This thesis aims at developing new tools to identify toxic compounds released into our environment.

Around three decades ago, environmental chemists developed a new technique to identify pollutants present in complex environmental mixtures: effect-directed analysis (EDA). EDA uses chemical tools (for the extraction, fractionation, and analysis of samples) together with biological tools (as bioassays) to find the cause of an observed effect. Such studies can be very powerful but the extensive material, the high number of fractions generated, and the expertise required by such intensive study can be an obstacle. This thesis tested different techniques for each EDA steps and several EDA studies have been performed. The aim of the thesis is to propose ways to increase EDA throughput and to facilitate the use of bioassays and chemical fractionations and analyses together. For the thesis, two bioassays were further developed and different fractionation and analytical techniques were performed and compared. In conclusion a «generic EDA» protocol was suggested as well as further development opportunities for EDA.