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Effectiveness of Zn-DTPA in removal of plutonium from rats

A. SEIDEL, V. VOLF and A. CATSCH

Institut für Strahlenbiologie, Kernforschungszentrum,
75 Karlsruhe 1, Postfach 3640, Germany

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The use of the Zn-chelate of diethylenetriaminepentaacetate (DTPA) instead of Ca–DTPA for removal of internally-deposited radionuclides has been suggested (Catsch 1968, Catsch, Lê and Chambault 1964). This recommendation is based on the fact that Zn–DTPA has a markedly lower toxicity than Ca–DTPA (Catsch 1964, Catsch and Wedelstaedt 1960, Seidel 1970, Smith 1970, Weber 1969), but is only slightly less effective in mobilizing ^{91}Y and ^{144}Ce from the body (Catsch *et al.* 1964). Meanwhile, both chelates were found to be equally effective in removing ^{147}Pm (Smith 1970), whereas the influence Ca-DTPA on the excretion of ^{239}Pu seems to surpass that of the Zn-chelate (Smith 1966). In the latter study, chelate treatment was initiated 1 hour after injection of ^{239}Pu; the main objective of Zn–DTPA, however, is the delayed treatment situation (Catsch 1968). In view of the great importance of ^{239}Pu, a reinvestigation was advisable.

Female albino rats averaging 190 g in weight were injected intravenously with 0·2 μCi monomeric $^{239}Pu(IV)$ (0·25 ml., pH 8·5). Monomeric Pu was prepared according to Taylor (personal communication) by diluting the stock solution of $Pu(NO_3)_2$ with sodium citrate and filtration through millipore filter (pore diameter 25 nm) before injection. Na_3[Ca–DTPA] and Na_3[Zn–DTPA], respectively, were injected intraperitoneally on the 6th, 8th and 11th day; the dosage equalled 1 mmol $\times$ kg^{-1} $\times$ d^{-1} (2 ml., pH 7·4). The α-activity of tissue samples was assayed by liquid scintillation counting (Seidel and Volf, in press).

	Control 6th day	Control (0·9 per cent NaCl) 13th day	Ca–DTPA 13th day	Zn–DTPA 13th day
Liver	14·6 ± 0·88	7·15 ± 0·71	1·44 ± 0·07	1·64 ± 0·09
Spleen	0·24 ± 0·02	0·32 ± 0·02	0·16 ± 0·01	0·18 ± 0·01
Kidneys	1·04 ± 0·04	0·74 ± 0·05	0·45 ± 0·04	0·36 ± 0·02
Lung	0·14 ± 0·01	0·12 ± 0·01	0·047 ± 0·003	0·054 ± 0·005
Thyroid	0·22 ± 0·003	0·016 ± 0·0005	0·009 ± 0·001	0·008 ± 0·001
Adrenals	0·012 ± 0·001	0·013 ± 0·001	0·006 ± 0·001	0·0062 ± 0·0003
Ovaries	0·017 ± 0·001	0·016 ± 0·002	0·010 ± 0·001	0·009 ± 0·001
Skeleton	62·0 ± 1·09	56·5 ± 0·54	41·5 ± 2·20	40·9 ± 0·79
n	6	5	4	5

^{239}Pu-content of the organs (percentage of ^{239}Pu-dose).
Means ± S.E. n = number of animals.

As can be seen from the table, both chelates show virtually equal efficacy in lowering the ^{239}Pu-content of the organs. This is in keeping with recent results obtained by Smith (personal communication) with ^{238}Pu. The favourable result of our study prompted us to start a more detailed investigation, which will be concerned with the action of Zn–DTPA on monomeric and polymeric ^{239}Pu as influenced by treatment schedule.

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