16-EH-01

Committee: Environmental Health

Title: Developing a National Aeroallergen Tracking Network

I. Statement of the Problem:

The prevalence of allergic rhinitis, also known as hay fever, in the U.S. population has increased from 10% to 30% from 1970 to 2000, and this condition affects approximately 40% of children (Meng et al., 2016; O'Connell, 2004; Oswalt & Marshall, 2008). Further, approximately 25 million people in the United States currently have asthma, and the numbers are expected to grow (Akinbami, Moorman, Liu, & National Center for Health Statistics, 2011; Bahadori et al., 2009; Masol et al., 2004). Outdoor aeroallergens such as pollen and mold exacerbate health conditions including asthma, allergic rhinitis, chronic obstruction pulmonary disease (COPD), and conjunctivitis (Bush et al., 2006; Knutsen et al., 2012; National Asthma Education and Prevention Program, 2007; Wallace & Dykewicz, 2008). In recent decades, cutaneous sensitivities to various aeroallergens have increased (Meng et al., 2016). While not having a significant effect on mortality, aeroallergens have large effects on morbidity, well-being, school attendance, work productivity, and are associated with increasing health care costs (Bahadori et al., 2009; O'Connell, 2004).

The burden of allergic respiratory disease has been increasing, in part, due to increasing exposure to aeroallergens as plants respond to warmer temperatures and higher atmospheric carbon dioxide concentrations (Lang-Yona et al., 2013; Levetin & Van de Water, 2008; Shea et al., 2008; Takaro, Knowlton, & Balmes, 2013; Wolf et al., 2010; Ziska et al., 2003; Ziska et al., 2011). Increased carbon dioxide can elevate pollen production in plants such as ragweed, and increase the spore abundance and allergenic activity of mold (Lang-Yona et al., 2013; Wolf et al., 2010; Ziska et al., 2003). Warmer annual average air temperatures can contribute to a shift in the timing and extend the duration of pollen seasons (Luber et al., 2014; Ziska et al., 2011). The adverse effects of aeroallergens on human health may be exacerbated as the intensity, frequency, and duration of air pollution episodes increase with a steadily warming climate (Cecchi et al., 2010; Takaro, Knowlton, & Balmes, 2013).

Despite the large and increasing percentage of the U.S. population with allergic respiratory disease, reliable and geographically-specific pollen and mold measurement data are often unavailable to patients, public health practitioners, health care providers, or researchers. At present, aeroallergen monitoring (i.e., regular, validated observation) is geographically and temporally limited and dependent on individual collectors who are often self-funded and do not report data to a centralized network. Therefore, specific questions related to tracking aeroallergens need to be addressed, such as optimal spatial (e.g., spacing of stations) and temporal (e.g., frequency of pollen collection) resolution, level of speciation required, and the most appropriate sampling and analysis equipment to use. Models have been developed to fill in gaps in the observed data and forecast the potential impact of climate change on aeroallergens (Zhang, 2013; Zhang, 2015); however, details regarding models and their validation are generally lacking. There is potential to develop more accurate models using alternative indicators for tracking aeroallergens and exposure based on satellite imagery, temperature and precipitation data, phenology tracking, and health data (e.g., over-the-counter antihistamine purchases and insurance claims). However, these indicators need to be validated, a task that requires robust aeroallergen data.

There is a need for a coordinated, cross-disciplinary effort to collect, catalogue, and analyze pollen and mold data to allow for improved diagnosis and treatment of patients with allergic respiratory diseases, public health tracking, research on the effects of climate on aeroallergens and health, development of evidence-based interventions, and dissemination of key findings.

II. Statement of the desired action(s) to be taken:

CSTE recognizes that exposure to aeroallergens has significant public health implications and that human exposure is changing in response to our changing climate. A coordinated, **national aeroallergen tracking network**, which incorporates both new and existing stations identified through an **inventory**, and an accessible **data repository** should be a public health priority at the national, state, territorial, tribal, and local levels. **Applications of the data** collected may include public health tracking, clinical diagnostics and treatment, academic research, and near-term forecasting. In addition, there is a need to develop **evidence-based interventions and guidance** to reduce the burden of allergic respiratory disease and to conduct related **outreach** activities. CSTE recognizes that an important part of this collaboration is to designate a leader in this effort.

