Leveraging Multi-State Analytical Capabilities: Biomonitoring in the Four Corners States: An update

Sanwat Chaudhuri, Eric Petty, Jason Mihalic, David McKay, Gabe Silva, Jackie Patel, Mike Smith, Jane Zhang

BACKGROUND

The goal of this study is to 1) combine resources from the public health environmental programs of Arizona, Colorado, New Mexico and Utah to develop and enhance regional collaboration between the states’ laboratories and environmental epidemiologists to develop new and expand laboratory based biomonitoring programs in this region and, 2) assess the extent and nature of human exposure to environmental toxicants. The ultimate goal includes reduction or elimination of exposure to environmental toxicants among residents of the four states. This study was funded by CDC’s State Biomonitoring Cooperative agreement in 2014.

METHODS

The state public health agencies of Arizona, Colorado, New Mexico, and Utah organized a Four Corners States Biomonitoring Consortium (4CSBC), led by the Utah Public Health Laboratory, to address persistent environmental health concerns that are common to the four states.

Each state used instrumentation and staff from respective Public Health Emergency Preparedness (PHEP)/Chemical Threat/CT), program to develop laboratory capacity for biomonitoring.

Resources from Environmental Public Health Tracking Network (EPHTN), and other public health program resources are utilized to augment sample collection, private well water testing, data analyses, exposure assessment and risk communication activities.

Laboratory work is distributed among the four states to create centers of testing for certain exposures in the 4-states regions to allow each laboratory to specialize in an analytical method and reduce analytical redundancy across the consortium.

4CSBC is organized around a core team that includes one primary chemist and one primary epidemiologist from each state, chaired by two co-leads, one for laboratory and one for epidemiology activities. Additional staff are leveraged from states within supportive programs.

The 4CSBC adopted some of the methods developed by the Rocky Mountain Biomonitoring Consortium (2003-2008), of which all the 4CSBC states were members.

Monthly conference calls, bi-annual face-to-face meetings of chemists, epidemiologists, along with frequent emails, one-on-one calls as needed are used for project planning, sharing ideas, troubleshooting problems, training, member progress, decision challenges and ways to overcome them.

Grant funds are distributed from Utah to other states through inter-state contracts established between Utah and member state health agencies.

RESULTS

The 4CSBC utilized analytical instruments already available to state laboratories through the PHEP Laboratory Response Network Chemicals (LRN-C) programs when the instruments are not being used for their intended project use. Laboratories utilized ICP-MS, LC-MS-MS, and other instruments as needed for the projects.

Laboratory staff have validated methods, demonstrated on-going successes in proficiency level (PT), and are currently engaged in the analyses of urine samples for the biomonitoring projects. Following are status of analytical methods for the projects:

- Heavy Metals / As, Co, Hg, Mn, Se, U in urine: analytical methods are based upon LRN-C methods. Methods are be based on the CDC methods CDC 3018A.3 (for arsenic), CDC 3018.4 (cadmium, manganese, selenium and uranium), and CDC 3032.7.01 (for mercury).
- All States: developed capabilities for metals analysis. Laboratory staff completed method validation and on-going PT. Tested 700 samples from four states. Reported results to respective state epd-partner.
- As: Speciation A2: Method validation is in progress, using modified method FSA-ESME-04.
- 2,4-DOP and 2,5-DOP in urine using LC-MS-MS: Colorado, the designated state for 4CSBC, participated in hands-on training in CDC, completed validation of method, tested 250 samples and sent results to respective state epd-partner and consortium state contacts.
- Prichnial metabolites (16 metabolites) in urine, using LC-MS-MS: Staff from Arizona, the designated state for this method completed training in CDC, validated method, tested 500 samples and sent results to respective state epd-partner and consortium state contacts.
- Pyrethrod metabolites (2 metabolites) and 2,4-D in urine: New Mexico and Utah: Staff completed trained in CDC method validation is in progress.

CONCLUSION

Utilizing public health resources from multiple states and programs the Four Corners States Biomonitoring Consortium have developed new and expanded existing biomonitoring capability and capacity in the regions of Arizona, Colorado, New Mexico and Utah.

Biomonitoring capabilities for i) six heavy metals in private well drinking water: arsenic, cadmium, manganese, mercury, selenium, uranium, ii) herbicide (2,4-D) used for agriculture, iii) three metabolites of pyrethroid pesticides used for mosquito abatement, and pesticide (p-DCB) used in personal care products have been developed for assessing exposures from these chemicals among residents in the four states region and among children from the San Luis Valley (Colorado).

Risk from exposures to these chemicals and ways to reduce exposure are communicated by phone calls to participants and Risk Communication Charts 1 and 2, return letters to participants, with fact sheets and information about exposures. Risk communication protocol begins with a phone call notification to the participants with elevated levels of urinary or water results and discuss ways the individual may reduce exposure. Some states also notify the local health officer of the region the individual resides in.

Acknowledgements
Special thanks to our epidemiology partners without whom this work would not be possible: Sam Leffone, Barbara Toth, Heidi Krippa, Kathy James, Kaye Isulian, Carrie Baker, Megan Danen (students); Following programs/agencies are also acknowledged for significant contributions:
- Public Health Emergency Preparedness (PHEP)/Chemical Threat/CT), program of AZDHS,CDHS, NMDOH, UTDH
- Environmental Public Health Tracking Network (EPHTN) of NMDOH, UTDH
- Co School of PH, University of Colorado

For More Information
Visit: www.4CSBC.org
Four Corners States Biomonitoring Consortium: Lessons Learned During Implementation. J of Public Health and Practice (Accepted for publication)

ACKNOWLEDGEMENTS

This study was supported by the Cooperative Agreement Number U38EH001537 funded by the Centers for Disease Control and Prevention. Its contents are solely the responsibility of the authors and do not necessarily reflect the official views of the Centers for Disease Control and Prevention or Department of Health and Human Services.