

on the use of natural compounds such as ascorbic acid to remove heavy metals from the body, and these few studies and anecdotal observations have not provided any direct evidence for ascorbic acid on the excretion of lead from the body (1-4).

In the present communication we report a direct effect of ascorbic acid on the excretion profile of lead in the rat. The control group of rats (weight 300-450 g) were given demineralized water for 4 weeks; the treatment group received 4% ascorbic acid (pH 7.4) as drinking water. Food was given *ad libitum* to both groups ( $n = 16$ ). Lead was administered as lead acetate solution in 5% dextrose intravenously at a dose of 0.637  $\mu\text{g}$  of lead/g of body weight. The treatment group also received a bolus dose of ascorbic acid (1 mg/g of body weight) following administration of lead acetate solution. This was followed by 0.25 mg of ascorbic acid/g of body weight given subcutaneously every 6 hr. The blood samples were collected from the tail vein periodically for up to 163 hr, and urine samples were collected in 24-hr pools for up to 1 week. All samples were analyzed for total lead using a flameless atomic absorption spectrophotometer with graphite furnace<sup>1</sup>.

The initial blood levels in the treatment group were higher than the control in accordance with previous findings (3). The urinary clearance of lead was calculated from the plots of blood concentration ( $C_b$ ) against the urinary excretion ( $X_u$ ) rate:

$$\text{Control: } \frac{dX_u}{dt} = 0.0049 + 0.1932 C_b \quad (r > 0.92) \quad (\text{Eq. 1})$$

$$\text{Treatment: } \frac{dX_u}{dt} = -0.02089 + 0.4261 C_b \quad (r > 0.99) \quad (\text{Eq. 2})$$

<sup>1</sup> Atomic Absorption Spectrophotometer model 503, Perkin-Elmer, Norwalk, Conn.

The good linear correlation coefficient signifies the relationship between blood concentration and the urinary excretion according to clearance principles; the slopes of Eqs. 1 and 2 were statistically different ( $p < 0.05$ ). An increase of almost 120% in the urinary clearance of lead was recorded as a result of treatment with ascorbic acid. This finding was also reflected in a similar increase in the total amount of lead excreted in the urine (6.5 versus 12.8%) within 1 week (difference significant at  $p < 0.05$ ).

Despite the complications involved in the disposition kinetics of lead in the body, such direct observation of the effect of ascorbic acid attests to the many anecdotal uses of ascorbic acid in the treatment and prevention of lead poisoning.

(1) H. N. Holmes, K. Campbell, and E. J. Amberg, *J. Lab Clin. Med.*, **24**, 1119 (1939).

(2) L. Pillemer, J. Seifter, A. I. Kuehn, and E. E. Eskes, *Am. J. Med. Sci.*, **200**, 322 (1940).

(3) R. Papiounou and A. Solher, *Fed. Proc. Fed. Am. Soc. Exp. Biol.*, **37**, 405 (1978).

(4) R. A. Goyer and M. G. Chirian, *Life Sci.*, **24**, 433 (1979).

S. Niazi <sup>x</sup>

J. Lim

Department of Pharmacodynamics  
College of Pharmacy  
University of Illinois Medical Center  
Chicago, IL 60680

J. P. Bederka

Department of Toxicology  
University of Illinois Medical Center  
Chicago, IL 60680

Received March 3, 1982.

Accepted for publication June 9, 1982.

## BOOKS

### REVIEWS

**The International Pharmacopoeia, Third Edition, Vol. 2:** Quality specifications, Health and Biomedical Information Programme, World Health Organization, 1211 Geneva 27, Switzerland. 1981. 342 pp. 16 x 24 cm. Price 36 Sw fr.

By virtue of a resolution of the Third World Health Assembly, the *International Pharmacopoeia* is published to improve the quality control of all drugs and pharmaceutical substances. The quality specification establishment and revision process was carried out with the help of members of the World Health Organization's Expert Advisory Panel on the International Pharmacopoeia and Pharmaceutical Preparations and other specialists.

The present (third) edition of the *International Pharmacopoeia* will appear in five volumes. This volume, the second, contains quality specifications for 126 individual drugs widely used in health care. The first volume was published in 1979 and describes 42 general methods of analysis and should be used along with the general notices given in the

present volume. The remaining three volumes will contain further specifications.

Specifications included in the second edition of the *International Pharmacopoeia* have been subjected to thorough revision. For other substances, no international quality specifications have been previously issued. While these specifications have no legal status in any country, unless expressly introduced into the national legislation, they are intended to serve as references for national authorities; it is expected that they will be applied by many developing countries for pharmaceuticals used by their health systems.

As for the monographs themselves, for substances used in more than one form (*e.g.*, anhydrous and hydrated, or noninjectable and sterile) the requirements for the relevant forms have been put together in a single monograph, but separate tests have been provided, as required, for each specific form. Also, IR spectra are mentioned in a number of monographs; however, a separate publication containing reproductions of such spectra will be issued at a later date.

Staff Review