IDENTIFICATION OF PRENATAL KIDNEY INJURY BY THE DETECTION OF EARLY BIOMARKERS IN AMNIOTIC FLUID

Abstract # 1205

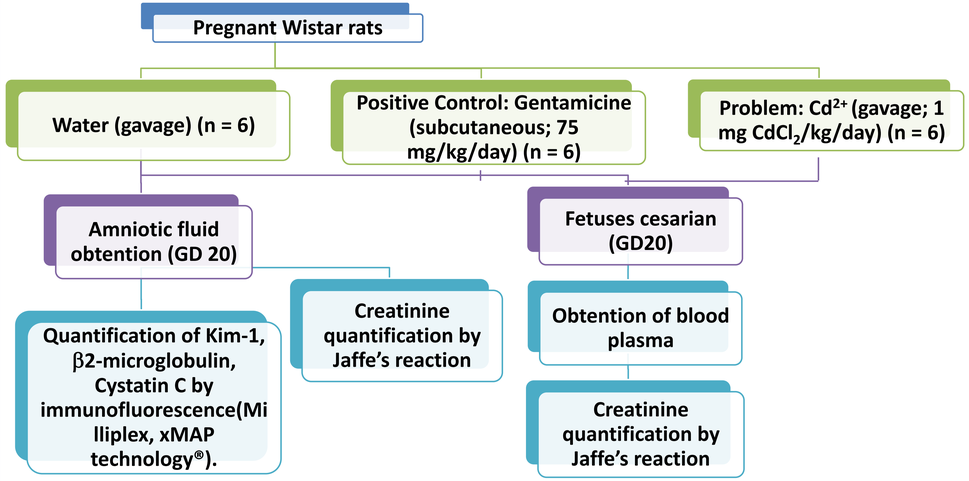
T. Jacobo-Estrada, M. Cárdenas-González, A. De Vizcaya-Ruiz and O. Barbier
Toxicology Department, CINVESTAV-IPN, Mexico City, Mexico

Introduction

Over recent years, nephropathies have been rising in infants and newborns in Mexico, and worldwide. Prenatal exposure to cadmium (Cd^{2+}), a nephrotoxic agent to which we are exposed through contaminated food and water as well as cigarette smoke[1], could be related to some of these cases as it has been demonstrated that it can be freely diffused through placenta and accumulate in the kidney[2,3].

In recent years, a panel of more specific and sensible biomarkers has been studied in order to detect kidney injury before there is a loss of function. So far, these biomarkers have been quantified in urine samples; however, its usefulness in another matrix has not been evaluated yet. Since amniotic fluid is mainly formed of fetal urine, the goal of the study was to quantify these biomarkers in this matrix in order to evaluate its usefulness in diagnosing prenatal kidney injury caused by xenobiotics.

Methodology



Results

Cd^{2+} and gentamicin treatments significantly raised plasmatic creatinine levels in fetuses (0.76±0.03; 0.92±0.05 respectively, vs. 0.62±0.02 mg/dL) (Kruskal-Wallis, P<0.001) (mean±S.E.). Despite the fact that gentamicin raised creatinine levels in amniotic fluid, no significant difference was observed. This raise might have been caused by the significant increase of dam's creatinine plasmatic levels (Kruskal-Wallis, P=0.016).

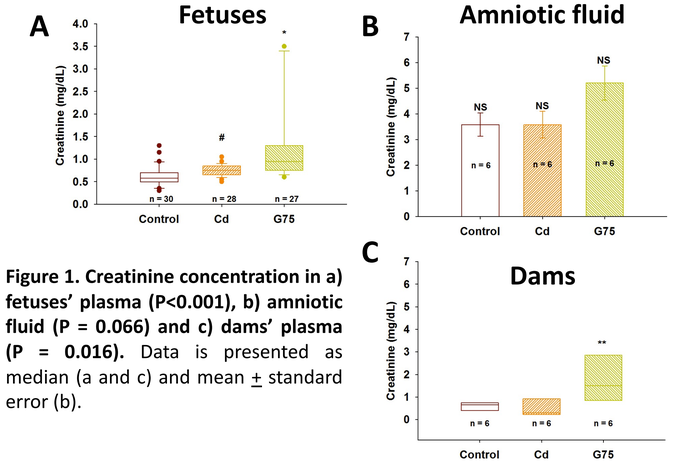


Figure 1. Creatinine concentration in a) fetuses' plasma (P<0.001), b) amniotic fluid (P = 0.066) and c) dams' plasma (P = 0.016). Data is presented as median (a and c) and mean ± standard error (b).

Additionally, in amniotic fluid we observed a decrease of β2-MG levels in the dams exposed to gentamicin, yet it was not statistically significant. Cystatin C levels remained unchanged, whereas Kim-1 showed a non-statistically significant rise on its levels when the dams were exposed to Cd^{2+}, but gentamicin induced a significant increase (22.28 ± 4.73 vs. 6.29 ± 0.42 pg/mL) (One-Way ANOVA, P = 0.014).

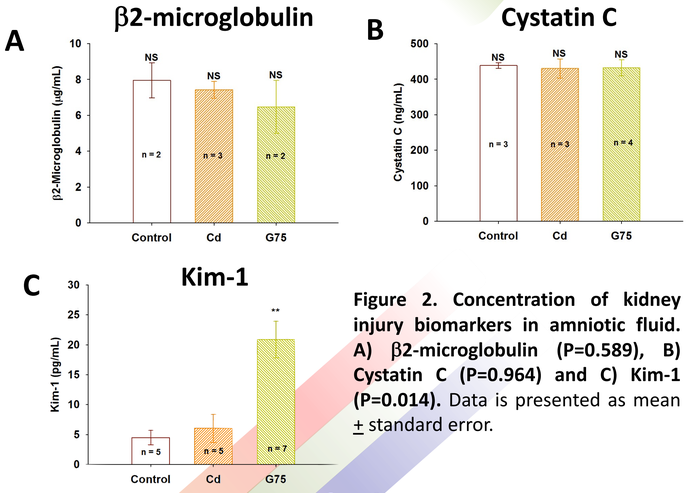


Figure 2. Concentration of kidney injury biomarkers in amniotic fluid. A) β2-microglobulin (P=0.589), B) Cystatin C (P=0.964) and C) Kim-1 (P=0.014). Data is presented as mean ± standard error.

Conclusions

These results suggest that:

- Cd^{2+} is possibly affecting the glomeruli.
- Gentamicin seems to be damaging both glomeruli and proximal tubules in fetuses.
- The rise of Kim-1 levels on amniotic fluid points out its potential use to diagnose fetal kidney injury on proximal tubule before birth.

References

1.- ATSDR, 2008.
2.- Jacquillet G. *et al.* (2007) AM J PHYSIOL-RENAL, 293: F1450 – 1460.
3.- Roman *et al.* (2004) INT J MORPHOL, 22: 231 – 236.