October 17, 2022

Heartland Health Research Alliance Comments Submitted to EPA Docket: EPA-HQ-OPP-2016-0223-0026

"Pesticide Registration Review: Dicamba Revised Human Health and Draft Ecological Risk Assessments"

I submit these comments on behalf of the Heartland Health Research Alliance (HHRA), a non-profit organization conducting research on the impacts of farming systems on public-health trends and outcomes (hh-ra.org). A primary focus of HHRA's ongoing birth-cohort study -- Heartland Study -- is whether the dramatic increase in the use of dicamba since 2016 throughout the Midwest is contributing to, or causing increased prenatal exposures, and thereby possibly altering the frequency and/or severity in human reproductive problems, adverse birth outcomes, and/or impairing children's development.

Our comments highlight several reasons why the EPA's Office of Pesticide Programs (OPP/EPA) should conduct a more thorough and data-driven assessment of the reproductive and developmental impacts following exposures to dicamba than the shallow analysis presented in the OPP/EPA's draft dicamba human health risk assessment.[1] In doing so, OPP/EPA should rely primarily on the data published in peer-reviewed science journals reporting changes in the levels and sources of prenatal and early-life exposures to dicamba, and possible linkages between such exposures and adverse birth and developmental outcomes.

These comments were written by Dr. Charles Benbrook on behalf of HHRA. Dr. Benbrook currently serves as the ED of the Heartland Health Research Alliance. Previously, he served as ED of the NAS Board on Agriculture from 1984-1990, carried out analytical work on the impacts of the Food Quality Protection Act on pesticide residues and dietary risks from 1994-2004, including a project for the EPA, and has published multiple papers on herbicide use, farming system and other impacts of GMO herbicide-tolerant cultivars, and pesticide risk and regulation. Dr. Benbrook has served as an expert witness in pesticide litigation, including past and ongoing cases involving glyphosate-based herbicides and non-Hodgkin lymphoma. He has not been involved to date with any dicamba-related litigation.

Trends in Dicamba Use

I submit as part of these comments an Excel workbook containing a set of tables and figures on dicamba use. Three tables and related figures cover dicamba use on all crops at

[1] In addition, much of the pesticide-registrant data on file in the OPP/EPA and available to assess dicamba's impacts on birth outcomes and children's development are old and of questionable quality, especially compared to the genotoxicity and reproductive study methods accessible today.

the national level from 1991 through 2020. A set of 26 tables and figures are also included that cover dicamba use in the 13 Midwestern states that are included in the Heartland Study. Two worksheets appear for each state: state-specific Table 1 reports dicamba use on all crops for which the USDA has surveyed pesticide use data from 1991 through 2020; and, Table 2 presents dicamba use on the two dicamba-tolerant crops currently on the market (soybeans and cotton).

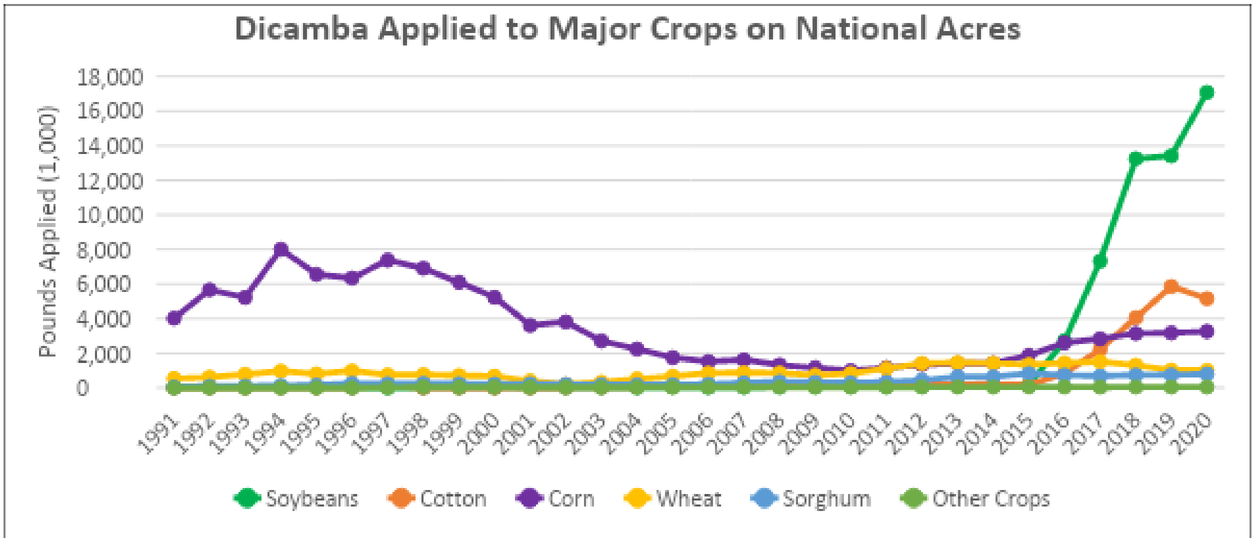
The dicamba use data in all tables and figures in the body of these comments and in the Supplemental Data file are reported as pounds of active ingredient applied. The tables and figures were generated from HHRA's Pesticide Use Data System (PUDS). PUDS draws upon the results of USDA pesticide use surveys as reported in QuickStats. PUDS incorporates the same methodology as the USDA's Economic Research Service in creating a continuous, annual data set on pesticide use from periodic survey data.

