












Biomonitoring research on persistent organic pollutants (POPs)
 In the surrounding environment of
 the WtE waste incinerator in Zubieta 2019 – 2023

| |  Dioxins |  PFAS |  PAH |  Heavy metals |
|--|--|---|--|---|
|  <p>Results 5-year biomonitoring</p> |  |  |  | |
| |  |  | | |
| |  | | | |

Eggs - Mother Milk - Pine needles
 Mosses - Water
 Sediment

A.Arkenbout, K.J.A.M. Bouman

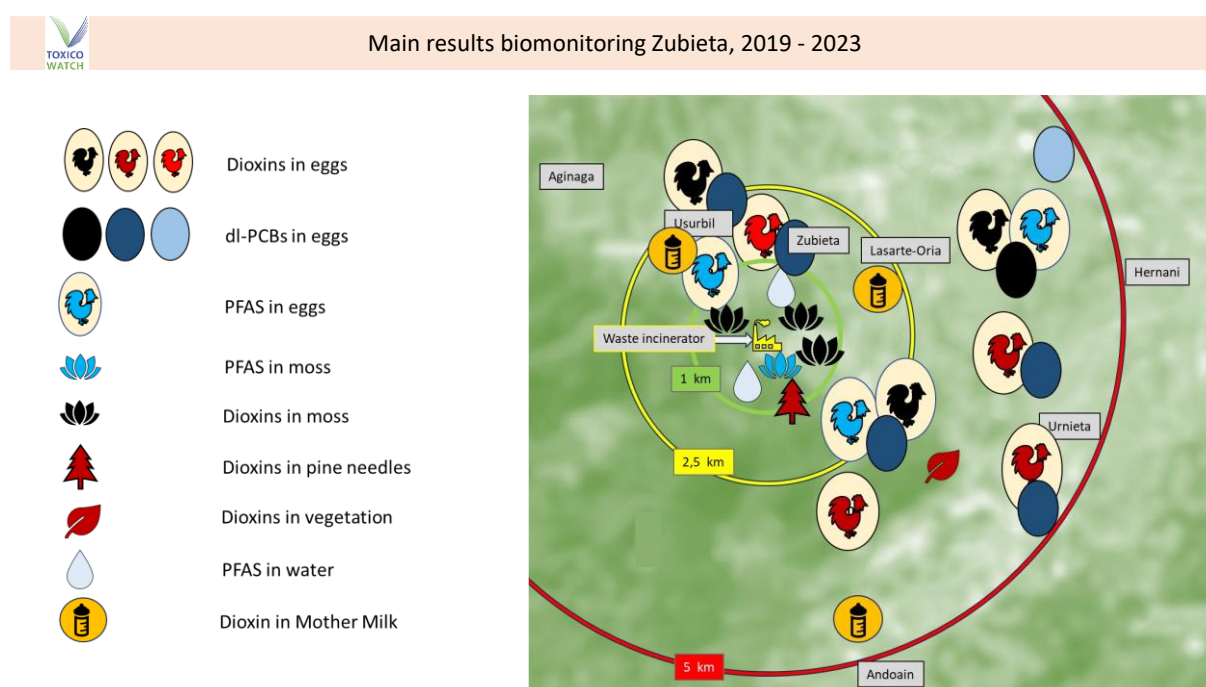
20 May - 2024

Conclusions

In 2019, ToxicoWatch (TW) initiated a multi-year biomonitoring research on persistent organic pollutants (POPs) in the surrounding environment of a newly constructed Waste-to-Energy (WtE) waste incinerator in Zubieta, at the request of the local group Zubieta-Lantzen. The biomonitoring research is concentrated in three zones: an inner circle of < 1 km, a second circle of < 2,5 km, and an outer circle of < 5 km around the Zubieta waste incinerator.

The research area is located in the north of Spain, in the Basque country. This multi-year research began during the construction of the waste incinerator, before waste combustion started. In the first year, zero-measurements on dioxins and dioxin-like PCBs (PCDD/F/dl-PCBs) were conducted using biomarkers such as backyard chicken eggs, vegetation (pine needles, leaves of evergreen shrubs, and mosses), mother's milk, water, and sediments. In 2019, a joint research by the Spanish research team Geyser focused on sampling and analysing dioxins and heavy metals in vegetation and soil. In the following years (2020-2023), the biomatrices were expanded to include analysis of PAH and PFAS using chemical (GC-MS, LC-MS/MS) and innovative bioassay techniques (PAH CALUX, PFAS CALUX, and FITC-T4 for PFAS). The 2019 results already showed dioxins in the eggs of backyard chickens, exceeding the food safety limits. No dioxins were detected in mosses and pine needles.

In 2023, with the support of Zero Waste Europe, TW was able to extend its biomonitoring research in the environment of the Zubieta waste incinerator extensively and will continue until 2025. Almost, all egg locations from 2019 could participate again part of the research in the 2023/2024 study. The results in 2023 show increasing levels of dioxins (PCDD/F and dioxin-like PCB) in all chicken egg locations.



At the Hernani-03 location, an increase of 460% in PCDD/F/dl-PCB was measured in backyard chicken eggs, marking the highest dioxin level in 10 years of TW biomonitoring in Europe around waste incineration facilities (both old and new WtE facilities).

In the Zubieta environment, exceedances are 2-3 times above the EU limits for the safe consumption of chicken eggs. The chemical analysis on eggs shows lower values since brominated dioxins are not yet included in monitoring and only 29 chlorinated dioxins are mandated by EU regulations. The contamination of Substances of Very High Concern (SVHC) is not only an egg problem but a general environmental issue in Zubieta. High concentrations of dioxins were also found in mosses (*Bryophyta*) and pine needles. An alarming discovery was the presence of PFAS in eggs, moss and vegetation. PFOS levels of 4.4 ng in eggs at Hernani-03 and Andoain-15 locations surpass the EU limit for PFOS by 440%.

In 2019 TW set up a baseline study with 39 participants. Mother milk was pooled in three samples in three villages around the incinerator. It will be interesting whether this mother's milk study can be repeated in 2024-2025. The results of this research can give information about the state of public health and the toxic load in this environment.

The increase of dioxins (PCDD/F/dl-PCB) and PFAS necessitates a thorough investigation of sources. Semi-continuous measurements of emissions from Zubieta's waste incinerator generate minute data on various parameters, providing insight into the effectiveness of flue gas treatment management. Monitoring the frequency of Other Than Normal Operating Conditions (OTNOC), such as start-ups and shutdowns is particularly crucial. This (semi-)continuous raw minute data (uncorrected, non-averaged periodic monitoring data) of the flue gases can elucidate the contribution of the Zubieta waste incinerator as a source of POP emissions.

ToxicoWatch will continue and expand this multi-year biomonitoring research in 2024 and 2025 on backyard chicken eggs, vegetation, water/sediment, soil and potentially a follow-up on the mother's milk research study.

TW – May 2024