

Report 56: Mechanisms of Resistance, Resilience and Recovery: Learning from Success in Dealing with Environmental Stressors

Convener: Ed Levin

Brief History: Typically attention has mostly been paid to mechanisms of susceptibility to the adverse effects of exposure to environmental toxicants and other stressors. Little attention has been paid to those individuals who do not show adverse effects after exposure, but it is those who can adequately deal with the environmental stress who may best direct us to how we can help the vulnerable to better respond.

Discussion Highlights: There are numerous examples of how physiology maintains homeostasis including accommodation of neurotransmitter receptors in the face of chronic agonist or chronic antagonist treatments, induction of liver catabolic enzyme systems, epigenetic modifications, DNA repair mechanisms, and induction of superoxide dismutase that help organisms cope with toxicant stresses without phenotypic impairment. These and other response systems such as induction of immunologic response for eliminating invading microbes or precancerous cells and neurobehavioral reactions to minimize further toxicant exposures can help minimize the functional impairment from toxicant exposures. Evolutionary adaptation has provided organisms with numerous systems which help maintain homeostasis. Indeed it is the exercise of these systems that can help with further response in thriving in a complex environment. The idea of achieving an idealized pristine environment without toxic challenges is unrealistic. We can decrease the toxicant load but not eliminate it. It is important to understand the mechanisms by which organisms can cope with toxicant challenges ameliorating their effect before they produce a functional toxic impairment.

Recommendations:

Pay attention to the reactions of the exposed groups in our studies who do not show functional toxic effects to determine the mechanisms by which they avoid such effects. This will help determine how endogenous mechanisms of homeostasis can protect from functional damage and provide leads into how to develop effective treatments for those who are vulnerable. Use of outbred lines to provide diverse response can facilitate this effort to understand diversity of response.

Discussion Participants:

Ed Levin, Claude Hughes, Deborah Cory-Slechta, Julia Gohlke