

# Centers for Disease Control and Prevention and National Institutes of Health

## Centers for Disease Control and Prevention

The Centers for Disease Control and Prevention (CDC), located in the Department of Health and Human Services, have wide-ranging responsibilities for human health including detection, prevention, and monitoring of foodborne illnesses.

### Tracking the Public Health Burden of Foodborne Illness

CDC studies show that each year roughly 1 in 6 Americans (or 48 million people) get sick, 128,000 are hospitalized, and 3,000 die of foodborne diseases. Estimating illnesses, hospitalizations, and deaths for various types of diseases is a common and important public health practice that is carried out in the U.S. by the CDC. CDC's 2011 estimates provide the most accurate picture yet of which foodborne disease vectors cause the most illness in the United States.<sup>1</sup> Since 1996, the Foodborne Diseases Active Surveillance Network, **FoodNet**, has been tracking trends for infections transmitted through food. The FoodNet database provides a foundation for food safety policy and prevention efforts by estimating the number of foodborne illnesses and monitoring trends in the incidence of specific food borne illnesses. FoodNet also attributes illnesses to specific foods and settings and disseminates this information to the public and to others working on food safety issues.<sup>2</sup>

### Investigating Outbreaks and Managing the DNA "Fingerprinting" Network

CDC has an Outbreak Response Team that collaborates with a national network of epidemiologists and other public health officials who work together to ensure rapid, coordinated detection and response to multistate outbreaks of foodborne, waterborne, and other enteric (intestinal) diseases and promote comprehensive outbreak surveillance.<sup>3</sup> The team also seeks to improve the collaboration and partnership among officials in local, state, and federal agencies who work with foodborne and diarrheal disease outbreak surveillance and response (for example, state and local health departments, the U.S. Department of Agriculture (USDA), the U.S. Food and Drug Administration (FDA), and PulseNet). PulseNet is a national surveillance network made up of state and local public health laboratories and federal food regulatory agency laboratories that compares the 'DNA fingerprints' of bacteria from patients to find clusters of disease that may be foodborne.<sup>4</sup>

In 2012, CDC monitored between 16 and 57 potential food poisoning clusters each week and investigated more than 200 multistate clusters. These investigations led to the identification of contaminated sources, which resulted in actions to stop the outbreaks, including the recalls of more than 300 products.<sup>5</sup>

### Tracking Trends in Resistance

The National Antimicrobial Resistance Monitoring System for Enteric Bacteria (**NARMS**) established in 1996 helps protect public health by providing information about emerging bacterial resistance, the ways in which resistance is spread, and how resistant infections differ from susceptible infections. NARMS is an example of collaboration among state and local public

health departments, CDC, the U.S. Food and Drug Administration (FDA), and the U.S. Department of Agriculture (USDA). This national public health surveillance system tracks changes in the antimicrobial susceptibility of certain enteric bacteria found in ill people (CDC), retail meats (FDA), and food animals (USDA) in the United States.<sup>6</sup> A recent CDC report called attention to the rise of antimicrobial resistance, and cited agricultural use as a significant contributing factor, concluding, “The use of antibiotics for promoting growth is not necessary, and the practice should be phased out.”<sup>7</sup>

## Occupational Hazards

According to the CDC:

*Agriculture ranks among the most hazardous industries. Farmers are at high risk for fatal and nonfatal injuries, work-related lung diseases, noise-induced hearing loss, skin diseases, and certain cancers associated with chemical use and prolonged sun exposure. Farming is one of the few industries in which the families (who often share the work and live on the premises) are also at risk for injuries, illness, and death.*<sup>8</sup>

NIOSH (National Institute of Occupational Safety and Health, a division of the CDC) established NIOSH Agricultural Centers in 1990 to carry out research, education and prevention on occupational diseases and accidents common to farmers and their families. Research priorities include study of respiratory illness and occupational lung disease in workers in large scale dairy and swine operations, risk factors for cholinesterase (ChE) depression among pesticide handlers, neurobehavioral assessment of pesticide exposure in children, prevention of tractor rollover, heat stroke prevention, risk assessment for farm children and adolescent workers.<sup>9</sup>

