

Summary and critique of North Carolina's report on pesticides and birth defects among three Ag-Mart workers

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The North Carolina Division of Public Health has released a much-anticipated report assessing the connections between the severe birth defects in three babies born to farmworkers and their pesticide exposures while working for Ag-Mart in North Carolina. The report, released by the NC Division of Public Health's Occupational and Environmental Epidemiology Branch (OEEB), evaluated the likely pesticide exposures for each of the three women and the duration and timing of these exposures during the critical periods in their pregnancies. The authors concluded that while there is not enough evidence to definitively "prove" whether pesticides caused the birth defects, there is ample cause for suspicion.

It is important to note that in epidemiological studies such as this one, it is virtually impossible to definitively "prove" causation. What the report does show are unacceptable exposures to known toxicants, a plausible cause (the exposures), and three tragic outcomes. The evidence gathered for this report was compelling enough to lead the NC Division of Public Health to make several recommendations for state and federal agencies. The recommendations included strengthening pesticide enforcement at the NC Department of Agriculture, establishing a state pesticide illness & injury surveillance program, improving education of farmworkers and physicians, and strengthening the federal Worker Protection Standard (WPS). The report did not make any specific recommendations for Ag-Mart, the employer whose actions are at issue in this case, or with respect to support and care for the affected families. *ARC/PESTed commentary and critique of these recommendations follows in the final section of this paper on page four.*

Background on exposure assessments and conclusions

Varying amounts of data were available to assess each of the three cases. Two of the women were interviewed by the authors, and medical records were only available for one of them. The table below summarizes the three cases and the families' risk factors for birth defects. The report refers to each of the women as "Case-mother" 1, 2 and 3; however all three have given media interviews and are identified by name in this summary.

Descriptive information for case mothers and infants

Case-mother #	Date of Delivery	Maternal age (years)	Infant Sex and Birth Defect	Personal risk factors for birth defects
1	Dec 17, 2004	19	Male born with no arms or legs (Tetramelia)	None known
2	Feb 4, 2005	30	Male with a diagnosis of Pierre Robin syndrome. Abnormalities include small jaw, high palate.	Father of baby has a small jaw (micrognathia). History of prior stillbirth.

3	Feb 6, 2005	21	Female with multiple malformations: cleft lip and palate, lack of visible sex organs, solitary kidney. Died 3 days after birth.	One prior pregnancy with malformation, fetal death.
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Source: "Investigation into the Occurrence of Congenital Malformation in Immokalee, Collier County, Florida 2005," Collier County Health Department report.

Case-mother 1: a plausible association

In the case of "Case-mother 1," Francisca Herrera, whose son Carlitos was born without arms and legs, the authors state that "there is a plausible association between this mother's possible occupational pesticide exposures in North Carolina and the limb defects seen in her child." Herrera has no risk factors for birth defects, and did not use tobacco, alcohol, prescription or other drugs during her pregnancy. Her pesticide exposures were significant, according to Ag-Mart records. During the "critical period" in her pregnancy (three months before conception through the thirteenth week of pregnancy), Herrera worked with fourteen different pesticides, five of which have been shown to cause birth defects in laboratory studies – totaling as much as 256 hours of exposure during the period before she should have been allowed back into the fields (during the "Restricted Entry Interval" or REI). In particular, Herrera may have been exposed to the pesticide Penncozeb 80 for more than 40 hours during the critical period of pregnancy, 31.5 of those hours within the REI. Penncozeb's active ingredient, mancozeb, has caused missing limbs and limb malformations in laboratory studies, according to the authors.

Case-mother 2: genetics and environment

In the case of "Case-mother 2," Sostenes Salazar, whose son Jesus was born with facial deformities, the authors concluded that genetic factors may have contributed to the defects, because the baby's father has a small jaw, a condition which is common in his family. Small jaw size can be a symptom of Pierre Robin's syndrome, Jesus's diagnosis. The authors state: "It is possible that an environmental exposure and a genetic susceptibility could have acted together to produce the birth defect. ...the evidence for an association between her pesticide exposure in North Carolina and the birth defect seen in her child is less strong than for Case-mother 1." Salazar worked with thirteen different pesticides during the critical period of her pregnancy, six of which have been shown to cause birth defects in laboratory studies. In particular, she may have been exposed to Penncozeb for as much as 53 hours during the critical period, 8 of them during the REI. One of the breakdown products of Penncozeb, ethylene thiourea, has been shown to cause small jaws and cleft palate in laboratory studies, according to the authors.

