# The distribution of naturally occurring hexavalent chromium in groundwater from the Piedmont aquifers of eastern United States

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Since early findings of hexavalent chromium (Cr(VI)) in drinking water in the Hinkley community of San Bernardino County, California, there has been a persistent controversy over the sources of Cr(VI) in groundwater and its human health impacts. Most Cr in aquatic systems occurs as either the trivalent chromium (Cr(III)) cation $Cr^{3+}$, or Cr(VI) oxyanions. It is commonly assumed that the occurrence of Cr(VI) in drinking water wells is directly associated with human activities and any detection of Cr(VI) infers anthropogenic contamination. Yet recent investigation of drinking water wells in the Piedmont aquifers of North Carolina show that Cr(VI) is the predominant species of dissolved Cr in groundwater, ubiquitous in certain aquifers, and unrelated to anthropogenic source, such as nearby coal ash ponds [1]. The geochemical characteristics of Cr(VI)-rich groundwater (up to 22.9 μg/L), and utilization of geochemical proxies such as boron to chromium and $^{87}Sr/^{86}Sr$ ratios showed systematic differences from the composition of coal ash leachates. Instead, the $^{87}Sr/^{86}Sr$ ratios reflect the rock sources of the aquifers [1]. We show systematic higher Cr(VI) levels in shallow and oxic groundwater, particularly from aquifers composed of mafic rocks. Our results indicate that Cr(VI) is most likely naturally occurring (geogenic) and ubiquitous in groundwater from the Piedmont region in eastern U.S., which could pose health risks to residents in the region who consume well water as a major drinking water source.

[1] Vengosh, Coyte, Karr, Harkness, Kondash, Ruhl, Merola, Dywer (2016) Environ. Sci. Technol. Lett. 3, 409–414.