These tables and figures are useful in assessing trends in dicamba use over time and the dominance of a few crops -- corn, cotton, wheat -- in accounting for dicamba use from 1991 to 2017 in most states and nationally.

Rapid adoption of soybean and cotton seeds genetically engineered to tolerate over-the-top, post-emergent applications of dicamba began in crop year 2017, the first year that substantial acreage was planted to dicamba-tolerant soybeans and cotton.[2] Today, GMO, dicamba-tolerant soybean and cotton crops account for nearly all dicamba use at the national level, as well as in most states surveyed by the USDA.

There is little controversy over the dramatic and rapid impact of dicamba-tolerant seeds on the use of dicamba. The figure below summarizes the trends in dicamba use by crop at the national level since 1991.

[2] A few million acres of GMO, dicamba-tolerant seeds were planted in 2016, the year before EPA approvals were granted for dicamba-herbicide labels allowing post-emergent applications on dicamba-tolerant cultivars.



Farmers, regulators, and the pesticide industry moved away from routine use of dicamba during the early 1990s through 2016. Dicamba use at the national level declined from peak use in 1994 at 9.1 million pounds, to just 2.4 million pounds in 2010. The dramatic increase in dicamba pounds applied began in 2016 and reached 27.3 million pounds by 2020. Overall use rose 11.4-fold from 2010 to 2020.

Since approval of dicamba-tolerant soybeans and cotton in 2017, ***dicamba use has risen over 6-fold in just four years*** and now accounts for nearly all dicamba use nationwide. The same trends are apparent in the 13 Heartland Study states covered in the dicamba-use Supplemental data file.

Dicamba use fell steadily from the mid-1990s through 2010 because of dicamba's inherent volatility and widely noted, negative tendency to move into the air and then downwind, away from treated fields and onto nearby plants, shrubs, vines, and trees. Unfortunately, then as now, some portion of the downwind plants onto which dicamba lands suffer mild-to-serious damage in any given year, and incrementally more serious damage over time in the case of long-lived trees, shrubs, and vines.

In is inevitable that as long as dicamba-tolerant seeds are planted on millions of acres of crops, there will be substantial non-target crop, vine, and tree damage from dicamba volatilization. It is also clear that the increasingly complex label restrictions placed on post-emergent dicamba-labels are not working as hoped and have failed to mitigate substantial and growing damage to non-target vegetation.

Such adverse impacts of post-emergent dicamba herbicide applications pose serious economic costs on individuals and society, costs that the pesticide-seed-biotech industry and EPA apparently consider an acceptable cost of business.

Dicamba Human Exposures

To our knowledge, and except for recent HHRA testing, no new dicamba human biomonitoring and exposure data has been generated since the 11-fold increase in dicamba use in the wake of approval of dicamba-tolerant soybeans and cotton. HHRA regards this as a very serious deficiency in the overall data the industry and EPA are relying on in judging whether dicamba use is posing unreasonable adverse effects on people or the environment.

In 2021 to support our Heartland Study, HHRA commissioned the Center for Toxicological Research (CTQ)[3] in Quebec, Canada to develop a new and sensitive method capable of quantifying levels of dicamba and 2,4-D in human urine. CTQ was successful in doing so, and its new method also lowers the limit of detection for several other analytes by 5-fold to 10-fold.

The new CTQ method built upon an existing, 12-analyte method relied on for years by the US CDC in its NHANES urine testing. A methods paper, including the results of HHRA initial testing of urine samples from pregnant women in the Midwest, will be published in the next few months, and in ample time for EPA to consider in finalizing its dicamba human-health risk assessment.

HHRA has access to stored, frozen urine samples collected from pregnant women enrolled in the nuMoM2b birth-cohort study funded by NIH. All such urine samples were collected prior to the approval and marketing of dicamba-tolerant crops. Around 70 of these frozen urine samples were sent to CTQ for quantification of dicamba and 2,4-D levels, along with levels of 10 pyrethroid and organophosphate insecticide analytes.

In addition, HHRA submitted to CTQ for testing via the new method some 80 samples of urine collected as part of our Heartland Study birth-cohort. These samples were collected in 2019-2022, well after dicamba-tolerant soybeans and cotton had gained over 50% market share and after the dramatic rise from 2017-2022 in dicamba use.

