CIRCULATING LEVELS OF THE DDT METABOLITE *p,p'*-DDE ARE RELATED TO PREVALENT HYPERTENSION IN THE ELDERLY

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Introduction

Exposure to PCBs and dioxin to experimental animals increase blood pressure[1]. Also in epidemiological investigations a relationship between POPs and hypertension has been reported. One cross-sectional analysis of the NHANES 1999-2002 survey found a RR 1.84 (95%CI 1.25-2.70) for highest quartile regarding self-reported hypertension for many PCBs (PCB126 and PCB118 strongest) [2], while another evaluation of the same survey using 524 subjects showed that dioxin and PCDF concentrations in serum related to newly diagnosed hypertension in women only (RR 5-6 for highest vs. lowest quartiles) [3].

In a cross-sectional analysis of data from a polluted environment of Anniston, US, including 758 participants, RR for highest vs. lowest tertile of PCB was 4.1 (95%CI 1.3-14.9). In this case, the diagnosis of hypertension was based on the combination of blood pressure measurements and/or history of antihypertensive medication, which is a proper to definition of hypertension prevalence, since more than half of all hypertensive cases are unknown in population surveys in adults [4].

In the present study, we investigated if circulating levels of persistent organic pollutants (POPs) were related to hypertension in a population-based sample of elderly subjects.

Material and Methods

1016 subjects aged 70 years were investigated in the Prospective Investigation of the Vasculature in Uppsala Seniors (PIVUS) study. Hypertension was defined as either use of antihypertensive treatment or blood pressure > 140/90 mmHg. Twenty-one different POPs, including 16 PCBs, three pesticides (HCB, DDE and TNC), one dioxin (OCDD) and one brominated compound (BDE47) were analyzed by high-resolution chromatography coupled to high-resolution mass spectrometry (HRGC/ HRMS) at age 70.

Results and Discussion

732 subjects (72%) showed hypertension.

When the POPs were treated as continuous variables and adjusted for gender only, several of the PCBs with a low number of chlorine atoms (PCB74, 99, 105, 118 and 138) were related to prevalent hypertension. Also the OC pesticides, HCB, TNC, *p,p'*-DDE, and the brominated compound BDE47 were related to hypertension. The strongest of these associations were seen for *p,p'*-DDE (OR 1.35 for a SD change, 95%CI 1.17-1.56, p<0.0001, See figure 1).

Following further adjustment for serum cholesterol and triglycerides, BMI, smoking, education and exercise habits, only *p,p'*-DDE was still significant (OR 1.23 for a SD change, 95%CI 1.06- 1.43, p=0.006).

TEQ was not significantly related to prevalent hypertension (OR 1.06, 95%CI 0.86- 1.32, p= 0.53).

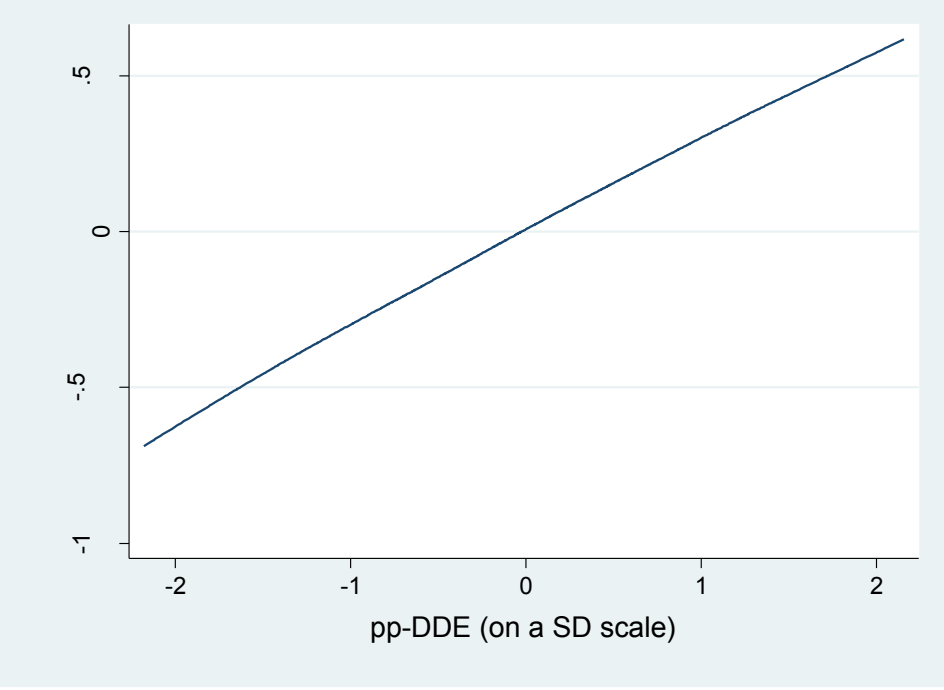
In order to evaluate possible non-linear relationships between the POPs and hypertension, the POPs were divided in quintiles. However, no consistent non-linear relationships were seen and as shown in figure 1, the relationship between *p,p'*-DEE and log odds for hypertension is strictly linear.

