Author	Title	Year	Journal/Proceedings	Reftype	DOI/URL
Aminov, Z., Haase, R.F., Pavuk, M., Carpenter, D.O. and Consortium, A.E.H.R.	**Analysis of the effects of exposure to polychlorinated biphenyls and chlorinated pesticides on serum lipid levels in residents of Anniston, Alabama.**	**2013**	**Environmental health : a global access science source Vol. 12, pp. 108**	**article**	**DOI**

Abstract: Anniston, Alabama, is the site of a former Monsanto plant where polychlorinated biphenyls (PCBs) were manufactured from 1929 until 1971. Residents of Anniston are known to have elevated levels of PCBs. The objective of the study was to test the hypothesis that levels of the various lipid components (total cholesterol, LDL cholesterol, HDL cholesterol, triglycerides) are differentially associated with concentrations of total PCBs and total pesticides, and further that different congeners, congener groups and different pesticides do not have identical associations in serum samples obtained from Anniston residents in a cross-sectional study. Fasting serum samples were obtained from 575 residents of Anniston who were not on any lipid-lowering medication and were analyzed for 35 PCB congeners, nine chlorinated pesticides, total cholesterol, LDL and HDL cholesterol and triglyceride concentrations. Associations between toxicant concentrations and lipid levels were determined using multiple linear regression analysis. We observed that elevated serum concentrations of lipids were associated with elevated serum concentrations of ΣPCBs and summed pesticides in analyses adjusted for age, race, gender, BMI, alcohol consumption, smoking and exercising status. The strongest associations were seen for PCB congeners with three, four, or at least eight substituted chlorines. Mono-ortho substituted congeners 74 and 156, di-ortho congeners 172 and 194, and tri- and tetra-ortho congeners 199, 196-203, 206 and 209 each were significantly associated with total lipids, total cholesterol and triglycerides. Serum concentrations of HCB and chlordane also had strong associations with lipid components. Increased concentrations of PCBs and organochlorine pesticides are associated with elevations in total serum lipids, total cholesterol and triglycerides, but the patterns are different for different groups of PCBs and different pesticides. These observations show selective effects of different organochlorines on serum concentrations of different groups of lipids. This elevation in concentrations of serum lipids may be the basis for the increased incidence of cardiovascular disease found in persons with elevated exposures to PCBs and chlorinated pesticides.

Birnbaum, L.S., Dutton, N.D., Cusack, C., Mennemeyer, S.T. and Pavuk, M.	Anniston community health survey: Follow-up and dioxin analyses (ACHS-II)--methods.	2016	Environmental science and pollution research international Vol. 23, pp. 2014-2021	article	DOI

Abstract: High serum concentrations of polychlorinated biphenyls (PCBs) have been reported previously among residents of Anniston, Alabama, where a PCB production facility was located in the past. As the second of two cross-sectional studies of these Anniston residents, the Anniston Community Health Survey: Follow-Up and Dioxin Analyses (ACHS-II) will yield repeated measurements to be used to evaluate changes over time in ortho-PCB concentrations and selected health indicators in study participants. Dioxins, non-ortho PCBs, other chemicals, heavy metals, and a variety of additional clinical tests not previously measured in the original ACHS cohort will be examined in ACHS-II. The follow-up study also incorporates a questionnaire with extended sections on diet and occupational history for a more comprehensive assessment of possible exposure sources. Data collection for ACHS-II from 359 eligible participants took place in 2014, 7 to 9 years after ACHS.

Goncharov, A., Bloom, M., Pavuk, M., Birman, I. and Carpenter, D.O.	Blood pressure and hypertension in relation to levels of serum polychlorinated biphenyls in residents of Anniston, Alabama.	2010	Journal of hypertension Vol. 28, pp. 2053-2060	article	DOI

Abstract: To determine risk factors for elevated blood pressure and hypertension in residents of Anniston, Alabama who live near a plant that manufactured polychlorinated biphenyls (PCBs). A total of 758 Anniston residents had multiple measurements of blood pressure, provided information on demographic factors, medications, smoking, and exercise, and provided blood samples for determination of PCBs and total serum lipid. Rates of hypertension increased significantly ($P < 0.05$) with age and concentration of serum PCBs and were higher in African-Americans (n = 351) than in whites (n = 407). Hypertension also increased with BMI, but was not related to total serum lipid, sex, smoking, or exercise. Among 394 persons not on antihypertensive medication, linear regression analysis demonstrated a significant positive relation between serum PCB level and both systolic and diastolic blood pressure. After adjustment for potentially confounding variables, logistic regression gave odds ratios for the highest to lowest tertiles of total serum PCBs that exceeded 3.5 for both systolic and diastolic hypertension. When analyzed by quintiles of PCBs, the highest odds ratio was in the third quintile, suggesting a low dose effect. In individuals not on antihypertensive medication, serum PCB levels were significantly associated with prevalence of hypertension. Significant positive associations were also observed between PCB concentrations and systolic and diastolic blood pressure even in normotensive ranges. The strength of the relationships between PCB exposure and both hypertension and blood pressure suggests that PCB exposure may be an important contributing factor in regulation of blood pressure.

