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Enhancement of the excretion of radiocaesium in rats by ferric cyanoferrate (II)

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Due to the high yield of ^{137}Cs in the fission of heavy atoms, its virtually complete absorption from the gut (Moore and Comar 1962), and its relatively long half-time in human beings (Richmond, Furchner and Langham 1962), this isotope must be considered as a potentially hazardous radionuclide. So far, all attempts to enhance its excretion have had negative or ambiguous results. These attempts have included : isotopic dilution, supplementation of potassium, diuretics, several hormones, ammonium chloride, special diets, as well as chelating agents (for detailed literature see Catsch 1963).

It is known that heavy metal salts of ferrocyanic acid bind Cs^+ at a neutral or slightly alkaline pH (Roginskiy, Malinina, Yanovskiy, Altshuler and Morokhovets 1960), the underlying mechanism being not yet fully understood (Kyrsh and Zvyagintsev 1958). Therefore it seemed worth while to test the efficacy of these compounds on the enteral absorption of ^{137}Cs.

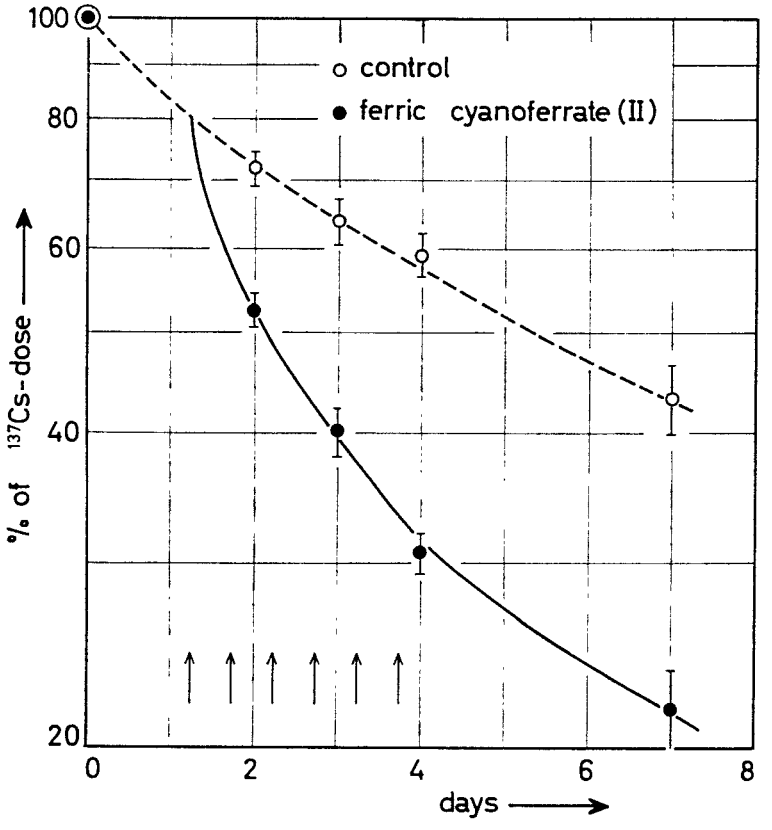
Carrier-free $^{137}CsCl$ and ferric cyanoferrate (II) ($Fe_4[Fe(CN)_6]_3$) were administered separately by a gastric tube to rats, who fasted for 20 hours, and the

Ferric cyanoferrate (II)		Body weight (grams)	Percentage of ^{137}Cs-dose (95 per cent fiducial limits)	Percentage of control
Dosage (mg/animal)	Times of administration (minutes after ^{137}Cs)			
0	—	219	58·1 (63·3–53·4)	100
1	2	215	9·42 (13·2–6·72)	16
10	,,	203	1·17 (1·64–0·84)	2
50	,,	186	0·57 (0·80–0·41)	1
100	,,	188	0·52 (0·73–0·37)	0·9
0	—	185	52·5 (54·1–51·0)	100
100	30	184	29·2 (36·8–23·0)	56
100	60	238	31·8 (40·2–25·2)	61

^{137}Cs-retention by rats (96 hours after its oral application) as influenced by oral administration of ferric cyanoferrate (II). Five animals per group.

retention of ^{137}Cs assayed by whole-body counting. Dosages and time schedules of administration of ferric cyanoferrate (II) are indicated in the table. The results show a pronounced suppression of the enteral ^{137}Cs-absorption even if ferric cyanoferrate (II) was given as late as 60 min after ^{137}Cs-administration.

Since it is known that Cs^+ is excreted into and reabsorbed from the gut (Moore and Comar 1962), a second experimental series tested the effectiveness of oral ferric cyanoferrate (II) on the elimination of *parenterally* administered



Retention of intraperitoneally injected ^{137}Cs by the rat as influenced by a six times repeated oral administration of 50 mg ferric cyanoferrate (II) (as indicated by arrows). ^{137}Cs injected on day 0. Eight animals per group (average body weight 180 g). Mean averages and 95 per cent fiducial limits.

^{137}Cs. It might be expected to enhance the faecal excretion of ^{137}Cs by interrupting its enteral cycle. This tentative assumption was confirmed, as can be seen from the data presented in the figure.

Since no toxic side-effects were observed even for the highest dosage of ferric cyanoferrate (II) used, our findings suggest the therapeutic applicability of this agent in cases of accidental incorporation of radiocaesium. Detailed studies on the effect of additional parameters on its efficacy, as well as the determination of the ratio of toxic to therapeutic doses, are now under way and the results will be published elsewhere.

ACKNOWLEDGMENT

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