Excessive Mercury Bioaccumulation in Putah Creek Fish

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In September, 1998 the US Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry in cooperation with the US EPA Region 9 have released the results of bioaccumulation studies for mercury and several other constituents in fish taken from Putah Creek near Davis, California. The data are based on fish collections conducted by the US EPA Region 9 during the Fall 1997. An ATSDR draft report, "Fish Sampling in Putah Creek (Phase II) Laboratory for Energy Related Health Research, Davis, Yolo County, California, Cerclis No. CA2890190000, September 16, 1998," shows that fish taken from Putah Creek in the vicinity of the University of California, Davis wastewater discharges and stormwater runoff to Putah Creek contain concentrations of mercury that are considered to be a threat to human health when the fish are used as food. While the ATSDR uses 0.57 mg Hg/kg in fish wet weight as a critical concentration, the US EPA Region 9 guideline critical concentration value is 0.14 mg Hg/kg wet weight fish. Examination of the data in this report shows that while only a few fish such as the large large-mouth bass mercury tissue concentrations exceed 0.57 mg/kg, many fish taken from Putah Creek have mercury in their tissue in excess of 0.14 mg/kg.

Putah Creek Sediments as a Source of Mercury

The ATSDR draft report indicates that since the concentrations of mercury in Putah Creek sediments are the same throughout the region investigated, the University of California, Davis campus wastewater discharges and stormwater runoff from the LEHR site are not responsible for the excessive bioaccumulation of mercury. However, the situation could readily be that the wastewater and stormwater discharges/runoff contribute to conditions in the Creek which promote methylation of mercury in the vicinity of Old Davis Road and therefore are responsible, at least in part, for creating a public health hazard through inadequate wastewater treatment and stormwater management.

Potential Significance of UCD Wastewater Discharges

The 1997 data collection was a follow-on to a 1996 data collection by the US EPA Region 9 and ATSDR. In 1996, fish taken from Putah Creek near Old Davis Road where UCD's wastewater discharges occur had excessive concentrations of mercury and lead in their tissue. Fish taken above and below this location on Putah Creek did not have excessive concentrations of mercury or lead. The implication at that time was that it was UCD's wastewater discharges and possibly stormwater runoff that were the source of the mercury that was bioaccumulating to excessive levels in the fish taken near the point of discharge for the campus wastewater treatment plant. However, as discussed by the author, Dr. G. Fred Lee in his comments on the 1997 report, it cannot be ruled out that the

mercury is already present in the Creek and that inadequately treated wastewaters are creating conditions in the Creek that are promoting methylation of the mercury that is present in the sediments to a sufficient extent to lead to excessive bioaccumulation within fish in the Creek near Old Davis Road.

An important difference between the 1996 and 1997 conditions is that in 1996 the Putah Creek flow during the summer months was low which significantly impacted the ability of the fish to migrate up or downstream from Old Davis Road. In 1997, because of the wet year and increased releases from the upstream dam, the flow during the summer months has been high, and there is no barrier to fish migration.

Both in 1996 and 1997 analyses were conducted to determine if chlorinated hydrocarbons are also bioaccumulating to excessive levels within the fish in Putah Creek. The 1996 studies were conducted

Office of Environmental Health Hazard Assessment (OEHHA) should critically review the data that has been collected on Putah Creek fish by US EPA Region 9 ATSDR and make a determination as to whether a fish consumption advisory should be issued for fish taken from Putah Creek, at least in the vicinity of thndg e /ke

Since Putah Creek has been re-established as migratory fish habitat where chinook salmon were found in 1998 to have successfully reproduced in Putah Creek in the vicinity of where the fish are being found to have excessive mercury, Putah Creek should be part of the overall CALFED program and thereby eligible for funding to address water quality issues. The current proposed funding for Cache Creek should be expanded to include work on Putah Creek mercury and other hazardous chemical bioaccumulation issues.

Summary

Putah Creek is an important resource to the area. The excessive bioaccumulation of mercury in fish taken from Putah Creek mandates that the CVRWQCB take the necessary action to have wastewater and stormwater dischargers to the Creek establish an ongoing monitoring program to determine the amount of excessive bioaccumulation of mercury and other constituents in Putah Creek, sources of the constituents/conditions responsible for the excessive bioaccumulation of mercury,

Comments on
the US Department of Health and Human Services Public Health Service
Agency for Toxic Substances and Disease Registry
Draft Health Consultation "Fish Sampling of Putah Creek (Phase II)"
for the LEHR National Superfund Site
dated September 16, 1998

