



CHROMIUM [⁵¹Cr] EDETATE INJECTION BP

Description

Chromium [⁵¹Cr] Edetate Injection BP is single dose clear purple coloured sterile pyrogen free aqueous isotonic solution for intravenous administration. Each 3 mL vial contains 8 MBq of chromium [⁵¹Cr], ~ 0.3mg of Chromium element and ~10mg of EDTA in 1 mL of 0.9 w/v% sodium chloride solution at a pH of between 3.5 and 6.5.

Physical Characteristics of Chromium 51

Chromium-51 has a physical half-life of 27.71 days, and has 9.9% disintegration's with a single gamma photon at 320 keV.

To correct for the effect of decay multiply the activity on the calibration date by the appropriate factor from the table below

Table 1- Physical Decay Chart

Day	Factor	Day	Factor
-5	1.133	13	.722
-4	1.105	14	.705
-3	1.078	15	.687
-2	1.051	16	.670
-1	1.025	17	.654
0	1.0	18	.637
1	.975	19	.622
2	.951	20	.606
3	.928	21	.591

Day	Factor	Day	Factor
4	.905	22	.577
5	.882	23	.563
6	.861	24	.549
7	.839	25	.535
8	.819	26	.522
9	.798	27	.509
10	.779	28	.496
11	.759	29	.484
12	.741	30	.472
		31	.461

External Radiation

The attenuation coefficient (μ) in lead¹ is ~ 3.6 cm⁻¹ and the attenuation factors for lead are given in Table 2:

Table2 – Radiation Attenuation by Lead Shielding

Shield Thickness cm Pb	Coefficient of Attenuation
0.18	0.5
0.64	1/10
1.28	1/100

Pharmacology

Chromium [⁵¹Cr] Edetate Injection BP is a chemically stable, hydrophilic metal chelate. It is metabolically inert and exhibits no pharmacological properties. Renal function is unaffected, even by large amounts of Chromium [⁵¹Cr] Edetate Injection BP.

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Pharmacokinetics

Following intravenous administration, the Chromium [⁵¹Cr] Edetate complex is excreted almost exclusively by the kidneys via the glomerular membrane. Less than 0.5% plasma protein binding occurs in patients, with normal glomerular filtration rate, the recovery of unchanged chelate is close to 100% during the first 24 hours post injection. Tubular secretion and reabsorption, as well as external excretion, are negligible.

After intravenous administration, the Chromium [⁵¹Cr] Edetate equilibrates within the intra- and extra-vascular spaces, a process taking between 30 and 90 minutes. Beyond this period, a constant percentage of the Chromium [⁵¹Cr] edetate present on the extracellular fluid is excreted by the kidneys per unit time. Total body retention is described by a double exponential function.

The mean value of the glomerular filtration rate in a normal adult is approximately 130 mL / min in men and 120 mL / min in women. (Normalised for body surface area of 1.73 m²)

Indications

Chromium [⁵¹Cr] Edetate Injection BP is indicated for the determination of glomerular filtration rate in the assessment of renal function.

Contraindications

There are no known contraindications.

Precautions

Patients should be encouraged to drink fluids and void the bladder frequently in the hours following administration of chromium [⁵¹Cr]

edetate injection BP to minimise radiation dose to the bladder.

Chromium [⁵¹Cr] edetate injection BP is not suitable for use in patients with oedema as in such patients equilibration of the administered chromium [⁵¹Cr] edetate between the plasma and interstitial fluid may take up to 12 hours.

General

Radiopharmaceuticals should be administered by medical practitioners who are qualified and licensed to handle radioisotopes.

Disposal of all radioactive wastes should be carried out in accordance with the NH & MRC "Code of practice for the disposal of radioactive wastes by the user" (1985).

The administration of radiopharmaceuticals creates risks for other persons from external radiation or contamination from spills of urine. Radiation protection precautions in accordance with national regulations must therefore be taken.

Check the following before use

The following should be checked prior to administration:

- Verification of the dose to be administered and patient identification.
- An inspection visually for colour (violet) and an absence of particulate matter.
- The expiry date.

Carcinogenesis, Mutagenesis, Impairment of Fertility

No carcinogenicity, mutagenicity or reproductive toxicity studies have been conducted with chromium [⁵¹Cr] edetate.

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Patient care

Care should be taken to minimise unwanted radiation exposure to patients, consistent with proper patient management.

Use during pregnancy

Category B2. Only imperative investigations should be carried out during pregnancy and only when the likely benefit exceeds the risk incurred by the mother and the foetus. When it is necessary to administer radioactive medicinal products to a woman of child-bearing potential the radiation exposure should be the minimum consistent with achieving the desired clinical information, whether or not the woman is known to be pregnant. Administration of 6 MBq chromium [^{51}Cr] edetate results in an absorbed dose to the uterus of 0.017mGy for normal renal function and 0.039mGy for abnormal renal function. Whenever possible, alternative techniques that do not involve ionising radiation should be employed. Any woman who has missed a period should be assumed to be pregnant until proven otherwise.

