Toxicity test - improving experimental conditions

One can make use of the sorption effect discussed in the previous question in order to improve the experimental conditions in a toxicity test. In many cases one faces the problem that uptake and/or metabolism of the compound do affect the aqueous concentration throughout the run of the experiment. Without a constant aqueous concentration the whole toxicity experiment is not well defined and might not be reproducible or applicable to natural systems. If, however, the experimental system contains a sorbent with a quick partition kinetic and with a capacity much higher than that of the fish and the water, then this sorbent would act as a buffer and replace most of the compound that has been taken up (and metabolised) by the fish.

How would you do this for the following situation: You want to conduct a tox test with hexachlorobenzene (HCB). Your goal is that the HCB concentration must not drop below 90 % of the starting concentration when 1 kg fish are put into the tank and start taking up the HCB. The average fat content of the fish is about 5 % (i.e. 0.05 kg lipid per kg wet weight). There is no sediment or any other sorbing phase in the system.

How much of a sorbent (pre-equilibrated with HCB at the starting concentration) would you have to add as a buffer to the aquarium before the start of the experiment in order to achieve this goal?

Use the following partition constants:

$\log K_{lipid/water} = 5.8\ (L_{water}/L_{lipid})$

$\log K_{sorbent/water} = 5.0\ (L_{water}/L_{sorbent})$

- Excercises for an improved intuitive understanding
- Questions for recapitulation
- Good to know
- Minesweeper-problems