

# SILVER AND COPPER OXIDE NANOPARTICLES AND THEIR MIXTURE INDUCED MICRONUCLEUS AND OTHER NUCLEAR LESIONS IN PERIPHERAL BLOOD OF *CLARIAS GARIEPINUS* (BURCHELL 1822)



Ogunsuyi, O. I.<sup>1</sup>, Fadoju O. M.<sup>1</sup>, Oyeyemi, I. T.<sup>1</sup>, Alabi, O. A.<sup>1,2</sup>, Alimba C. G.<sup>1</sup> and Bakare A. A.<sup>1\*</sup>

<sup>1</sup>Cell Biology and Genetics Unit, Department of Zoology, University of Ibadan, Ibadan, Nigeria

<sup>2</sup>Department of Biology, Federal University of Technology, Akure, Nigeria.

\*Email: adekunle.bakare@mail.ui.edu.ng; adebakar19@yahoo.com

## INTRODUCTION

➤ Silver (Ag) and copper oxide (CuO) nanoparticles (NPs) are metal and metal oxide nanoparticles that are widely in use particularly due to their antimicrobial and thermo-physical properties respectively. Considering their increased utilisation in various applications, their occurrence in the environment may lead to adverse public and environmental health effects.

➤ In this study, the cytogenotoxicity of AgNPs, CuONPs and their mixture was assessed using the micronucleus (MN) induction and nuclear abnormalities in peripheral blood of juvenile *Clarias gariepinus*.

## METHODOLOGY

➤ Juvenile *C. gariepinus* were exposed to five concentrations (6.25, 12.50, 25.00, 50.00 and 100.00 mg/L) of each of the NPs and their mixture (1:1) for 7 and 28 days. Dechlorinated tap water and benzene (0.05 mL/L) were used as negative and positive controls respectively. NPs were sonicated and vortexed before introducing into water medium. Piscine Micronucleus assay was performed on peripheral blood samples from the caudal vein (Bakare *et al.* (2013).

➤ Interaction between composite mixture of AgNPs and CuONPs were calculated according to Katsifis (1996)