Comments Submitted by
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In July 1995, with the US EPA's funding of the Technical Assistance Grant (TAG) to the Davis South Campus Superfund Oversight Committee (DSCSOC) and the appointment of Dr. G. Fred Lee as the TAG advisor, Dr. Lee pointed out, at a meeting with Dr. William Taylor of the Agency for Toxic Substance and Disease Registry (ATSDR), that the previously conducted studies over the past half a dozen years on the potential public health and environmental impacts of the UCD DOE LEHR national Superfund site were significantly deficient with respect to evaluating the potential for hazardous chemicals present in LEHR site stormwater runoff and wastewater discharges to cause public health and environmental problems associated with the use of Putah Creek. Of particular concern was the lack of information on the potential for LEHR site-derived wastes to bioaccumulate in Putah Creek fish to hazardous levels for those who use the fish as food, as well as other forms of aquatic and terrestrial wildlife. This situation led to ATSDR developing a cooperative working relationship with the US EPA Region 9, where a set of fish, water, and sediment samples were collected in 1996 from Putah Creek for analysis for chemicals that are of typical concern because of their potential to bioaccumulate to excessive levels in fish and other aquatic life, causing these organisms to be a threat to those who use them as food.

In the Winter of 1997 the first draft versions of the 1996 Putah Creek bioaccumulation studies were released. Since that time there have been a series of comments on that study relative to the important information gained from it and the deficiencies in the study. These comments have been prepared by J. Roth, Executive Director of DSCSOC and Dr. G. Fred Lee. The results of the 1996 fish bioaccumulation studies and the comments on these studies are available for review on the DSCSOC website, http://members.aol.com/dscsoc/dscsoc.htm. They include the following:

"Concentrations of Selected Radionuclides and Chemicals in Fish, Sediment, and Water Collected from the Putah Creek Near the Former Laboratory for Energy-Related Health Research," March 31, 1997.

"Health Consultation; Fish Sampling in Putah Creek, 1996," April 4, 1997.
"Agency for Toxic Substance and Disease Registry's (ATSDR) Fish Hazardous Chemical Study Report for Putah Creek," undated.

"Comments on UCD Bioaccumulation Studies," July 2, 1998.

"Follow-up Sampling of Putah Creek Fish for Hazardous Chemical Content," October 12, 1997.

"Unreliable Information on the Hazards of Consuming Putah Creek Fish Due to Excessive Bioaccumulation of Mercury and Lead," April 14, 1998.

"Additional Comments on Responses to 1996 ATSDR Bioaccumulation Studies," April 27, 1998.

In addition, several of the RPM meeting comments submitted by Dr. Lee to DSCSOC contain additional information on these issues.

The 1996 fish bioaccumlation study showed that Putah Creek fish taken from the vicinity of where some of the LEHR site stormwater and UCD campus wastewater, which includes waste from the LEHR site, as well as stormwater runoff from this site, contained excessive concentrations of mercury and lead. Fish taken upstream and downstream of this location did not contain excessive concentrations of these or other constituents that typically bioaccumulate in fish tissue to levels that represent a threat to human health.

However, as pointed out by Dr. Lee, there were significant problems with some of the analytical methods used for some other constituents of potential concern, especially certain chlorinated hydrocarbon pesticides, in that the analytical methods did not have sufficient sensitivity to measure the constituent of concern at the level that the US EPA Region 9 has established as a guideline value for potential human health impacts. Further, there were some problems with the ATSDR US EPA report with respect to interpretation of the sediment quality data. DSCSOC recommended that follow-on studies be conducted to better define the magnitude of the bioaccumulation problem, the year-to-year variability of the results, and to measure the other constituents with sufficient analytical method sensitivity to determine if these constituents were present in fish tissue above US EPA Region 9 guideline values. Also of concern was the initiation of studies to determine the source of the lead and mercury that was found in the fish taken from Putah Creek near Old Davis Road.

Overall Comments on 1997 Fish Bioaccumulation Studies

The 1997 bioaccumulation studies, which are the subject of this report, showed that some fish taken from Putah Creek in the vicinity of the University of California, Davis wastewater and stormwater discharges to Putah Creek contained excessive concentrations of mercury. Of particular concern were the higher trophic-level "game" fish, such as largemouth bass. However, again, there were significant problems with the analysis of the fish obtained in these studies with reference to certain chlorinated hydrocarbon chemicals that are of concern because of their tendency to bioaccumulate to excessive levels in fish tissue, causing the fish to be considered hazardous to those who consume them as food. These studies confirm that there is a potentially significant public health problem associated with consuming fish from Putah Creek because of excessive concentrations of mercury and possibly other constituents in the fish tissue.