Conclusion: In this cross-sectional analysis of an elderly population, high levels of circulating levels of *p,p'*-DDE were associated with prevalent hypertension, further strengthening the experimental findings that POPs might influence blood pressure.

Table 3. Relationships between POP levels and prevalent hypertension. The POP levels are used as ln-transformed continuous variables in the analysis. The first models are just sex and lipid adjusted, while the multiple adjusted models used sex, serum cholesterol and triglycerides, BMI, smoking exercise habits and education levels as confounders.

	Gender and lipid adjusted		Multiple adjusted	
Variable	OR (95% CI)	P-value	OR (95% CI)	P-value
PCB74	1.37 (1.05, 1.78)	0.0184	1.20 (0.89, 1.60)	0.229
PCB99	1.42 (1.13, 1.78)	0.0025	1.24 (0.97, 1.59)	0.0863
PCB118	1.56 (1.2, 2.01)	0.0007	1.26 (0.95, 1.67)	0.1098
PCB 105	1.5 (1.19, 1.89)	0.0005	1.23 (0.96, 1.60)	0.1075
PCB 153	1.29 (0.95, 1.77)	0.1063	1.19 (0.85, 1.67)	0.3146
PCB 138	1.45 (1.09, 1.93)	0.0101	1.25 (0.91, 1.70)	0.1627
PCB 156	0.88 (0.63, 1.21)	0.427	0.90 (0.63, 1.30)	0.5804
PCB 157	0.91 (0.68, 1.22)	0.532	0.90 (0.65, 1.26)	0.5532
PCB 180	0.84 (0.59, 1.19)	0.3189	0.94 (0.64, 1.38)	0.7464
PCB 170	0.9 (0.63, 1.27)	0.5349	0.94 (0.63, 1.40)	0.7709
PCB 189	0.87 (0.71, 1.07)	0.1784	0.87 (0.69, 1.09)	0.2212
PCB 194	0.92 (0.77, 1.09)	0.3329	1.02 (0.84, 1.24)	0.8238
PCB 206	0.82 (0.60, 1.12)	0.2143	0.90 (0.63, 1.27)	0.5435
PCB 209	0.81 (0.61, 1.07)	0.1395	0.96 (0.70, 1.32)	0.8232
OCDD	1.15 (0.90, 1.47)	0.2512	1.11 (0.86, 1.43)	0.4402
HCB	1.38 (1.01, 1.91)	0.0466	1.14 (0.80, 1.63)	0.4705
TNC	1.25 (1.01, 1.57)	0.0499	1.06 (0.82, 1.37)	0.6486
DDE	1.39 (1.19, 1.61)	0.0001	1.25 (1.07, 1.47)	0.006
BDE47	1.32 (1.04, 1.68)	0.0208	1.23 (0.96, 1.57)	0.0971

Figure 1. Relationship between the log odds of prevalent hypertension vs circulating levels of *–p,p'*-DDE (on a SD-scale) ($p<0.0001$).



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