Case-mother 3: missing data

"Case-mother 3," Maria Meza, whose baby had multiple malformations and died shortly after birth, did not work in North Carolina during the "critical period" of her pregnancy. However, she did work with several pesticides during employment with Ag-Mart in Florida during that critical period. The authors of the North Carolina report did not evaluate the possible associations between her pesticide exposures in Florida and the birth defects in her child.

Weaknesses in the report

In their analysis the authors used pesticide application records provided by Ag-Mart, investigative data from the NC Department of Agriculture, FL Department of Health and Collier County (FL) Health Department, as well as interviews with two of the three women (the authors note that Ag-Mart now disputes the accuracy of their own work records). The Collier County Department of Health did not release medical records or interview transcripts to the North Carolina authors. The scope of North Carolina's report was limited to an analysis of only the pesticide exposures that occurred in North Carolina, limiting the significance of their findings. In fact, the authors did recommend that a federal agency use the aggregate data from both states to create a more thorough assessment. Some of the other weaknesses in the report (some of which are acknowledged by the authors) include:

- **No exposure assessment for fathers.** This assessment focused entirely on the mothers' exposures; however the epidemiological literature indicates that fathers' exposures are also extremely relevant (all three fathers worked for Ag-Mart as well).
- **REI considered health-protective.** The authors assume that only exposures within the REI, or Restricted Entry Interval, were potentially harmful. However, the REI is designed to protect against acute toxicity to adults re-entering a field after a pesticide application – it should not be assumed that the REI is protective of a developing fetus.
- **Other sources of exposure not considered.** These workers were likely to have been exposed to pesticides from other sources. The NC Notice of Violation describes conditions that may have led to longer exposures, such as the absence of wash stations and protective equipment, and different exposures, such as inhalation exposure from illegal burning of pesticide containers. Potential dietary sources were also not considered. North Carolina investigators were unable to locate worker housing to evaluate potential pesticide exposure there.

Recommendations

The recommendations of the NC Division of Public Health were summarized briefly above. The state's recommendations focus primarily on practical steps for state agencies, but unfortunately do not take into account some major factors that may limit their effectiveness – namely the practical realities affecting farmworkers. Because of the very limited political power of farmworkers, many of whom are undocumented migrants, farmworkers are unlikely to be able to effect much change in working conditions, no matter how much energy is invested in education and outreach efforts. Furthermore, camps are typically located in isolated areas, with no transportation provided for workers, dramatically limiting access to basic medical care. In response to this report and ongoing dialogue among state agencies and farmworker advocacy groups, the Agricultural Resources Center & Pesticide Education Project offers some additional recommendations to improve the health and safety of farmworkers in North Carolina's fields.

1. *(Expanding on the report's recommendation that the NC Department of Agriculture should improve enforcement procedures).* More pesticide investigators are needed, especially fluent Spanish speakers. Investigators must protect the anonymity of workers who report pesticide violations or participate in investigations. Currently many farmworkers are unwilling or unable to participate in investigations for fear of employer

retaliation. In fact, one Ag-Mart worker claims he was fired for cooperating with North Carolina officials investigating these cases.

2. The NC Department of Agriculture and/or Department of Labor should require thorough training and certification in Worker Protection Standards for growers and crew leaders who employ farmworkers. A licensing requirement for those who employ farmworkers would ensure training and boost compliance with WPS. While some WPS trainings are currently available to NC growers, these are usually optional. Most education efforts are directed at the workers themselves, who are typically not able to change working conditions no matter how well trained they may be.
3. Ag-Mart should be held accountable for the hundreds of pesticide violations that may have caused the tragic birth defects in all three families. While the states can collect limited fines, they should also require that the company cover the health care costs for the affected children, whose care is likely to be far beyond the reach of their families. Farmworkers generally have very limited access to health care, and non-citizens do not have access to state or federal benefits programs.
4. The US EPA has registered tens of thousands of pesticide products for use in the US, many of which have been shown to cause birth defects in the laboratory. The registrations of teratogenic and mutagenic pesticides should be immediately revoked by US EPA. If the EPA does not act quickly to protect children's health, then the states should step in. The NC Department of Agriculture has the power to revoke the registrations of any pesticide for use in NC, and should act to remove known and suspected teratogens and mutagens from the market to prevent future harm.
5. The NC Division of Public Health has proposed a pesticide illness and injury surveillance system for the state, which is to be initially funded by limited grant funding. The NC General Assembly should act immediately to fully fund this proactive program. Without a pesticide surveillance system, it is virtually impossible to know whether the state's regulations, enforcement, outreach and intervention methods are actually successful in preventing exposures.
6. The NC Department of Agriculture should institute a pesticide use reporting requirement, similar to the program used in California, so that clear records of pesticide use are available to affected parties. As it stands, there is no federal or NC requirement that growers keep track of which pesticides they use, where or when.

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