THE OUTCOME OF POTASSIUM DICHROMATE PREPUBERTAL EXPOSURE ON CHROMIUM LEVEL AND SEXUAL HORMON DYNAMICS IN MALE RATS

Jelena Savici PhD DVM, Diana Brezovan PhD DVM, Alexandra Trif PhD DVM

Faculty of Veterinary Medicine, Timisoara, Romania
Cell Biology – Histology – Embryology

jelenarankov@yahoo.com
Chromium

- The sixth most abundant element in the earth’s crust.
- Ubiquitous in the environment, occurring generally as Cr 0, Cr III and Cr VI.
- Cr 0 is found only in metallic form, as component of iron-based alloys (stainless steel).
- Cr III is an essential nutrient, but with poor toxicity.
Cr VI - Group I known human carcinogen by IARC
Potassium dichromate is the most toxic compound of hexavalent chromium.
Chromium sources
Importance

- Because of wide utilization in industry Cr VI represents environmental risk nowadays, too

- Blacksmith Institute – “Top 10 world’s polluted places”
  Bangladesh, China, India – drinking water pollution
  California – 30% of drinking water

- Environmental and occupational exposure may have dramatic effects on health - male reproductive function
Objectives

Impact of hexavalent chromium compound intake on some biological markers of reproductive function in male rats:

- biological marker of exposure – chromium level in genital organs (testis and epididymis) and sexual accessory gland (seminal vesicles, prostate and bulbo-urethral glands),

- biochemical markers of testicular function – LH and testosterone seric levels.
Materials

- 8 white Wistar female rats purchased from Faculty of Medicine and Pharmacy Biobase Cluj-Napoca, Romania.
- Female rats were mated and after weaning 28 male pups were distributed in four groups, three experimental and one control.
- Individuals from experimental groups were exposed via drinking water to potassium dichromate after weaning and until sexual maturity.
- Control group received only tap water, which has no chromium content.
Treatment schedule was selected to determine the effect of relative low chromium levels, doses indicated by EPA to be LOAEL for male reproductive function:

\begin{align*}
E_1 & \text{ - } 25 \text{ ppm Cr VI (LOAEL);} \\
E_2 & \text{ - } 50 \text{ ppm Cr VI (2xLOAEL);} \\
E_3 & \text{ - } 75 \text{ ppm Cr VI (3xLOAEL).}
\end{align*}
- All biomarkers were assessed at sexual maturity.

- The study was performed in compliance with national and international law regarding animal welfare and ethics in animal experiments: 143/400/2002; 471/2002; 205/2004; 206/2004; 9/2008; 86/609/CEE.

- The results were statistically analyzed by Anova method (two ways) and Student test.
Methods

Ketamine 50mg/kg
Xylazine 5 mg/kg
i.p.

atomic absorption spectrometry (AAS – 6650 Shimadzu)

University of Politehnica Timisoara, Industrial Chemistry and Environmental Engineering
ISO 17025
Bucharest
chemiluminescence method
Results
Chromium concentration dynamics in genital organs and sexual accessory glands after prepubertal exposure
LH seric level

![Graph showing LH levels for different groups (C, E1, E2, E3) with a physiological limit line at 0.5.]
Testosterone serum level
Conclusions

Exposure to potassium dichromate via drinking water produced:

- Accumulation of chromium in sexual organs, significant comparative to control group and directly correlated to exposure level;

- Hierarchy, based on average of experimental groups, was: prostate, bulbo-urethral glands, seminal vesicles, testis, epididymis.
Decrease of testosterone seric levels in exposed groups, significantly only when tripling the dose, and indirectly correlated to exposure level;

All the values were within the physiological limit (between 2-3 ng/ml).

Increase of LH seric level in individuals treated with Cr VI, significantly only when tripling the dose, and directly correlated to exposure level;

Physiological limit of 0.5 ng/ml hasn’t been exceeded.
Chromium accumulation structure and function of sexual organs are disturbed (as we observed in our other studies)

Production of sexual hormones is affected, too.

Hormonal imbalance will lead to impairment of reproductive function (as seen in studies published by our team and by other authors)

Cr VI is toxic for male reproductive function when is introduced in the body through drinking water
Thank you for your attention!