## RESULTS

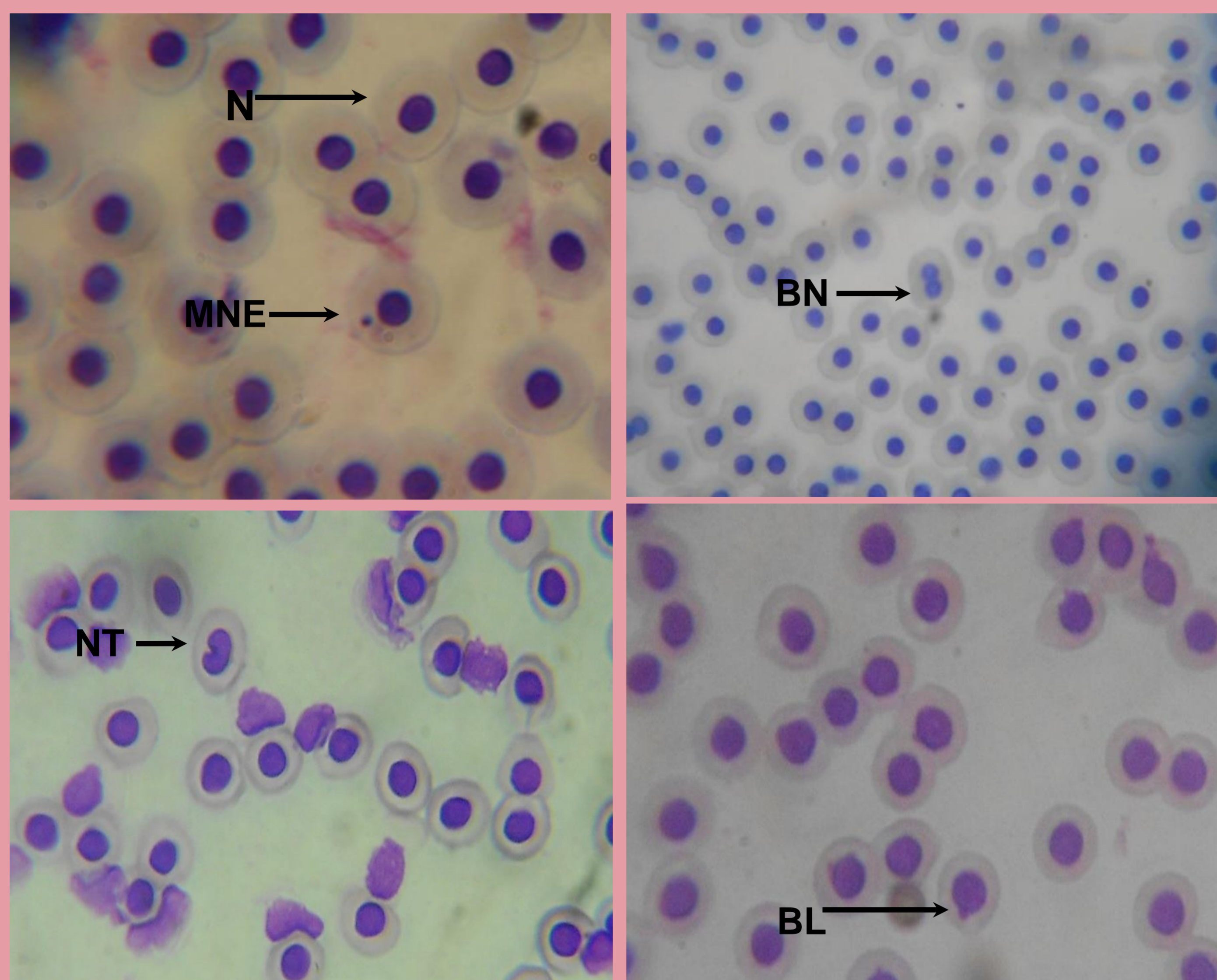


Figure 1: Photomicrographs of normal erythrocyte (N), micronucleated erythrocytes (MNE), binucleated cells (BN), notched (NT) and blebbed nuclei (BL) in peripheral blood of *C. gariepinus* exposed to AgNPs, CuONPs and their mixtures.

Table 1: Interaction effect of AgNPs and CuONPs mixture (1:1) on MN frequencies in peripheral erythrocytes of juvenile *Clarias gariepinus* after 7 and 28 days exposure period.

Concentrations (mg/L)	Interaction factor (IF ± SE <sub>IF</sub> )	
	7 days exposure	28 days exposure
NC	-	-
6.25	0.63 ± 0.78	-2.54 ± 0.61
12.50	-0.20 ± 0.97	-1.79 ± 1.31
25.00	-0.40 ± 1.13	-7.72 ± 2.09
50.00	-0.67 ± 1.20	-4.13 ± 2.17
100.00	-3.68 ± 1.20	-4.06 ± 1.57

NB: IF = (AgNPs + CuONPs - AgNPs - CuONPs + Control). A Negative value for the mixture denotes antagonism, a positive value denotes synergism while a zero value denotes additive effect.