We hypothesized that there would be a discernable increase in the frequency of dicamba detections and mean levels between the pre-dicamba-tolerant crop era and post-adoption of dicamba-tolerant seed and technology packages.

The results surprised us and are worrisome. In short in recent years, about two-thirds of the pregnant women in the Midwest have been exposed to dicamba on a regular basis, about a three-fold increase over the pre-dicamba-tolerant seed era. The mean levels of dicamba in the urine of pregnant women in the Heartland have also roughly tripled as a result of the widespread planting of dicamba-tolerant soybean and cotton seed.

[3] CTQ in Canada is the equivalent of the US CDC in terms of pesticide analytical chemistry expertise and biomonitoring.

In addition, essentially all pregnant women, and other citizens in the Midwest, are exposed on most days to 2,4-D, given the fact that 2,4-D was detected in essentially 100% of HHRA samples tested by CTQ. Last, the mean levels of dicamba in the urine of pregnant women since dicamba-tolerant seeds have gained substantial market share have risen nearly to the mean levels of 2,4-D in urine.

HHRA is continuing to test stored, frozen urine samples and more recently collected Heartland Study urine samples for dicamba, 2,4-D, glyphosate and its primary metabolite AMPA, and glufosinate and its primary metabolite 3-MPPA. We will publish our dicamba biomonitoring results in the next few months and continue to test additional samples as rapidly as funding allows. We will submit to the dicamba docket newly published, HHRA papers describing and analyzing our biomonitoring results, and in 2023 and beyond, Heartland Study papers addressing possible impacts on reproduction and birth outcomes.

We expect, however, no substantial change in the trends in the frequency of dicamba detections and mean levels that we have observed in our testing to date, at least not until EPA and/or state-level regulatory actions, court-imposed limits, the spread of dicamba-resistant weeds, excessive cost and poor weed-control performance, or some combination of factors leads to reductions in the percent of soybean and cotton fields planted to dicamba-tolerant seeds.

Implications of Rising Dicamba Exposures and EPA Challenges

The final OPP/EPA dicamba human-health risk assessment should provide a data-driven assessment of the impact of dicamba-tolerant seed technology on prenatal and early-life exposures to dicamba, drawing on urine test data.

The OPP/EPA should contract with scientists independent of the pesticide industry, or a US government agency, to develop as a matter of priority a state-of-the-art dicamba pharmacokinetic model to estimate levels of dicamba exposure across population groups based on measured levels in urine.

Under the FQPA, OPP/EPA must carry out a cumulative risk assessment of exposure to pesticides like 2,4-D and dicamba that likely pose risks of adverse birth and developmental outcomes via a common mechanism of action. Given the very recent and dramatic increase in human exposures to dicamba, this too should be regarded by EPA as a high-priority component in the final dicamba human-health risk assessment.

Equally important, OPP/EPA must determine and explain to the public, scientists, farmers, the food industry, and pesticide-seed manufacturers what accounts for the dramatic increase since 2017 in human exposures to dicamba. Based on HHRA's extensive work with USDA data on pesticide residues in food, we think it extremely unlikely that changes in dicamba residues in food accounts for more than a small fraction of rising dicamba exposures.

Instead, it is likely that some combination of inhalation exposure and the presence of dicamba in drinking water accounts for most of the rising frequency and levels of dicamba exposure in the human population, and not just in the US.

As Heartland Study enrollment of mother-infant pairs (MIPs) continues, the number of samples of urine tested for dicamba will rise appreciably. In time, we will have ample samples to carefully assess the interactions of time of year when a urine sample was collected (during and outside the herbicide spray season) and the place of residence of a MIP (urban/suburban versus farm country).

We expect our analyses of dicamba levels in the urine of pregnant women will provide some of the first, rigorous assessments of likely dicamba-exposure pathways. If levels change only modestly between the herbicide spray season in rural areas and the non-spray season in urban areas, such data would suggest drinking water as a primary driver of exposure levels. If dicamba levels are consistently higher during the herbicide spray season among pregnant women living in rural areas near soybean and cotton fields compared to levels over the winter when there would be no or extremely minor inhalation exposures, such data would point squarely toward dicamba volatilization and off-target movement as a primary driver of rising levels of dicamba human exposure.

We urge EPA to take whatever steps it regards as needed to answer the above, foundational questions regarding dicamba exposure pathways and levels. It will also be vital for EPA to revisit published studies on dicamba-induced impacts on animal reproduction and development via new studies commissioned and carried out by government scientists or scientists independent of the pesticide industry.

HHRA will also share any insights gained with EPA via the dicamba docket as the number of pregnant women enrolled in the Heartland Study grows.

Charles Benbrook