Serum Biomarkers of Oxidative Stress Measured During MCMA-2006 Campaign in Mexican Children Exposed to the Air Pollutants Plume Fall.

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Introduction.- Mexico City Metropolitan Area (MCMA) is a big polluted area, and its geographic characteristics enhance the concentration of air criteria contaminants. During 2006 the MILAGRO-MCMA campaign was organized to evaluate the regional impacts of ambient air pollution. Environmental contaminants are associated with oxidative stress and there are many biomarkers to measure the intensity of this event. Some of this blood biomarkers are: a) Myeloperoxidase (MPO) activity (EC. 1.11.1.7), b) Nitroblue Terazolium reduction dye , c) Thiobarbituric Acid Reactive Substances (TBAR), e) The paraoxonase (PON1) (EC 3.1.1.2) activity.

Objective: To determine the activity and concentration of: MPO, PON-1, TBAR, NBT reduction dye and carbonyl groups in children living in areas exposed to the MCMA air pollutants plume.

Materials and Methods: Children living in three different areas of MCMA were recruited. Two sites were locations exposed to the megacity aerosol plume: T1_Tecamac, México and T2_San Pedro, Hidalgo; one a non aerosol plume site, T0_Iztapalapa, D.F. and a control site outside the MCMA, TT_Santa Ana, Tlaxcala. After getting their parents informed consent, a children 6 ml of blood sample was collected. The determination of the different biomarkers of oxidative stress was carried by spectrophotometric techniques measuring: MPO activity, PON-1 activity, the reduction of Nitroblue Tetrazolium dye, TBAR determination and the quantification of carbonyl groups. Statistical analysis was done by the One Way ANOVA and the U Man-Whitney test to compare between the groups. The statistical significance level was set at p<0.05

Results: The MPO plasma activity was significantly elevated in children living in TT compared to those living in T0 and T2 (65.42±4.26 vs 53.7±2.3 and 47.7±2.03). Regarding to PON-1 activity, the children living in TT also showed the lowest value compared to other regions (0.06±0.01 vs 0.10±0.01; 0.10±0.01 and 0.12±0.01). Contrary to this, TT children showed the highest concentration of TBAR (15.31±4.7) followed by T2 (13.0±1.9) and it was significantly different from T0 and T1 groups (9.01±0.95 and 9.44±0.95 respectively). Regarding the determination of carbonyl groups, T2 children showed a significantly higher concentration (1.67±0.18) than the other groups. Finally, T1 children showed the lowest nitroblue tetrazolium reduction dye (5.33±0.22) compared to the other children.

Conclusions: This work demonstrates that children from TT showed an increased MPO activity, and lipoperoxidation products (TBARs), but lesser PON-1 activity and carbonyl groups; indicating a non specific inflammatory response not directly related of air contamination. Children from the other sites showed a induction of PON-1 activity and higher concentration of carbonyl groups, specially those from T2 where the nutritional status is deficient indicating an oxidative stress status probably enhanced by environmental contamination because of the aerosol plume fall. Further statistical analysis are in course to confirm if these findings are related to air pollutant exposure.