Audio Podcast about the Symposium on the Science of Disproportionate Environmental Health Impacts

CHRISTINE GUITAR: With us now is Dr. Jane Clougherty and she's going to be speaking to us on social-psychological factors of community and public health. Dr. Clougherty…

JANE CLOUGHERTY: Great! Yes, thank you Christine. Hi. My name is Jane Clougherty and I'm a research associate with the Department of Environmental Health at the Harvard School of Public Health. I was a discussant on the panel at the EPA Environmental Justice Symposium looking at the effect of chronic social and psychological factors in U.S. communities and how these may affect distributions in health outcomes and may affect susceptibility to environmental pollutants.

CHRISTINE GUITAR: Could you please describe to us what a social-psychological factor is?

JANE CLOUGHERTY: Sure, social and psychological factors especially in urban communities, where I do a lot of my research, can take a lot of different forms. These can be things like poverty or unemployment or underemployment creating the condition that individuals are always worried about how they are going to pay for their next meals or how they're going to pay the rent for next month. Another good example is fear of violence in urban communities where we have shown effects of chronic fear of violence and hyper-vigilance that may be associated with this does appear to impact health outcomes directly and potentially may modify the association between certain physical exposures such as air pollution and their effects on asthma and other health outcomes. So when we think about stress it's important to think about the chronicity. There are some classic stress indicators that we think about that are largely associated with acute stress. This is sort of the fight or flight physiological response that many of us are familiar with. This is the cortisol or epinephrine increase, the rapid heart beat, increased broncho-dilation in ventilation. These are the physiologic mechanisms that prepared our ancestors to run from a saber-toothed tiger and today they seem to kick in when an individual is, for example, sitting down to take an important exam. But more importantly there's a separate effect of chronic stress and this is perhaps the continuous feeling about being worried about finances or being continually worried about fear in your community. These chronic stressors appear to differently affect our physiology and to potentially depress immune function over time and may lead to increased susceptibility to other environmental factors such as air pollution.

CHRISTINE GUITAR: Now Dr. Clougherty, can you tell us a little bit about the work you do as a researcher for Harvard?

JANE CLOUGHERTY: Of course. My research is largely focused around the intersection between chronic social stress and air pollution exposures in predicting respiratory and cardiovascular outcomes. So, as one example, there was a study I

published in 2007 where we found a significant association between the effect of nitrogen dioxide which is a nice marker for combustion- related air pollutants or traffic- related air pollutants and asthma onset among children. However, the important thing about this study or the really surprising finding was those children who had been exposed to violence seemed to have a greater susceptibility to the effects of traffic-related air pollution in their communities in predicting asthma outcomes. So we needed a way to explain and understand this powerful interaction that we were observing. And one important piece of this is probably the chronic stress that they experienced as a result of their exposures to violence. And indeed chronic stress is hypothesized to be one of those important parts of socio-economic status that may explain the increased susceptibility that we seem to see consistently across multiple studies between persons of lower socioeconomic status and increased susceptibility to pollution exposures. Now, about two years ago I started a stream of research in toxicology which is effectively animal studies. And there what we tried to do was to mimic the same association we were seeing in humans between chronic stressors, air pollution exposures, and respiratory outcomes. We tried to mimic this in animals and the reason why we do this is because in the real world we have a lot of reason to believe that air pollution and other physical environment exposures may be very strongly spatially correlated with stressors in urban communities. A great example is traffic. When you have a highway, not only do you have a lot of pollution exposures, you also have a lot of noise. And it's very hard to know if the health effects among people living near highways are really driven by the air pollution or are driven by the noise and potentially there may be some interaction between those. There may also be a modification by poverty and other stressors that may be spatially correlated with living near a highway or an industrial facility. In the animals, however, we can actually assign these exposures so we don't need to worry about this confounding or correlation between exposures. That's a difficulty in the human studies. In the animals we were able to assign rats to stressed and non-stressed groups-- concentrated-air pollution exposed and filtered air animals. So it's a 2 x 2 design where we were able to isolate the effects of chronic social stress and air pollution exposures. And what we found was that in those animals who were exposed to both, we found a markedly different response to pollution exposures than we did among those animals who were not also exposed to this stress. We found a higher rate of breathing, of respiratory frequency, in response to air pollution exposures only among those animals who are also exposed to stress. Likewise, those animals also were breathing more shallowly that was taking in a lower total volume of air over a certain period of time. So, which is all to say that, like in the human studies, we are starting to explore this interaction among animals as well and we are starting to find a very real interaction between chronic stress and air pollution which is very difficult to disentangle in the real world.

CHRISTINE GUITAR: Great. Well, thank you so much.