Effect of Carboxylic Acid Ionophores given Simultaneously with Pb on the Accumulation of Pb in Selected Rat Tissues

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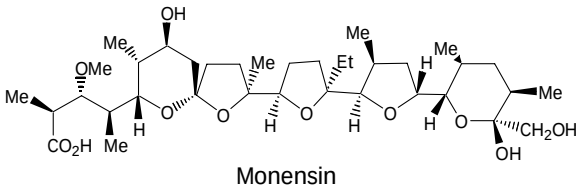
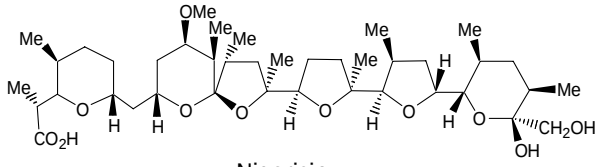
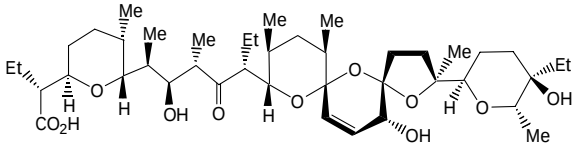
ABSTRACT. Many of the carboxylic acid ionophores that have been found to transport Pb^{2+} are used in agriculture as feed additives which combat coccidial infections and promote growth in livestock. It is known that quantities of these compounds carry over into the human diet, that the G.I. tract is the most important path for Pb entry into the body, and that Pb entry *via* this path is limited to a small fraction of what we actually ingest. In view of these considerations, the current studies were undertaken to determine if the use of ionophores in agriculture might increase the assimilation of Pb or alter its distribution between selected organs and tissues. We also sought to determine if the ionophores ingested together with Pb might alter the levels of trace elements in the same organs and tissues. Structures of the compounds investigated are shown in the imbedded figure. The organs tissues and elements considered are the same sets that are described in an accompanying poster presented by D. R. Pfeiffer et.al. The ionophores were administered at 100 ppm in feed, Pb, as $Pb(acetate)_2$, at 100 ppm in drinking water, and these conditions were maintained for three weeks.



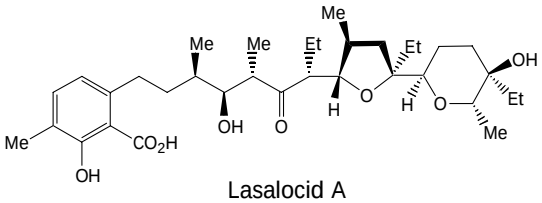
Monensin



Nigericin



Salinomycin



Lasalocid A

None of the ionophores tested increased the level of Pb found in tissues ($p > .05$), although nigericin showed this tendency. Monensin and lasalocid decreased Pb accumulation in heart and femur, respectively, and showed a tendency to do this in most other tissues. Salinomycin also showed this tendency. When the data were compared as one ionophore *vs.* another, all ionophores tested produced lower levels of Pb accumulation than the accumulation seen in the presence of nigericin ($p < .05$). This shows that there are differences between the compounds in terms of promoting Pb accumulation and suggests that animal variability can mask these in some cases. The origin of this variability and an approach to reducing it in future investigations will be considered.

Among elements other than Pb, salinomycin reduced Ca in brain by ~ 60 %, whereas changes in physiological elements produced in other tissues, and by other compounds, were more modest. Although present only as trace contaminants, several nonphysiological elements having a toxic potential were perturbed during Pb administration, with or without the simultaneous administration of an ionophore. For example, As and Cd rose markedly in muscle during Pb administration, but this was counteracted by lasalocid or nigericin. Potential practical implications of this will be considered.