To this end, CSTE recommends that:
1) CSTE, American Academy of Allergy, Asthma & Immunology (AAAAI), American College of Allergy, Asthma & Immunology (ACAAI), and other partners should support the ongoing effort to conduct an **inventory** of existing aeroallergen monitors, which includes identifying and engaging potential partners and locating existing stations.

2) Centers for Disease Control and Prevention (CDC), National Institute of Environmental Health Sciences (NIEHS), United States Environmental Protection Agency (EPA), current data collectors, and other partners should support the development of a **national aeroallergen tracking network**. This network should be open to any counting station meeting minimum quality requirements developed collaboratively by participating partners. Direct support and outreach is necessary for existing stations, which should be the foundation of a comprehensive and sustainable aeroallergen tracking strategy. This strategy may also require the initiation of new, strategically-located stations.

3) CDC, National Oceanic and Atmospheric Administration (NOAA), and other partners should support the development and maintenance of a **data repository** to house data collected by the national aeroallergen tracking network and which incorporates auxiliary exposure data, such as meteorological and climatological metrics. Development of IT infrastructure should be flexible enough to accommodate existing and emerging data collection methods and include collection of metadata and an online portal. The repository should be secure but easily accessible to partners in national, state, territorial, tribal, and local public health and environmental agencies. Access may also be granted to academic, health care, and pharmacological users meeting predefined criteria.

4) CDC, EPA, NIEHS, NOAA, CSTE, and other partners should support the **application of data** collected by the network and stored in the data repository. Public health partners should be encouraged to focus on environmental tracking, including the development of pollen and mold indicators that are flexible enough to incorporate local health outcome data. Indicator development should also include the development of guidance on using data appropriate in a public health context. Health care providers should have access to aeroallergen data to support the diagnosis and treatment of patients with allergic respiratory disease. Academic partners should be encouraged to use aeroallergen data for research, including, but not limited to, analysis of thresholds at which counts may be harmful to human health and development of near-term forecasts.

5) CDC, EPA, NIEHS, NOAA, and other partners should develop **evidence-based interventions and guidance** to reduce the burden of allergic respiratory disease. The value of hazard communications, including an aeroallergen alert system, should be evaluated. If developed, alerts should be location-specific and based on predefined threshold criteria. Other interventions may be related to building and urban design. Information should be disseminated to public health and environmental agencies, health care providers, and concerned members of the public.

6) CDC, CSTE, AAAAI, ACAAI, National Phenology Network, and other partners should foster **outreach** activities, including engaging citizen scientists in data collection and developing educational resources about aeroallergens and health outcomes for various audiences. Data should be disseminated in multiple forms, including data visualizations that make it accessible and understandable to the general public.

III. Public Health Impact:

The data collected by a national aeroallergen tracking network will be used for tracking and forecasting. There is a need for the development of better indicators, more accurate predictive models which can be used both to provide modeled data where no monitors exist, and additional research into the health impacts of pollen and mold. Aeroallergens are considered leading indicators of climate change, and the development of this network will allow researchers to better predict future changes in pollen and mold counts and seasons associated with warming temperatures and increasing atmospheric carbon dioxide levels.

A national network will positively benefit those who suffer from allergic disease. More comprehensive data will provide both patients and health care providers with more accurate and timely information about the onset and duration of pollen and mold seasons. Providers can use information about current pollen and mold conditions for diagnostic purposes and use forecasts for treatment plans. Informed and educated patients can take a more active role in their care. Further, the development of an alert system, analogous to the EPA's Air Quality Index, could expand the reach of hazard communications regarding high aeroallergen levels to public health and environmental agencies and the public.

Finally, a national network will improve the efficacy of public health actions to reduce the burden of allergic disease. Data can be used to inform interventions, such as the timing of aeroallergen early warning messaging, the design and operation of building filtration systems, and planting less allergenic tree species in urban areas. It will complement and inform public health systems and programs concerned with air quality, asthma, and COPD. Overall, both individual and population-level health benefits will be derived as public health practitioners, health care providers, patients, and researchers have access to a robust national aeroallergen tracking network. CSTE believes that this effort should not be funded at the expense of existing air quality monitoring.