Use during lactation

Breast feeding need not be discontinued, however it is recommended that it be interrupted for four hours post administration the end of which period the milk is expressed and discarded.

Interaction with other drugs

Decreased glomerular filtration rate has been noted in patients treated with a variety of drugs such as aminoglycosides (gentamicin) and amphotericin B. This is believed to be an effect

of the nephrotoxicity associated with the use of such drugs.

This product should not be administered together with other medications unless this is in the context of a simultaneous investigation of renal function.

Long-term effects

None known.

Adverse Reactions

Unwanted effects have been reported infrequently after single or repeated intravenous administrations of chromium [^{51}Cr] edetate such that the incidence of individual reactions cannot be quantified. Limited details are available, but mild allergic phenomena have been described.

Exposure to ionising radiation is linked with cancer induction and a potential for development of hereditary defect. For diagnostic nuclear medicine investigations the current evidence suggests that these effects will occur with low frequency because of the low radiation doses incurred.

Dosage and Administration

Chromium [^{51}Cr] edetate injection should be used without dilution. Product is for one dose in one patient only. Discard any remaining contents appropriately. Contains no antimicrobial agent.

Dose handling

Radiation exposure to staff must be minimised. For each patient, exposure to ionising radiation must be justified on the basis of likely benefit.

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The normally recommended dose for adults is 1.1 to 6.0 MBq by intravenous injection or continuous infusion. Higher doses up to 11 MBq may be appropriate for the use in conjunction with external counting techniques. The dosage for children may be calculated as a proportion of adult body weight or surface area. For newborn or children under one year the target organ's size should be taken into consideration.

Adults

The normal recommended dose for adults is 1.1 to 6.0MBq (30 - 160 μCi) by intravenous injection or continuous infusion. The actual activity administered will depend on the technique used to determine the renal clearance and on that used for radioactivity detection. Higher activities up to a maximum of 11MBq (300 μCi) may be appropriate for use in conjunction with external counting techniques.

Because of the complexities of the infusion technique a single injection technique is normally used. This method obviates the need for urine collection, but is not suitable for patients with oedema. A single intravenous dose of 3.7 MBq of Chromium [^{51}Cr] Edetate Injection BP is normally given and the plasma clearance is calculated from the injected amount of Chromium [^{51}Cr] Edetate BP and the decrease of activity in the plasma samples as a function of time.

For continuous intravenous infusion a priming dose of 1.85 MBq is given intravenously followed by the infusion of a solution containing 37 kBq per mL at a rate of 0.5 mL per minute. After about 40 minutes, the plasma concentration becomes constant. A urine

collection lasting about 15 minutes is then started and a venous sample taken at the mid time. This process is repeated with rapid separations and counting of the plasma radioactivity until constant plasma activity is observed in two successive samples. The GFR is then calculated.

Paediatric administration

The dosage to be administered to children may be calculated approximately by correcting on a weight or body surface area basis the dosage to adults. For the newborn and children under about one year of age, the target organ size in relation to the whole body must also be taken into consideration.

Overdosage

In the event of an accidental administration of an overdose of chromium [^{51}Cr] edetate, the absorbed radiation dose to the patient should be reduced by increasing the elimination of the radionuclide from the body. This may be done by more frequent emptying of the urinary bladder by hydration, diuretics and catheterisation.

Radiation Dosimetry

Radiation dose to specific organs, which may not be the target organ, can be influenced significantly by pathophysiological changes induced by any disease processes. This should be taken into consideration when using the following information.

This data assumes a body retention half-life of 100 minutes and a transit time of 5 minutes. (Considered normal) For abnormal renal function refer Table 4.

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Table 3
Absorbed dose per unit activity administered (mGy/MBq.)²