Goncharov, A., Pavuk, M., Foushee, H.R., Carpenter, D.O. and Consortium, A.E.H.R.	Blood pressure in relation to concentrations of PCB congeners and chlorinated pesticides.	2011	Environmental health perspectives Vol. 119, pp. 319-325	article	DOI

Abstract: Residents of Anniston, Alabama, live near a Monsanto plant that manufactured polychlorinated biphenyls (PCBs) from 1929 to 1971 and are relatively heavily exposed. The goal of this study was to determine the relationship, if any, between blood pressure and levels of total serum PCBs, several PCB groups with common actions or structure, 35 individual PCB congeners, and nine chlorinated pesticides. Linear regression analysis was used to determine the relationships between blood pressure and serum levels of the various contaminants after adjustment for age, body mass index, sex, race, smoking, and exercise in 394 Anniston residents who were not taking antihypertensive medication. Other than age, total serum PCB concentration was the strongest determinant of blood pressure of the covariates studied. We found the strongest associations for those PCB congeners that had multiple ortho chlorines. We found the associations over the full range of blood pressure as well as in those subjects whose blood pressure was in the normal range. The chlorinated pesticides showed no consistent relationship to blood pressure. In this cross-sectional study, serum concentrations of PCBs, especially those congeners with multiple ortho chlorines, were strongly associated with both systolic and diastolic blood pressure.

Rubin, I.L., Nodvin, J.T., Geller, R.J., Teague, W.G., Holtzclaw, B.L. and Felner, E.I.	Environmental health disparities: environmental and social impact of industrial pollution in a community - the model of Anniston, AL.	2007	Pediatric clinics of North America Vol. 54, pp. 375-98	article	DOI

Abstract: The health and well-being of children are critically dependent on the environment in which they live. This article explores the complex relationship between the environment in which a child lives and the environmental factors that can adversely affect health and development. It also examines how awareness of these adverse factors can be helpful in promoting optimal health for children through the societal infrastructures that deal with health, the environment, and social justice.

Jandacek, R.J.	Intervention to reduce PCBs: learnings from a controlled study of Anniston residents.	2016	Environmental science and pollution research international Vol. 23, pp. 2022-2026	article	DOI