IV. Revision History

V. References

Akinbami, L. J., Moorman, J. E., Liu, X., & National Center for Health Statistics (U.S.). (2011). *Asthma prevalence, health care use, and mortality: United States, 2005-2009*. Hyattsville, MD: U.S. Dept. of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics.

Bahadori, K., Doyle-Waters, M. M., Marra, C., Lynd, L., Alasaly, K, Swiston, J., & FitzGerald, J. M. (2009). Economic burden of asthma: a systematic review. *BMC Pulmonary Medicine, 9*(24), doi: 10.1186/1471-2466-9-24

Bush, R. K., Portnoy, J. M., Saxon, A., Terr, A. I., & Wood, R. A. (2006). The medical effects of mold exposure. *The Journal of Allergy and Clinical Immunology*, 117(2), 326-33.

Cecchi, L., D'Amato, G., Ayres, J. G., Galan, C., Forastiere, F., Forsberg, B., ... Annesi-Maesano, I. (2010). Projections of the effects of climate change on allergic asthma: the contribution of aerobiology. *Allergy, 65*(9), 1073-1081.

Knutsen, A. P., Bush, R. K., Demain, J. G., Denning, D. W., Dixit, A., Fairs, A., … Wardlaw, A. J. (2012). Fungi and allergic lower respiratory tract diseases. *The Journal of Allergy and Clinical Immunology*, 129(2), 280-91.

Lang-Yona, N., Levin, Y., Dannemiller, K. C., Yarden, O., Peccia, J., & Rudich, Y. (2013). Changes in atmospheric CO2 influence the allergenicity of *Aspergillus fumigatus*. *Global Change Biology*, 19(8), 2381-8.

Levetin, E. & Van de Water, P. (2008). Changing pollen types/concentrations/distribution in the United States: Fact or fiction?. *Current Allergy and Asthma Reports, 8*(5), 418-424.

Luber, G., Knowlton K., Balbus J., Frumkin H., Hayden M., Hess J., … L. Ziska, (2014) Ch. 9: Human Health. Climate Change Impacts in the United States. *The Third National Climate Assessment*, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 220-256. doi:10.7930/J0PN93H5

Masoli, M., Fabian, D., Holt, S., Beasley, R., & Global Initiative for Asthma (GINA) Program. (2004). The global burden of asthma: Executive summary of the GINA Dissemination Committee report. *Allergy, 59*(5), 469-78.

Meng Q., Nagarajan S., Son Y., Koutsoupias, P., and Bielory, L. (2016). Asthma, oculonasal symptoms, and skin test sensitivity across National Health and Nutrition Examination Surveys. *Annals of Allergy, Asthma & Immunology, 116*(2):118-25.

National Asthma Education and Prevention Program. Expert Panel Report 3 (EPR-3). (2007). *Guidelines for the diagnosis and management of asthma*. (NIH Publication No. 07-4051). Retrieved from http://www.ncbi.nlm.nih.gov/books/NBK7232/

O'Connell, E. J. (2004). The burden of atopy and asthma in children. *Allergy, 59*(*Suppl*. 78), 7-11.

Oswalt, M. L, & Marshall, G. D. (2008). Ragweed as an Example of Worldwide Allergen Expansion. *Allergy, Asthma, and Clinical Immunology, 4*(3), 130–135.

Shea, K. M., Truckner, R. T., Weber, R. W., & Peden, D. B. (2008). Climate change and allergic disease. *Journal of Allergy and Clinical Immunology, 122*(3), 443-453.

Takaro, T. K., Knowlton, K., & Balmes, J. R. (2013). Climate change and respiratory health: Current evidence and knowledge gaps. *Expert Review of Respiratory Medicine, 7*(4), 349-361.

Wallace, D. V., & Dykewicz, M. S. (2008). *The diagnosis & management of Rhinitis: An updated practice parameter*. Retrieved from http://www.allergyparameters.org/published-practice-parameters/alphabetical-listing/rhinitis-download/

Wolf, J., O'Neill, N. R., Rogers, C. A., Muilenberg, M. L., & Ziska, L. H. (2010). Elevated atmospheric carbon dioxide concentrations amplify *Alternaria alternata* sporulation and total antigen production. *Environmental Health Perspectives*, 118(9), 1223-8.