There is need for the regulatory agencies and the responsible parties for the LEHR site, the University of California, Davis, and others to implement a comprehensive, ongoing monitoring program for excessive bioaccumulation of hazardous chemicals in Putah Creek fish in order to define the magnitude of the problem, factors influencing the degree of bioaccumulation, the sources of the bioaccumulatable chemicals, and/or other constituents that lead to excessive bioaccumulation, such as the discharge of inadequately treated campus wastewaters to Putah Creek by the University of California, Davis. Further, in accord with current regulatory requirements, Putah Creek should be listed as an impaired waterbody that will lead to the development of a comprehensive remediation program to control the excessive bioaccumulation of hazardous chemicals in Putah Creek fish. Presented below are specific comments on the September 16, 1998 draft 1997 fish bioaccumulation studies.

Specific Comments

The cover page for this report lists the LEHR site as Yolo County. The LEHR site is in Solano County.

On page 1, under "Background," third paragraph, no mention is made of the fact that inadequate analytical methods were used in the 1996 fish bioaccumlation studies for several of the constituents of concern to detect the presence of the constituent at potentially hazardous concentrations. This should be mentioned, since now the presentation of the results is misleading, in that there could have been other bioaccumulation problems other than lead and mercury, which would have been detected if appropriate analytical methods had been used. As pointed out by the DSCSOC in their comments on the 1996 fish bioaccumulation studies, the second set of samples should have included organics as well, where more appropriate analytical methods were used for certain of the organics than were used in the 1996 sampling.

On page 1, last paragraph, it is mentioned that Thomas R. Payne & Associates, Inc. has been conducting fisheries monitoring on the lower Putah Creek for the Solano County Water Agency for the past six years. Copies of that data should be obtained and reviewed.

On page 2, under "Conclusions," it is of interest to find that mercury is still being found to be at excessive concentrations in some Putah Creek fish taken near the LEHR site.

On page 2, Conclusion 6, the statement, *"None of the analyses indicate that metals or other radionuclides in sediments pose a public health hazard."* This statement cannot be made from the data that are available. As discussed in DSCSOC's comments on the 1996 study, it is not possible from the data available to rule out that mercury in sediments in Putah Creek are a source of the mercury that is bioaccumulating to excessive levels in Putah Creek fish.

Conclusion No. 6 needs to be modified to state that "None of the analyses indicate that the metals in the sediments pose a public health hazard through direct contact. The mercury in sediments could be a public health threat through conversion to methylmercury, which then bioaccumulates in some fish to excessive levels."

Page 3, under "Follow-Up Public Health Actions," focuses on preparing a brochure which could be distributed to pregnant and nursing women to warn them about eating largemouth bass from Putah

Page 18, Table 5A for the chromium data which is assumed to be total chromium shows that the dissolved chromium, which could readily be chromium VI, is present in Putah Creek water at concentrations that are potentially toxic to zooplankton. This data and similar data taken in the past indicate that Putah Creek should be listed as an impaired waterbody due to the fact that the concentrations of chromium are repeatedly being found to be higher than well-established values for chromium VI toxicity to zooplankton. This, in turn, should cause the regulatory agencies to follow current regulatory practice of initiating a remediation program, including the development of TMDLs, to control the sources of chromium to Putah Creek so that they do not cause aquatic life toxicity within the Creek.

Page 19, Table 5B, indicates that the mercury concentrations in the Putah Creek water at the various locations were less than the detection limits used in the studies. Unfortunately, this is another example of inadequate detection limits used in these studies. The current US EPA "Gold Book" criterion for total recoverable mercury in water is 12 ng/L. This table indicates that the detection limit used in this study was 120 ng/L. The US EPA will, as part of its revised national mercury study, decrease the allowable mercury in water to approximately 5 ng/L. Based on how the Putah Creek studies were conducted, all that could be said about the water concentrations of mercury is that the concentrations are less than the detection limit. However, what should be said is that the analytical method detection limit used is inadequate to detect mercury at concentrations which represent worst-case-based assessments for bioaccumulation of mercury to excessive levels in fish. There are analytical methods that can detect mercury at the critical levels. Unfortunately, these were again not used in these studies, even though this problem was pointed out in the DSCSOC comments on the 1996 study.

One of the issues that should be mentioned in this report is that the Putah Creek flow regimes during the 1996 and 1997 studies are significantly different. Increased flow, such as occurred in 1997, would tend to lead to a more widespread distribution of fish and mercury problems than would occur under low-flow conditions associated with UCD wastewater and/or LEHR site stormwater runoff-derived mercury or constituents that promote mercury methylation.