Author	Title	Year	Journal/Proceedings	Reftype	DOI/URL
Abstract: Nonabsorbable dietary lipid reduces the absorption of dietary PCBs and increases the excretion of previously absorbed stored PCBs. Absorption of all PCB congeners will presumably be interrupted by nonabsorbable lipid; however excretion will be enhanced only for PCBs that have not been metabolized and also for their lipophilic metabolites. Our study with the nonabsorbable lipid, olestra, in a controlled trial in Anniston residents with elevated PCB levels demonstrated that it is possible to enhance removal of PCBs from the body in the clinically meaningful time frame of 1 year. The rate of disappearance of PCBs in participants who ate 15 g/day of olestra was significantly faster than the rate determined during the 5 years prior to intervention. The rate of disappearance was not changed from the pretrial rate in participants who ingested vegetable oil. Consideration of the role of body weight and fat is an important factor in the design of intervention trials of this kind, and the results of this trial suggest that the level of body fat in individuals will influence the rate of removal from the body. Previously reported data from animals and from a case report indicate that weight loss combined with nonabsorbable dietary lipid will maximize removal of PCBs and presumably other stored organochlorine compounds. The design of future intervention trials should include a focus on body fat levels and changes. Future trials should also include the testing of dietary compounds other than olestra that have affinity for PCBs, such as plant-derived polyphenols.					
Brown, M.	Military Chemical Warfare Agent Human Subjects Testing: Part 1—History of Six-Decades of Military Experiments With Chemical Warfare Agents	2009	Military Medicine Vol. 174(10), pp. 1041-1048	article	DOI
Brown, M.	Military Chemical Warfare Agent Human Subjects Testing: Part 2—Long-Term Health Effects Among Participants of U.S. Military Chemical Warfare Agent Testing	2009	Military Medicine Vol. 174(10), pp. 1049-1054	article	DOI
Silverstone, A.E., Rosenbaum, P.F., Weinstock, R.S., Bartell, S.M., Foushee, H.R., Shelton, C. and Pavuk, M.	**Polychlorinated biphenyl (PCB) exposure and diabetes: results from the Anniston Community Health Survey.**	**2012**	**Environmental health perspectives Vol. 120, pp. 727-732**	**article**	**DOI**
Abstract: Polychlorinated biphenyls (PCBs) manufactured in Anniston, Alabama, from 1929 to 1971 caused significant environmental contamination. The Anniston population remains one of the most highly exposed in the world. Reports of increased diabetes in PCB-exposed populations led us to examine possible associations in Anniston residents. Volunteers (n = 774) from a cross-sectional study of randomly selected households and adults who completed the Anniston Community Health Survey also underwent measurements of height, weight, fasting glucose, lipid, and PCB congener levels and verification of medications. Odds ratios (ORs) and 95% confidence intervals (CIs) were calculated to assess the relationships between PCBs and diabetes, adjusting for diabetes risk factors. Participants with prediabetes were excluded from the logistic regression analyses. Participants were 47% African American, 70% female, with a mean age of 54.8 years. The prevalence of diabetes was 27% in the study population, corresponding to an estimated prevalence of 16% for Anniston overall; the PCB body burden of 35 major congeners ranged from 0.11 to 170.42 ppb, wet weight. The adjusted OR comparing the prevalence of diabetes in the fifth versus first quintile of serum PCB was 2.78 (95% CI: 1.00, 7.73), with similar associations estimated for second through fourth quintiles. In participants < 55 years of age, the adjusted OR for diabetes for the highest versus lowest quintile was 4.78 (95% CI: 1.11, 20.6), whereas in those >= 55 years of age, we observed no significant associations with PCBs. Elevated diabetes prevalence was observed with a 1 SD increase in log PCB levels in women (OR = 1.52; 95% CI: 1.01, 2.28); a decreased prevalence was observed in men (OR = 0.68; 95% CI: 0.33, 1.41). We observed significant associations between elevated PCB levels and diabetes mostly due to associations in women and in individuals < 55 years of age.					
Hermanson, M.H. and Johnson, G.W.	**Polychlorinated biphenyls in tree bark near a former manufacturing plant in Anniston, Alabama.**	**2007**	**Chemosphere Vol. 68, pp. 191-198**	**article**	**DOI**
Abstract: Tree bark samples were collected to identify the relative amounts and congener profiles of atmospheric polychlorinated biphenyls dissolved into bark lipids from the gas phase in Anniston, Alabama, USA, where PCBs were manufactured from the 1920s until 1971. The area is heavily contaminated with PCBs: At least 4550 metric tons (mt) of PCB and 14000 mt of PCB distillation residue, known as Montar, remain buried in two landfills near the plant site. A minimum of 20.5 mt of PCBs were emitted to the atmosphere by the plant between 1953 and 1971 based on emissions figures for 1970. Bark results show that total PCB concentrations range over more than three orders of magnitude from 171927 ng/g lipid near the plant/landfill area, dropping exponentially to 35 ng/g lipid at a distance of about 7 km. The exponential trend is highly correlated (r=-0.77) and significant (p<0.05). The most concentrated tree started growing after 1971 showing that atmospheric PCB concentrations remained high after PCB production ended. All PCB congener profiles show persistent congeners 31+28, 52, 66, 153, 138, and 180. Congener profiles from trees growing near the plant/landfill all have somewhat similar profiles but those growing during PCB production show high molecular mass compounds not usually found in the atmosphere and not found in younger trees, even in the most concentrated sample. We believe that high-temperature Montar disposal released high molecular mass PCBs into the gas phase which were dissolved into older tree bark lipids.					
Pavuk, M., Olson, J.R., Wattigney, W.A., Dutton, N.D., Sjödin, A., Shelton, C., Turner, W.E., Bartell, S.M., of Anniston Environmental Health Research Consortium Steering Committee include S Carter, A.E.H.R.C.M., Bartell, S., Carpenter, D.O., Cash, J., Foushee, R., Percy, A., Frumkin, H., Lavender, M., Moysich, K., Olson, J., Pavuk, M., Rosenbaum, P., Silverstone, A., Weinstock, R. and Shelton, C.	**Predictors of serum polychlorinated biphenyl concentrations in Anniston residents.**	**2014**	**The Science of the total environment Vol. 496, pp. 624-634**	**article**	**DOI**
Abstract: The Anniston Community Health Survey was a community-based cross-sectional study of Anniston, Alabama, residents who live in close proximity to a former PCB production facility to identify factors associated with serum PCB levels. The survey comprises 765 Anniston residents who completed a questionnaire interview and provided a blood sample for analysis in 2005-2007. Several reports based on data from the Anniston survey have been previously published, including associations between PCB exposure and diabetes and blood pressure. In this study we examine demographic, behavioral, dietary, and occupational characteristics of Anniston survey participants as predictors of serum PCB concentrations. Of the 765 participants, 54% were White and 45% were African-American; the sample was predominantly female (70%), with a mean age of 55 years. Serum PCB concentrations varied widely between participants (range for sum of 35 PCBs: 0.11-170.4 ng/g wet weight). Linear regression models with stepwise selection were employed to examine factors associated with serum PCBs. Statistically significant positive associations were observed between serum PCB concentrations and age, race, residential variables, current smoking, and local fish consumption, as was a negative association with education level. Age and race were the most influential predictors of serum PCB levels. A small age by sex interaction was noted, indicating that the increase in PCB levels with age was steeper for women than for men. Significant interaction terms indicated that the associations between PCB levels and having ever eaten locally raised livestock and local clay were much stronger among African-Americans than among White participants. In summary, demographic variables and past consumption of locally produced foods were found to be the most important predictors of PCB concentrations in residents living in the vicinity of a former PCB manufacturing facility.					