NIOSH, in partnership with EPA and NIH, is conducting a national Agricultural Health Study, designed to “investigate the effects of environmental, occupational, dietary, and genetic factors on the health of the agricultural population.”<sup>10</sup>

## National Institutes of Health

### Environmental Risk Factors

The National Institutes of Health (NIH) another division of the Department of Health and Human Services, addresses human health and safety through medical research. NIEHS (National Institute of Environmental Health Science), an institute of the National Institutes of Health (NIH), conducts research on environmental factors contributing to human disease. Among NIEHS priorities relevant to the agricultural sector<sup>11</sup> are the following:

### Endocrine Disruptors

Endocrine-disrupting compounds (EDCs) are chemicals that act as “switches” for human hormones, and as a result even tiny amounts can have significant impacts on the normal function of tissue and organs.<sup>12</sup> EDCs in use with regard to food and farming include:

- BPA, used in plastic bottles and to line tin cans<sup>13</sup>
- Phthalates, used as an inert ingredient in many agricultural pesticides<sup>14</sup>
- Arsenic, used in chicken feed to promote growth until recently banned for this use by the FDA<sup>15</sup>

- Pesticides, insecticides, and fungicides; of the chemicals known to be endocrine disruptors, “46% are insecticides, 21% herbicides and 31% fungicides.”<sup>16</sup>

## Pesticides and Health

(See **Agriculture Update paper on Pesticide Management**)

## Nanomaterials

(See **Agriculture Update paper on Nanotechnology and Other Technologies.**)

The NIEHS acknowledges that not much is known about human health impacts of nanotechnology, although initial studies<sup>17</sup> suggest risk factors for at least some nanomaterials of interest to agriculture, including carbon nanotubes (shown to increase seed germination and seedling growth). Funding for research is limited:

*Fifteen different federal agencies conduct nanotechnology research, and their funding is reported through the National Nanotechnology Initiative (NNI). The NNI's 2010 research budget totaled an estimated \$1.78 billion. About 5% of that was devoted to environmental, health, and safety research*<sup>18</sup>

## Environmental Mixtures (Complex, Chronic Exposures)

While most safety testing is done with one factor, tested for a limited time in a controlled environment, humans experience environmental risk factors as complex mixtures, encountered across all stages of development, and often bioaccumulating across time in tissue and organs. In 2011 the NIEHS hosted a workshop on “Advancing Research on Mixtures: New Perspectives and Approaches for Predicting Adverse Human Health Effects.” Themes identified there included a need for improved monitoring and modeling, systems biology research on complex mixtures, increased cross-disciplinary training, collaboration across fields, and improved mixture-related databases. Following that workshop, the agency set research on mixtures as a top priority for 2012 – 2017.<sup>19</sup>

## Recommended Readings

Although there are no formal recommended readings for this section, the various CDC and NIH links in the endnotes could be explored.

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<sup>1</sup> CDC, Estimates of foodborne illnesses in the United States, 2011, <http://www.cdc.gov/foodborneburden/index.html>, accessed 10/29/13.

<sup>2</sup> CDC, Foodborne diseases active surveillance network (FoodNet), <http://www.cdc.gov/foodnet/>, accessed 10/29/13.

<sup>3</sup> CDC, Outbreak response team, <http://www.cdc.gov/outbreaknet/index.html> and Multistate Outbreaks, <http://www.cdc.gov/outbreaknet/outbreaks.html>, accessed 10/29/13.

<sup>4</sup> CDC, PulseNet, <http://www.cdc.gov/pulsenet/>, accessed 10/29/13.

<sup>5</sup> CDC, “Outbreak Response Team Overview,” <http://www.cdc.gov/outbreaknet/>, accessed 10/29/13.

