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Pesticides in water sources from agricultural areas of Santiago del Estero, Argentina

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The presence of pesticides in drinking water is an important issue to rural communities from agricultural areas. In semi-arid regions of Argentina, surface water sources are generally scarce and groundwater may be of poor quality, therefore rainwater becomes essential for safe water supply to local people. The advance of agriculture in these regions due to no till management and glyphosate-resistant crops has led to a high use of pesticides, endangering the safety of all water sources used for human consumption.
This study monitored the presence of pesticides in different water sources from two cities located in agricultural areas of the province of Santiago del Estero: Sachayoj and Bandera. Sampling was carried out between April 2014 and June 2017 during seasons of pesticide spraying in the crops surrounding both cities. Samples belonged to tanks in which rainwater is collected, wells and dams. 34 compounds (30 pesticides and 4 secondary metabolites) were analyzed by ultra-high performance liquid chromatography combined with a MS/MS detector.
All compounds were detected at least once, although they could not always be quantified. The most contaminated sources were dams, followed by cisterns and finally wells. Wells were the only source that showed differences between locations for some pesticides.
The environmental behavior was mainly governed by the characteristics of the pesticides, but doses applied to the field and frequency of use also played an important role in defining the presence of a compound and its concentration. Thus, the most frequent molecules were most of them herbicides and their degradation products. Atrazine and hydroxyatrazine were the most abundant, while glyphosate and aminomethylphosphonic acid presented the highest concentrations.
Measured values were generally below the EPA and WHO limits and only 7.4% of the data obtained for individual molecules exceeded the limit of 0.1 μg L-1 established by the EU, but adding up all the molecules for each site and sampling date 73% of them exceeded the limit of 0.5 μg L-1.