INTRODUCTION

Arsenic (As) is not a well-documented element in biota and particularly in birds. Very few field studies on As exposure and effects in passerine birds have been done, all of them correlative so far (Sánchez-Virosta et al. 2015).

The aim of our study (Sánchez-Virosta et al. 2017): To explore experimentally if environmentally relevant As levels affect growth, survival and physiological biomarkers (antioxidant molecules, lipid peroxidation, protein carbonylation, DNA lesions and telomere length) of the great tit (Parus major).

For this purpose, free-living nestlings were orally dosed with sodium arsenite daily. The responses to experimental manipulations (Control, Low and High groups) are compared with those in a population breeding in the vicinity of a Cu-Ni smelter (Smelter group), an anthropogenic As source (Figure 1).

METHODS

The experiment was conducted in 2015 in an unpolluted area, SW Finland. Great tit nestlings were orally dosed (Figure 2) with sodium arsenite (from day 3 to day 13, n=70 broods) in three experimental groups (Control, Low and High: 0, 0.2 and 1 µg As/g body mass/day) and were compared with those living in the vicinity of a Cu-Ni smelter, an As source (Smelter group, 0 µg/g/d).

RESULTS

Arsenic concentrations in feces were significantly higher in the Smelter and High groups, followed by the Low group, and finally the Control group with significantly lowest levels. Internal concentration was highest in the High group (Figure 3).

CAT activity was somewhat lower in the High As group, while GPx, vitamin A levels and nestling mortality were significantly higher in the Smelter group when compared to the Control group (Table 1, Figure 4).

None of the parameters correlated directly with fecal As levels, but some of them were associated to growth (body mass at d14): poorly growing nestlings showed higher GPx, SOD, and lipid peroxidation and lower CAT activity and GSH:GSSG ratio.

CONCLUSIONS

i. Experimental As treatment did not affect growth, survival or physiological biomarkers in P. major nestlings, even though their internal concentrations rose above those found in the polluted environment, where survival was decreased.

ii. The higher GPx activity and nestling mortality in the polluted environment may reflect higher level of oxidative stress, probably due to the exposure to a mixture of metals and the associated limitation of resources (lower food quality and quantity) emphasizing the importance of secondary pollution effects on birds.

iii. Higher vitamin A levels in the polluted area could be a response against oxidative stress.

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