Recommenda­tions follow­ing a multi-laboratory com­par­i­son of mi­cro­bial source track­ing meth­ods

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AB­STRACT

Mi­cro­bial source track­ing (MST) meth­ods were eval­u­ated in the Source Iden­ti­fi­ca­tion Pro­to­col Proj­ect (SIPP), in which 27 lab­o­ra­tories com­pared meth­ods to iden­tify host sources of fecal pollu­tion from blind­ed water sam­ples contain­ing either one or two dif­fer­ent fecal types col­lected from Cal­i­for­nia. This paper de­tails les­sons learned from the SIPP study and makes rec­om­men­da­tions to fur­ther ad­vance the field of MST. Over­all, re­sults from the SIPP study dem­on­strated that meth­ods are avail­able that can cor­rectly iden­tify whether par­tic­ular host sources in­clud­ing hu­mans, cows and birds have con­trib­uted to con­tam­i­na­tion in a body of water. How­ever, dif­fer­ences be­tween lab­o­ra­tory proto­cols and data pro­cess­ing af­fected re­sults and com­pli­cated in­ter­pre­ta­tion of MST method per­for­mance in some cases. This was an is­sue par­tic­u­larly for sam­ples that tested pos­i­tive (non-zero Ct val­ues) but below the lim­its of quan­ti­fica­tion or de­tec­tion of a PCR assay. Al­though false pos­i­tives were ob­served, such sam­ples in the SIPP study of­ten con­tained the fecal pollu­tion source that was be­ing tar­geted, i.e., the sam­ples were true pos­i­tives. Given these re­sults, and the fact that MST of­ten re­quires de­tec­tion of tar­gets pres­ent in low con­cen­tra­tions, we pro­pose that such sam­ples be re­ported and iden­ti­fied in a unique cate­gory to fa­cil­i­tate data analy­sis and method com­par­i­sions. Im­por­tant data can be lost when such sam­ples are sim­ply re­ported as pos­i­tive or nega­tive. Ac­tion­able thresh­olds were not de­rived in the SIPP study due to lim­i­ta­tions that in­clud­ed geo­graphic scope, age of sam­ples, and diffi­culties in­ter­pre­t­ing low con­cen­tra­tions of target in en­vi­ron­ment­al sam­ples. Nev­er­the­less, the re­sults of the study sup­port the use of MST for water man­age­ment, espe­cially to pri­or­i­tize im­paired waters in need of re­medi­a­tion. Fu­ture in­teg­ra­tion of MST data into quan­ti­ta­tive mi­cro­bial risk as­ses­sments and other mod­els could al­low man­agers to more ef­ficiently pro­tect pub­lic health based on site con­di­tions.

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