l). Quite high amounts (11.9 – 12.5 ng/l) of paracetamol were detected in Lithuanian River Kulpe, located near Šiauliai WWTP.

Overall, higher average concentrations of most analyzed **pharmaceutical** substances were more typical of Lithuanian water bodies. In Latvian waters slightly higher average concentrations were typically found of antibiotics: azithromycin, clarithromycin and sulfamethoxazole.

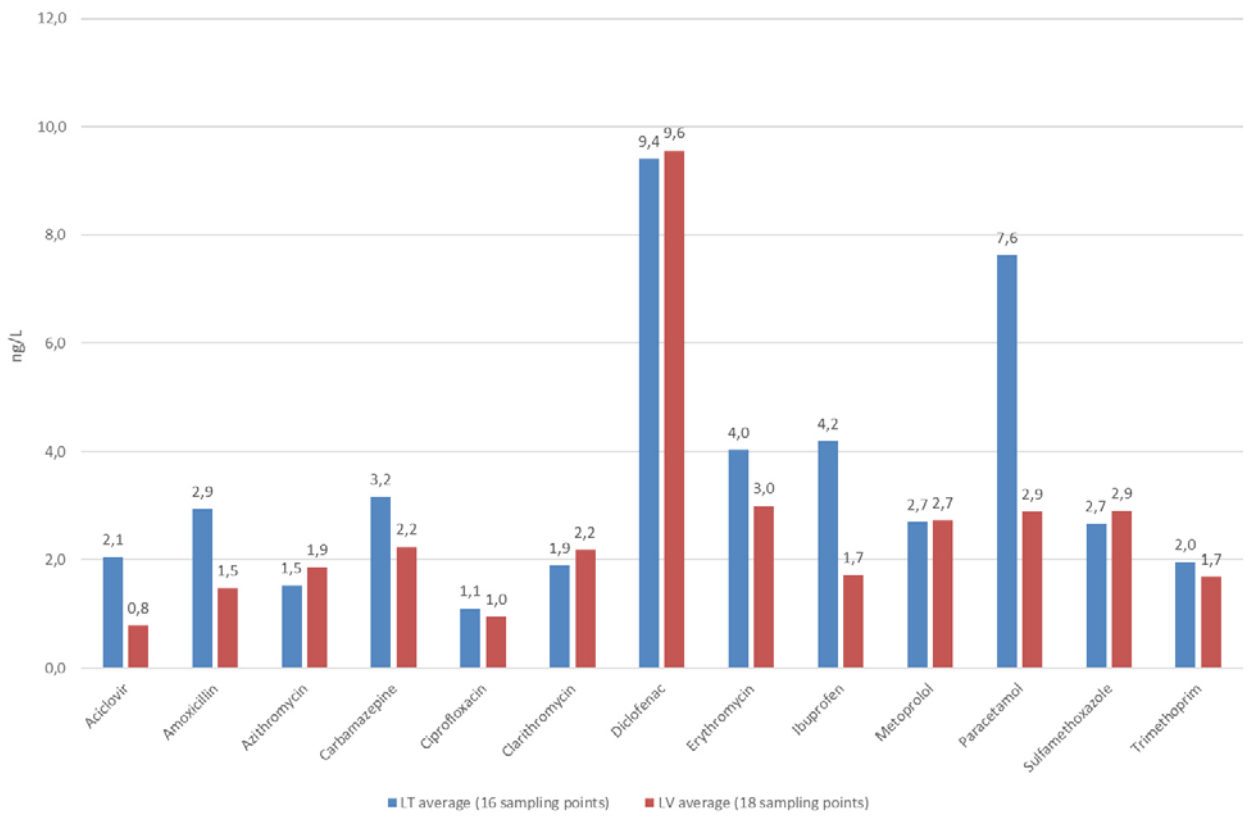


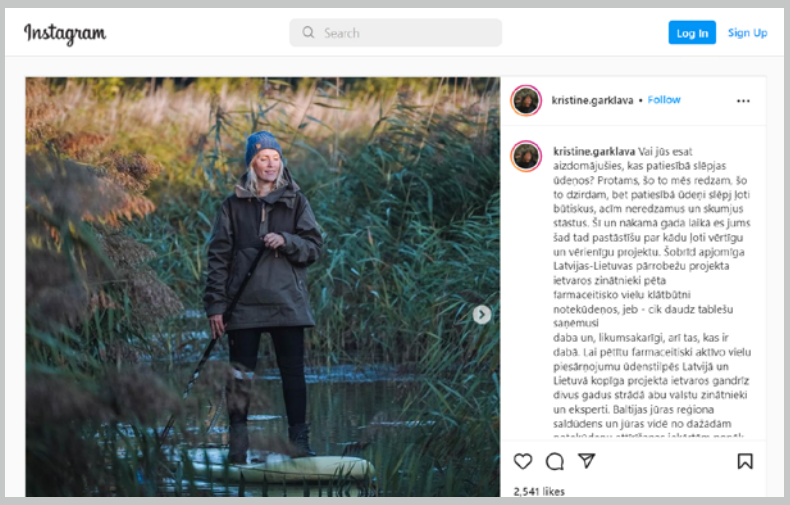
Fig. 4. Average concentrations of pharmaceuticals in Lithuanian (n=16) and Latvian (n=18) water bodies (MEDWwater 2021 summer sampling)

INFORMATION PREPARED BY
Dr. Sergej Suzdalev, researcher at University of Klaipeda

Communication activities

In order to find out more information about the project and the related topics for as wide a range of people as possible, within the project MEDWwater we have started cooperation with bloggers from both Latvia and Lithuania. Please follow our bloggers *@kristīne.garklāva* and ***@Išpakuota*** on social media platforms or see posts on Facebook by our Project partners under

#MEDWwater #DabaiTabletiNevajag #GamtaiVaistųNereikia #NatureNeedsNoPill



www.instagram.com/kristine.garklava/

www.facebook.com/ispakuota/

Gamtai Vaistų Nereikia

Dabai Tableti Nevajag

Nature Needs No Pill

In cooperation with the State Agency of Medicine in Latvia and Lithuania, Pharmaceutical Care Association of Latvia, Pharmacists' society of Latvia and Individual Pharmacists' organisation, we have started working on creating two educational videos and infographics for general public. Pharmaceuticals can be found in the rivers, lakes, The Baltic Sea and the