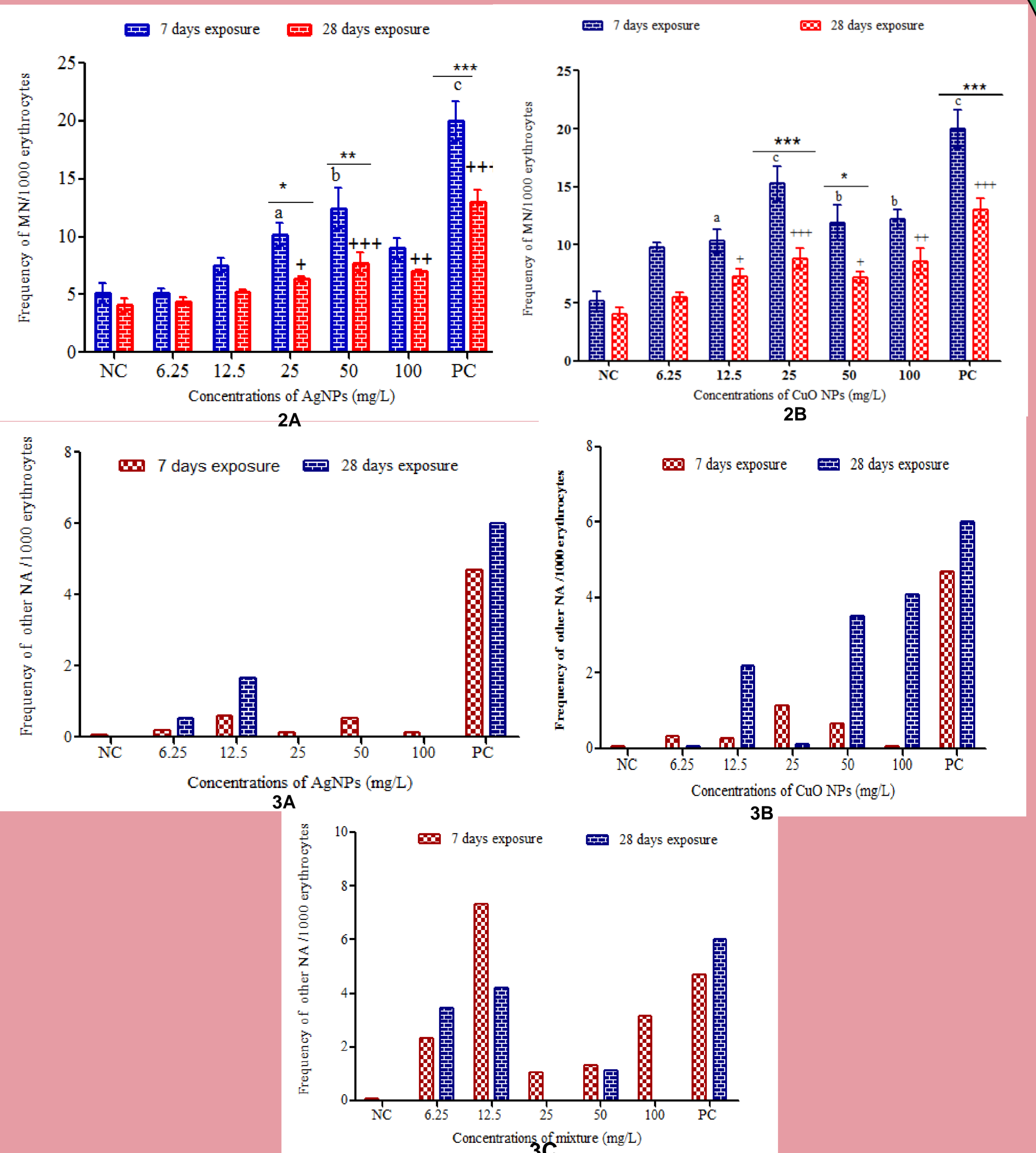


Figure 2 A and B: Variations in frequency of micronuclei induced in peripheral erythrocytes of juvenile *C. gariepinus* exposed to AgNPs and CuO NPs for 7 and 28 days. Following a one way analysis of variance (ANOVA), <sup>a</sup>p < 0.05, <sup>b</sup>p < 0.01, <sup>c</sup>p < 0.001 at 7 days and \*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001 at 28 days compared with corresponding control. Using two way ANOVA <sup>p</sup>p < 0.05, <sup>\*\*</sup>p < 0.01, <sup>\*\*\*</sup>p < 0.001 between 7 and 28 days exposure periods.

Figure 3 A, B and C: Variation in frequency of total nuclear abnormalities (-MN) induced in peripheral erythrocytes of juvenile *C. gariepinus* exposed to Ag NPs, CuO NPs and their 1:1 mixture for 7 and 28 days

## CONCLUSION

- AgNPs, CuONPs and their composite mixture induced DNA damage in *C. gariepinus*.
- The mixture of both particles interacted antagonistically in the damaging effect observed in both 7 and 28 days exposure groups.
- The findings herein indicates that exposure to AgNPs, CuONPs and their mixture poses health and environmental contamination risk to aquatic biota.

## REFERENCES

- Bakare, A. A., Alabi, O. A., Gbadebo, A. M., Ogunsuyi, O.I. and Alimba, C.G. 2013. *In vivo* cytogenotoxicity and Oxidative stress induced by electronic waste leachate and contaminated ground water. *Challenges* 4: 169 – 187.
- Katsifis, S. P., Kinney, P. L., Hosselet, S., Burns, F. J. and Christie 1996. Interaction of nickel with mutagens in the induction of sister chromatid exchanges in human lymphocytes. *Mutation Research* 359: 7- 15