Zhang, Y., Bielory, L., Mi, Z., Cai, T., Robock, A., & Georgopoulos, P. (2015). Allergenic pollen season variations in the past two decades under changing climate in the United States. *Global Change Biology, 21*(4), 1581-1589.

Zhang, Y., Isukapalli, S. S., Bielory, L., & Georgopoulos, P. G. (2013). Bayesian Analysis of Climate Change Effects on Observed and Projected Airborne Levels of Birch Pollen. *Atmospheric Environment, 68*, 64-73.

Ziska, L. H., Gebhard, D. E., Frenz, D. A., Faulkner, S., Singer, B. D., & Straka, J. G. (2003). Cities as harbingers of climate change: Common ragweed, urbanization, and public health. *Journal of Allergy and Clinical Immunology, 111*(2), 290-295.

Ziska, L.H., Knowlton, K., Rogers, C., Dalan, D., Tierney, N., Elder, M. A., … Frenz, D. (2011). Recent warming by latitude associated with increased length of ragweed pollen season in central North America. *National Academy of Sciences, 108*(10), 2448-2451.

VI. Coordination

Agencies for Response:

(1) American Academy of Allergy, Asthma & Immunology
Thomas A. Fleisher, MD, FAAAAI
President
555 East Wells St, Suite 1100
Milwaukee, WI 53202
(414) 272-6071
tfleishe@mail.nih.gov

(2) American College of Allergy, Asthma & Immunology
Bryan L. Martin, DO
President
85 West Algonquin Rd, Suite 550
Arlington Heights, IL 60005
(847) 427-1200
bryan.martin@osumc.edu

(3) Centers for Disease Control and Prevention
Thomas R Frieden, MD, MPH
Director
1600 Clifton Rd NE, MS G-14
Atlanta, GA 30333
404-639-7000
txf2@cdc.gov

(4) National Institute of Environmental Health Sciences
Linda S. Birnbaum, PhD
Director, NIEHS & NTP
P.O. Box 12233
Mail Drop B2-01
Research Triangle Park, NC 27709
(919) 541-3201
birnbaumls@niehs.nih.gov

(5) National Oceanic and Atmospheric Administration
Kathryn D. Sullivan, PhD
Under Secretary of Commerce for Oceans & Atmosphere and NOAA Administrator
1401 Constitution Ave NW, Room 5128
Washington, DC 20230
(202) 482-3436
kathryn.sullivan@noaa.gov

(6) USA National Phenology Network
Jake Weltzin, PhD
Executive Director
1311 E 4th St
Tucson, AZ 85721
(520) 626-3821
jweltzin@usgs.gov

(7) United States Environmental Protection Agency
Gina McCarthy, MS
Administrator
William Jefferson Clinton Building
1200 Pennsylvania Ave NW
Mail Code: 1101A
Washington, DC 20460
(202) 564-4700
mccarthy.gina@epa.gov

Agencies for Information:

(1) Aerobiology Research Laboratories
Frances Coates
President and CEO
81 Auriga Dr., Unit 39
Ottawa, Ontario K2E7Y5
(613) 226-9820
aerobio@aerobiology.ca

(2) Air and Waste Management Association
Stephanie Glyptis
Executive Director
One Gateway Center, 3rd Floor
420 Fort Duquesne Blvd
Pittsburgh, PA 15222
(412) 904-6006
sglyptis@awma.org

(3) Allergy and Asthma Network
Tonya Winders, MBA
President & CEO
8229 Boone Blvd., Suite 260
Vienna, VA 22182
(800) 878-4403
twinders@allergyasthmanetwork.org

(4) American Association for Respiratory Care
Thomas J. Kallstrom, MBA, RRT, FAARC
Executive Director and CEO
9425 N. MacArthur Blvd.
Irving, TX 75063
(972) 243-2272
kallstrom@AARC.ORG

(5) American Lung Association
Susan J. Rappaport, MPH
Vice President, Research and Scientific Affairs
21 West 38th Street
New York, NY 10018-2254
(212) 315-8791

susan.rappaport@lung.org

(6) American Public Health Association
Georges C. Benjamin, MD
Executive Director
800 I St. NW
Washington, DC 20001
(202) 777-2430
georges.benjamin@apha.org