Organ	Adult	15 year	10 year	5 year	1 year
Adrenals	8.1E-04	9.1E-04	1.4E-03	2.2E-03	4.0E-03
Bladder wall	2.3E-02	3.2E-02	4.6E-02	7.0E-02	1.3E-01
Bone surface	7.0E-04	8.2E-04	1.2E-03	1.9E-03	3.5E-03
Breast	5.6E-04	5.6E-04	8.3E-04	1.3E-03	2.6E-03
GI tract -					
Stomach wall	7.3E-04	8.4E-04	1.3E-03	2.1E-03	3.6E-03
Small intestine	1.1E-03	1.4E-03	2.1E-03	3.3E-03	5.8E-03
ULI wall	1.0E-03	1.2E-03	1.9E-03	3.0E-03	5.1E-03
LLI wall	1.6E-03	2.1E-03	3.0E-03	4.5E-03	7.6E-03
Kidneys	1.8E-03	2.2E-03	3.2E-03	4.6E-03	8.1E-03
Liver	6.8E-04	8.3E-04	1.3E-03	2.1E-03	3.8E-03
Lung	5.7E-04	7.2E-04	1.1E-03	1.7E-03	3.2E-03
Ovaries	1.6E-03	2.0E-03	3.0E-03	4.5E-03	7.6E-03
Pancreas	7.8E-04	9.4E-04	1.5E-03	2.3E-03	4.1E-03
Red marrow	8.7E-04	1.0E-03	1.5E-03	2.1E-03	3.5E-03
Spleen	7.2E-04	8.6E-04	1.3E-03	2.0E-03	3.8E-03
Testes	1.2E-03	1.6E-03	2.8E-03	4.2E-03	7.8E-03
Thyroid	5.3E-04	7.3E-04	1.2E-03	1.9E-03	3.5E-03
Uterus	2.8E-03	3.4E-03	5.3E-03	7.9E-03	1.3E-02
Other tissue	8.0E-04	9.5E-04	1.5E-03	2.2E-03	4.1E-03
Effective dose³ (mSv/MBq)	2.1E-03	2.8E-03	4.0E-03	6.1E-03	1.1E-02

Table 4 Abnormal Renal Function
Absorbed dose per unit activity administered (mGy/MBq)²

Organ	Adult	15 year	10 year	5 year	1 year
Adrenals	4.5E-03	5.0E-03	7.7E-03	1.2E-02	2.1E-02
Bladder wall	2.1E-02	2.9E-02	4.2E-02	6.4E-02	1.2E-01
Bone surface	3.6E-03	4.2E-03	6.4E-03	9.8E-03	1.8E-02
Breast	3.2E-03	3.2E-03	4.8E-03	7.6E-03	1.4E-02
GI tract -					
Stomach wall	4.1E-03	4.7E-03	7.2E-03	1.1E-02	1.9E-02
Small intestine	4.5E-03	5.5E-03	8.4E-03	1.3E-02	2.3E-02
ULI wall	4.3E-03	5.2E-03	7.7E-03	1.2E-02	2.1E-02
LLI wall	4.6E-03	5.7E-03	8.8E-03	1.3E-02	2.3E-02
Kidneys	8.3E-03	1.0E-02	1.4E-02	2.1E-02	3.6E-02
Liver	3.8E-03	4.6E-03	7.2E-03	1.1E-02	2.0E-02
Lung	3.3E-03	4.2E-03	6.3E-03	9.7E-03	1.8E-02
Ovaries	4.6E-03	6.0E-03	9.1E-03	1.4E-02	2.5E-02
Pancreas	4.3E-03	5.2E-03	8.1E-03	1.2E-02	2.2E-02
Red marrow	4.0E-03	4.8E-03	7.1E-03	1.0E-02	1.8E-02
Spleen	4.0E-03	4.8E-03	7.3E-03	1.1E-02	2.0E-02
Testes	3.7E-03	4.6E-03	7.2E-03	1.1E-02	2.1E-02
Thyroid	3.1E-03	4.3E-03	6.8E-03	1.1E-02	2.0E-02
Uterus	5.8E-03	7.1E-03	1.1E-02	1.7E-02	2.9E-02
Other tissue	3.4E-03	4.1E-03	6.3E-03	9.9E-03	1.8E-02
Effective dose³ (mSv/MBq)	4.7E-03	5.9E-03	8.9E-03	1.4E-02	2.4E-02

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Presentation

Chromium [⁵¹Cr] Edetate Injection BP is contained in a 3 ml glass vial, sealed with a rubber stopper and a gold coloured aluminium cap. It is transported in a labelled pill packs.

The pack size is 8 MBq at calibration, 0900hours (Eastern Standard Time) the first day of each calendar month.

Expiry

Expiry is 31 days after calibration.

Storage

Store in an airtight container in a place that is sufficiently shielded to protect personnel from irradiation by primary or secondary emission and that complies with national and international regulations concerning the storage of radioactive substances.

Store below 25°C. Do not freeze.

References

1. The Health Physics and Radiological Health Handbook, (eds. Schleien, B, Terpilak, M.S.), Nucleon Lectern Associates, Olney, 1984.
2. ICRP publication 53, Radiation Dose to Patients from Radiopharmaceuticals, Pergamon, Oxford p106-107, 1988
3. ICRP publication 60, 1990. Recommendations for the International Commission on Radiological Protection. Pergamon, Oxford, p7-8, 1991.

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Contact Details

ANSTO Health
Locked Bag 2001
Kirrawee DC
NSW 2232

Telephone: 1800 251 572

Facsimile: 02 9543 6511

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