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<sup>6</sup> CDC, National Antimicrobial Resistance Monitoring System for Enteric Bacteria, NARMS, <http://www.cdc.gov/narms/>, accessed 10/29/13.

<sup>7</sup> CDC, Antibiotic Resistance Threats in the United States, p. 11, <http://www.cdc.gov/drugresistance/threat-report-2013/pdf/ar-threats-2013-508.pdf>, accessed 10/29/13.

<sup>8</sup> Agriculture: NIOSH Workplace Safety and Health Topics, <http://www.cdc.gov/niosh/topics/agriculture/>, accessed 10/29/13.

<sup>9</sup> NIOSH Agricultural Safety and Health Centers, NIOSH, <http://www.cdc.gov/niosh/agctrhom.html>, accessed 10/29/13.

<sup>10</sup> "Agricultural Health Study," NIH, <http://aghealth.nih.gov/>, accessed 10/29/13.

<sup>11</sup> "NIEHS Priority Areas and Programs," The National Institute of Environmental Health Sciences, overview, p. 2, NIEHS, [http://www.niehs.nih.gov/health/materials/niehs\\_overview.pdf](http://www.niehs.nih.gov/health/materials/niehs_overview.pdf), accessed 10/29/13.

<sup>12</sup> Linda S Birnbaum and Suzanne E Fenton, "Cancer and developmental exposure to endocrine disruptors," *Environ Health Perspect*, 2003 April; 111(4): 389–394, PMID: PMC1241417.

<sup>13</sup> Bisphenol A: BPA, NIEHS, National Toxicology Program, [http://www.niehs.nih.gov/health/assets/docs\\_a\\_e/bisphenol\\_a\\_bpa\\_508.pdf](http://www.niehs.nih.gov/health/assets/docs_a_e/bisphenol_a_bpa_508.pdf), accessed 10/29/13.

<sup>14</sup> Arnold Schechter, Matthew Lorber, Ying Guo, Qian Wu, Se Hun Yun, Kurunthachalam Kannan, Madeline Hommel, Nadia Imran, Linda S. Hynan, Dunlei Cheng, Justin A. Colacino, Linda S. Birnbaum, Phthalate Concentrations and Dietary Exposure from Food Purchased in New York State, *Environmental Health Perspectives*, 121:473-479 (2013), <http://dx.doi.org/10.1289/ehp.1206367>, accessed 10/29/13, or <http://ehp.niehs.nih.gov/1206367/>, accessed 10/29/13.

<sup>15</sup> Stephanie Strom, "FDA Bans Three Arsenic Drugs Used in Poultry and Pig Feeds," *New York Times*, October 1, 2013, [http://www.nytimes.com/2013/10/02/business/fda-bans-three-arsenic-drugs-used-in-poultry-and-pig-feeds.html?\\_r=0&adxnml=1&adxnmlx=1382039105-ZWSB2Yqu/UffOJpZ4kOdxg](http://www.nytimes.com/2013/10/02/business/fda-bans-three-arsenic-drugs-used-in-poultry-and-pig-feeds.html?_r=0&adxnml=1&adxnmlx=1382039105-ZWSB2Yqu/UffOJpZ4kOdxg), accessed 10/29/13.

<sup>16</sup> Wissem Mnif, et al, "Effect of Endocrine Disruptor Pesticides: A Review," <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3138025/>, accessed 10/29/13.

<sup>17</sup> Rebecca Kessler, Engineered Nanoparticles in Consumer Products: Understanding a New Ingredient, *Environmental Health Perspectives*, 119:a120-a125, 2011, <http://ehp.niehs.nih.gov/119-a120/>, accessed 10/29/13.

<sup>18</sup> Ibid

<sup>19</sup> Danielle J. Carlin, Cynthia V. Rider, Rick Woychik, Linda S. Birnbaum, "Unraveling the Health Effects of Environmental Mixtures: An NIEHS Priority," *Environmental Health Perspectives* 121:a6–a8 (2013). <http://dx.doi.org/10.1289/ehp.1206182>, accessed 10/29/13.