(7) Association of State and Territorial Health Officials
Sharon Moffatt, RN, BSN, MS
Interim Executive Director
2231 Crystal Dr., Suite 450
Arlington, VA 22202
(571) 522-2306
smoffatt@astho.org

(8) Asthma and Allergy Foundation of America
Cary Sennett, MD, PhD
President and CEO
8201 Corporate Dr., Suite 1000
Landover, MD 20785
(202) 466-7643 x233
csennett@aafa.org

(9) Environmental Council of the States
Alexandra Dapolito Dunn, JD
Executive Director and General Counsel
50 F St. NW, Suite 350
Washington, DC 20001
(202) 266-4929
adunn@ecos.org

(10) National Association of Clean Air Agencies
S. William Becker
Executive Director
444 N. Capitol St. NW, Suite 307
Washington, DC 20001
(202) 624-7864
bbecker@4cleanair.org

(11) National Association of County and City Health Officials
LaMar Hasbrouck, MD, MPH
Executive Director
1100 17th St. NW, Seventh Floor
Washington, DC 20036
(202) 507-4247
lhasbrouck@naccho.org

(12) National Atmospheric Deposition Program
David A. Gay

Center Head
Illinois State Water Survey
2204 Griffith Dr.
M/C 674
Champaign, IL 61820-7495
(217) 333-7871
nadp@isws.illinois.edu

(13) United States Global Change Research Program, Crosscutting Group on Climate Change and Human Health (CCHHG)

John Balbus, MD, MPH
CCHHG Co-Chair and NIEHS Representative
National Institute of Environmental Health Science
31 Center Dr.
Claude D Pepper Building
Bethesda, MD 20892
(301) 496-3511
john.balbus@nih.gov

Fabien Laurier, PhD
CCHHG Co-Chair and OSTP Representative
Office of Science and Technology Policy
Executive Office of the President
Eisenhower Executive Office Building
1650 Pennsylvania Ave.
Washington, DC 20504
(202) 288-2879
Fabien_J_Laurier@ostp.eop.gov

George Luber, PhD
CCHHG Co-Chair and CDC Representative
Centers for Disease Control and Prevention
4770 Buford Hwy NE
CDC Chamblee Campus Building 106
Mailstop F59
Chamblee, GA 30341-3717
(770) 488.3429
gluber@cdc.gov

Juli Trtanj, MES
CCHHG Co-Chair and NOAA Representative
National Oceanic and Atmospheric Administration
1401 Constitution Ave. NW, Room 5128
Washington, DC 20230
(301) 734-1214
juli.trtanj@noaa.gov

VII. Submitting Author:

(1) ☒ Active Member ☐Associate Member
Meredith A. Jagger, MS, MPH
All Hazards Epidemiologist
Oregon Health Authority, Public Health Division
800 NE Oregon St, Ste. 772
Portland, OR 97232-2187
(971) 673-3343
meredith.a.jagger@state.or.us

Co-Authors:

(1) ☐ Active Member ☒Associate Member
Norman Anderson
Environmental Public Health Consultant
Anderson Environmental Health
31 Pat St.
Winslow, ME 04901
(207) 649-6145
andersonenvironmentalhealth@gmail.com

(2) ☐ Active Member ☒Associate Member
Leonard Bielory, MD
Professor
Rutgers University
400 Mountain Ave.
Springfield, NJ 07081
(973) 912-9817
bielory@envsci.rutgers.edu

(3) ☒ Active Member ☐Associate Member
Wendy M. Brunner, PhD
Epidemiologist Principal
Minnesota Department of Health
85 E. 7th Place
P.O. Box 64882
St. Paul, MN 55164
(651) 201-5895
wendy.brunner@state.mn.us

(4) ☒ Active Member ☐Associate Member
Lauren Thie, MSPH
Environmental Program Consultant
Division of Public Health, Occupational and Environmental Epidemiology
North Carolina Department of Health and Human Services
2001 Mail Service Center
Raleigh, NC 27699-2001
(919) 707-5931
lauren.thie@dhhs.nc.gov