

Multi-decadal records of endocrine-disrupting compounds (PCBs, dioxins, furans, hormones, and parabens) in Rhône River sediment cores

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Introduction:

Identification of long-term trends in contaminant concentrations of endocrine-disrupting compounds in rivers can contribute to improved risk assessment and to evaluation of the effectiveness of environmental policies. However, datasets at a multi-decadal time scale (e.g., 20–50 years) of contaminant concentrations in water, sediment, and biota are not available for most large rivers. One way to overcome this limitation is to reconstruct histories of contamination by using sediment cores. In some fluvial systems, sediment accumulates in off-channel depositional zones over long periods, creating multi-decadal records of contaminant concentrations.

Methods:

Here we present historical records of concentrations of PCBs, dioxins (PCDDs), and furans (PCDFs) in sediment cores collected from eight sites along the Rhône River (France), from Lake Geneva to the Mediterranean Sea, and from a reference site (Lake Paladru) (Fig. 1, a). Hormone and paraben concentrations also were measured in two of those cores. Sediments were age-dated using radionuclide profiles (¹³⁷Cs), and ages were refined by identification of flood deposits.

Results:

At the reference site, concentrations of PCBs, PCDDs, and PCDFs peaked in the 1970s, and have since decreased continuously [1]. Concentrations of PCBs, PCDDs, PCDFs, and hormones in Rhône River cores generally were elevated and variable in the late 1980s through the mid-1990s, decreased in the late 1990s, and have remained relatively stable since [2, 3]. At some sites, however, maximum concentrations were measured in sediment deposited as recently as the 2000s; most of these sites are downstream from the city of Lyon. In contrast,

concentrations of some parabens tend to be stable or increase downstream from Lyon in sediment deposited after the 2000s. Concentrations of PCBs and PCDDs increase in a downstream direction (Fig. 1, b).

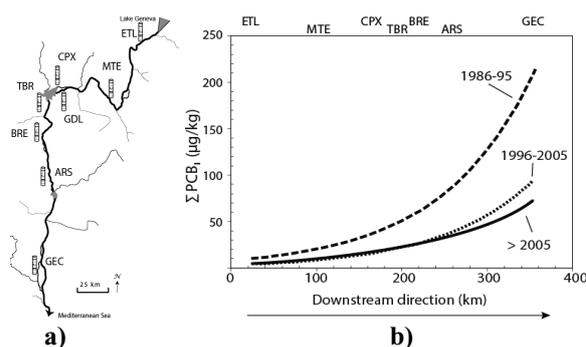


Fig. 1: a) Map of the study area (Rhône River basin, France) and locations of sediment core collection; b) Spatial trends for PCBs for decadal time windows.

Discussion:

This indicates that urban and industrial activities in the greater Lyon area and in the watersheds of some tributaries to the Rhône River have been and continue to be the principal sources of PCBs, PCDDs, and PCDFs to the river. Exponential models fitted to concentrations indicate that at some sites it might be decades before concentrations in sediment decrease to levels commensurate with regulatory threshold concentrations in fish tissue [2].

References: [1] Desmet et al. (2012) *STOTEN*, **433** : 189–197; [2] Mourier et al. (2014) *STOTEN*, **476–477** : 568–576; [3] Babut et al. (in prep).