Author	Title	Year	Journal/Proceedings	Reftype	DOI/URL
Aminov, Z., Haase, R., Olson, J.R., Pavuk, M., Carpenter, D.O. and Consortium, A.E.H.R.	**Racial differences in levels of serum lipids and effects of exposure to persistent organic pollutants on lipid levels in residents of Anniston, Alabama.**	**2014**	**Environment international Vol. 73, pp. 216-223**	**article**	**DOI**

Abstract: Serum lipid levels are major risk factors for cardiovascular disease. In addition to diet, exercise, genetics, age and race, serum concentrations of persistent organic pollutants (POPs) influence concentrations of serum lipids. We investigated associations between fasting concentrations of 35 polychlorinated biphenyl (PCB) congeners and nine organochlorine pesticides in relation to total serum lipids, total cholesterol, low-density lipoprotein (LDL) cholesterol, high density lipoprotein (HDL) cholesterol and triglycerides in 525 Caucasian and African American residents of Anniston, Alabama, who were not on any lipid-lowering medication. In Model 1, data were adjusted for age, age quadratic, gender, BMI, alcohol consumption, smoking and exercise, while in Model 2, additional adjustment was done for other POPs. As compared to Caucasians, African Americans had lower levels of total lipids and triglycerides with higher concentrations of HDL cholesterol, but higher concentrations of PCBs and pesticides. Total pesticides were more strongly associated with elevations in serum lipids than were total PCBs, and the associations were stronger in African Americans. Total DDTs were not associated with serum lipids after adjustment for other POPs in either racial group, while the strongest positive associations were seen for hexachlorobenzene (HCB) in both racial groups. Racial differences in lipid profiles, concentrations of POPs and associations between POP concentrations and serum lipids are relevant to racial differences in rates of cardiovascular disease.

Author	Title	Year	Journal/Proceedings	Reftype	DOI/URL
Pavuk, M., Olson, J.R., Sjödin, A., Wolff, P., Turner, W.E., Shelton, C., Dutton, N.D., Bartell, S. and Consortium, A.E.H.R.	**Serum concentrations of polychlorinated biphenyls (PCBs) in participants of the Anniston Community Health Survey.**	**2014**	**The Science of the total environment Vol. 473-474, pp. 286-297**	**article**	**DOI**

Abstract: Serum concentrations of 35 ortho-substituted polychlorinated biphenyl congeners (PCBs) were measured in 765 adults from Anniston, Alabama, where PCBs were manufactured between 1929 and 1971. As part of the Anniston Community Health Survey (ACHS), demographic data, questionnaire information, and blood samples were collected from participants in 2005-2007. Forty-six percent of study participants were African-American, 70% were female, and the median age was 56 years. The median concentration of the sum of 35 PCB congeners (ΣPCBs) was 528 ng/g lipid, with a 90th percentile of 2,600 ng/g lipid, minimum of 17.0 ng/g lipid, and maximum of 27,337 ng/g lipid. The least square geometric mean ΣPCBs was more than 2.5 times higher for African-American participants than for White participants (866 ng/g lipid vs. 331 ng/g lipid); this difference did not change materially after adjustment for age, sex, body mass index (BMI) and current smoking. In spite of large differences in absolute PCB levels, relative contributions of individual congeners to ΣPCBs were quite similar between race groups. Nevertheless, while percent contributions to ΣPCBs for most of the most abundant penta- to heptachlorobiphenyls were higher among African-Americans, the percentages were higher in Whites for the lower-chlorinated PCBs 28 and 74 and for octa- to decachlorinated PCBs. No major differences were observed in geometric mean ΣPCBs between women and men when adjusted for age, race, BMI and current smoking (516 ng/g lipid vs. 526 ng/g lipid). Principal component analysis revealed groups of co-varying congeners that appear to be determined by chlorine substitution patterns. These congener groupings were similar between ACHS participants and the National Health and Nutrition Examination Survey (NHANES) 2003-04 sample of the general United States population, despite ACHS participants having serum concentrations of ΣPCBs two to three times higher than those in comparable age and race groups from NHANES.

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