The INCA-Pathogens model application to the Finnish river basin

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Good microbiological quality of surface waters is essential for recreational water use, drinking water production and food supplies via irrigation. Predictions of how and when microbes are transported are needed to protect downstream water users. In Finland there are guideline values for hygienic water quality which are set for drinking waters, bathing waters or waters used in food production. In this study we tested the new process-based INCA-Pathogens model in Finland. The INCA model is a catchment scale process based model to calculate pollutant transfer from terrestrial environment and point sources to the catchment outlet. The study area Loimijoki river basin is located in south western Finland. Fields cover 38% of the catchment area. There are also some areas with small-scale industry and several small but relatively densely populated settlements as well as cattle breeding farms. There are daily discharge measurements in three stations along the main river, and altogether 17 water quality sampling points of faecal coliforms (FC) and faecal enterococci (FS). In 1995-2004 sampling density was 2-10 samples per year, the highest sampling density being in the main river. . The highest bacterial counts were in the middle part of the main stream immediately after small industries and municipal sewage treatment plants. INCA-Pathogen model was able to produce bacteria count level and seasonality in the low count sampling points and in the high count sampling points. The simulated bacterial counts in runoff waters from fields were at the same magnitude with the measured ones. The model performance was sensitive to the parameters defining light decay in river water and in soil compartment. Simulations were sensitive also to amount of faecal bacteria spread on the fields in manure. Number of faecal bacteria repeatedly exceeded the guideline values for good quality of bathing water.