

**The National Institute of Environmental Health Sciences
(NIEHS)/National Institutes of Health (NIH): Environmental
Exposures and Decline in Renal Function**

The primary focus of this research project is to study the contributions of a variety of environmental agents in the development of end-stage renal disease. The project is being conducted with a cohort of people occupationally exposed to the element lead. The investigators have also found other health affects including declines in mental ability as the cohort ages.

Lead Agency:

The National Institute of Environmental Health Sciences (NIEHS)/
National Institutes of Health (NIH)

Agency Mission:

The mission of the NIEHS is to reduce the burden of human illness and disability by understanding how the environment influences the development and progression of human disease.

Principal Investigators:

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General Description:

End stage renal disease (ESRD) is associated with substantial morbidity and mortality. Strategies to prevent the renal function decline that can ultimately result in ESRD are essential. The impact of environmental exposures has received relatively little attention in this regard, despite the fact that exposures such as cadmium and lead are known renal toxicants that are stored long-term in the body and ubiquitous in humans. In fact, the lead and cadmium dose-effect curves for renal function remain uncertain for the low to moderate range of doses. The project will investigate a broad set of causes of renal function decline, including lead, cadmium, blood pressure, diabetes, nephrotoxic medication use, genetic polymorphisms, and age. This research project will build on data, from the large cohort of current and former lead workers and participants without occupational lead exposure in the originally funded grant. Study subjects have a wide

range of lead exposure and dose measures and renal outcome data from three visits each over an average of 2.2 years. Analysis of existing data has already provided very important results, including longitudinal decline in renal function associated with lead dose measures; interaction between age and lead dose on renal function and renal function decline; interaction between ALAD genotype and lead dose on renal function; and associations of environmental level cadmium dose with elevated NAG in a subset of lead workers. We believe the proposed work will allow a more complete understanding of the causes of renal function decline and lead to the development of public health interventions to prevent this considerable public health problem.

Excellence: What makes this project exceptional?

Results from this project suggest that the "normal" cognitive decline experienced as people age may be related to recent and life-time exposure to lead. In three separate independent epidemiologic studies, bone lead content was associated with poorer measures of cognitive function.

Significance: How is this research relevant to older persons, populations and/or an aging society?

Lead exposure is widely known to cause problems in learning in children along with reducing the peak intelligence children can obtain. Lead is readily stored in bone tissue and there are few effective treatments for removing lead from the body once exposure has occurred. It can be released from bone during gestation and milk production and in aging people if osteopenia or osteoporosis develops. The neurological effects of long-term lead exposure on aging populations have not been well described.

Effectiveness: What is the impact and/or application of this research to older persons?

Added to the knowledge that exposure to lead lowers the peak IQ a person reaches, these studies show that lead exposure is a life-long issue. The researchers point out that the current occupational safety standards for lead workers are inadequate to protect them. The researchers believe that blood lead levels in adults should be kept below 20 micrograms per deciliter of blood and tibia lead should be kept below 15 micrograms per gram to prevent cognitive function loss.

Innovativeness: Why is this exciting or newsworthy?

This research draws into question that cognitive decline as people age is normal and that their life-long exposure to lead may influence their mental abilities later in life. It demonstrates again that there is no safe level of lead exposure at any age and that current efforts to protect adult workers from lead exposure may be inadequate.