

V24

Photoreduction of Ferric Bleomycin

RICHARD M. BURGER and JACK PEISACH

Albert Einstein College of Medicine, Bronx, N.Y. 10461, U.S.A.

The degradation of DNA by iron-bleomycin requires the formation of a complex with reduced oxygen species. Such complexes can result from reactions of Fe(III)•bleomycin with peroxides, or by reduction of O₂ with Fe(II)•bleomycin. In the absence of both peroxides and reductants Fe(III)•bleomycin is normally inactive in cleaving DNA, but, like Co(III)•bleomycin [1], some activity is detected upon exposure to strong light. This activity of the ferric complex is now shown to result from the formation of Fe(II)•bleomycin. Anaerobic solutions of Fe(III)•bleomycin, when exposed to ultraviolet light, produce a stable complex which forms a characteristic chromophore ($\lambda_{\max} = 500$ nm) with the O₂-analogue ethyl isocyanide. This reacts with O₂ to cause DNA cleavage with the expected yield of ~20%, with the regeneration of Fe(III)•bleomycin as indicated by optical and EPR spectroscopy.

1 C.-H. Chang and C. F. Meares, *Biochemistry*, 21, 6332 (1982).

V25

Adsorptive Power of Different Activated Charcoal Samples of Some Metals at Various pH

G. BRESSA, L. CIMA, F. GIUNTA

Centre of Specialization in Toxicology, Inst. of Pharmacology, Inst. of Anaesthesiology, University of Padua, Italy.

C. MACCÀ

Inst. of Analytical Chemistry, University of Padua, Italy

Activated charcoal still plays a very important role in toxicology [1–4]. Even though recent findings suggest that it might be replaced by more specific resins, charcoal will probably remain indispensable both as an aspecific external antidote, and as an internal antidote for haemoperfusion [5, 6]. One aspect which is still poorly understood is the adsorption of metals by charcoal because of the rarity of acute intoxications, the very high distribution volumes with low plasma levels, and difficulty in defining the chemical state of the solution. In spite of these limitations, our interest was focused on the adsorption of some heavy metals, *i.e.* Cd, Cu, Pb, and Zn. These metals are frequently the cause of

occupational intoxications which very often show a chronic feature, though acute events can occur, and antidotal treatments generally are not sufficient. There is insufficient knowledge of the intermediate phases of heavy metal distribution and of the nature of the bonds these metals form with plasma carriers.

The aim of this study is to evaluate the adsorption of these ions by charcoal in water, before extending the research to the adsorption of the above-mentioned ions in plasma.

The charcoal samples were with or without coating; we pre-tested each for methylene blue adsorptive capacity according to *Ph. Eur.* [7] and assayed their 1 g/100 ml suspensions in 1 mg% w/v solutions of the four metals. The assays were done at 23 ± 1 °C pH 1.2–4.8 to avoid precipitation which can occur above pH 5. Adsorptive power was quantified after 5–15–30–60 min incubation by differential determination of each element by atomic absorption. The results showed that, as the pH increased within the narrow acidic range, the adsorption capacity of all charcoal samples was related to the increasing amount of complex ions of one or two OH⁻. In particular, as the adsorption rate is dependent upon the physicochemical state of each metal at the above solution pH, Cd and Zn were least adsorbed because they are only in their Cd²⁺ and Zn²⁺ forms, whereas Cu and Pb were most adsorbed as the Cu²⁺ and Pb²⁺ forms are present only in traces.

Raw activated charcoal > 50 mesh showed higher adsorptive capacity than granulated charcoal coated with hydroxy-ethylmetacrylate (Norit). The coating material caused a 10–25% decrease in adsorption. A petroleum pitch based bead-type active carbon, of very hard 0.6 mm spherical beads and coated with collodion (Asahi Medical Co.), exhibited very high adsorptive power, almost comparable to the highest level exhibited by the raw activated crushed charcoal. In view of the effective detoxication and prevention of poisoning observed, the pH range studied seems to be large enough to permit an estimate of the adsorption power of raw charcoal in the gastric medium and to provide a preliminary evaluation of the use of covered charcoal in haemoperfusion. Finally the isotherms provide the desired metal:charcoal ratio to achieve the highest adsorption with the most suitable charcoal. (See diags. on facing page).

- 1 A. H. Andersen, *Acta Pharmacol. Toxicol.*, 4, 379 (1947).
- 2 A. L. Picchioni, L. Chin, H. L. Verhulst and B. Dieterle, *Toxicol. Appl. Pharmacol.*, 8, 447 (1966).
- 3 D. G. Corby, R. H. Fisher and W. J. Dekker, *Pediat. Clin. M. Amer.*, 17, 545 (1970).
- 4 L. Chin, A. L. Picchioni, W. M. Bourn and L. E. Laird, *Toxicol. Appl. Pharmacol.*, 26, 103 (1973).
- 5 J. A. Vale, A. J. Rees, B. Widdop and R. Goulding, *Brit. Med. J.*, 1, 5 (1975).
- 6 S. Okonek, I. Reininghaus, H. Setyadharma and P. Daudron, *Arch. Toxic.*, 46, 215 (1980).
- 7 *Pharmacopée Européenne*, 1, 149 (1969).