soil. How do they get there? What is their impact on nature? Can each of us do anything to reduce their negative effects on plants and living creatures? Where to put unused medicine? These videos and infographics are part of the informative campaign "Nature needs no pill", which will actively start during 3rd period of project and where we will try to get attention of general public and explain the answers to questions mentioned previously in an interactive and easy- to understand way.

Summer and wintertime sampling phases are over. You will find out more about sampling in wintertime in Lithuania and the importance of the project MEDWwater in TV3 story

https://play.tv3.lt/clips/tv3-zinios-mokslininkai-vandenyje-rado-vaistu-likuciu-nuo-tokiu-farmaciniu-liekanu-net-zuvys-ima-keisti-lyti,clip-3744971?fbclid=IwAR2CCk-T7JJof-3ezzKtylVYr8eQyGWhfQh-gir7dKXj-gAU3ZLvqC_N50Us

MEDWwater project manager and researcher Ieva Putna - Nīmane explains in TV interview the current situation about the active pharmaceutical ingredient pollution in water bodies.

https://skaties.lv/zinas/900-sekundes/cik-sazaloti-ir-latvijas-udeni/?fbclid=IwAR0GlbtCkGbNuEG_GW-f8UX6qtaowOZk0TVDKojVvoYJ5ie5Ve6oVk6fplKo

INFORMATION PREPARED BY
Liena Freimane, Project communication coordinator, Kurzeme Planning region

For more information about the MEDWwater (LLI-527) project, please visit the following sites:

LV
https://www.kurzemesregions.lv/projekti/vides-aizsardziba/medwwater/

LT
http://apc.ku.lt/index.php/medwwater/

ENG
https://www.kurzemesregions.lv/en/projects/protection-of-environment/medwwater/
and
https://latlit.eu/?s=medwwater

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