Pyrophosphoric acid, tetrasodium-tin chloride salt (PYROPHOSPHATE)

Pharmacological category
Diagnostic agent of heart disorders

Composition
Each vial contains:

<table>
<thead>
<tr>
<th>Component</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decahydrate sodium pyrophosphate</td>
<td>84.0 mg</td>
</tr>
<tr>
<td>Dihydric tin chloride</td>
<td>2.0 mg</td>
</tr>
<tr>
<td>Sodium chloride</td>
<td>10.0 mg</td>
</tr>
<tr>
<td>Injection water</td>
<td>c.s.p. 1 mL</td>
</tr>
<tr>
<td>Sodium hydroxide</td>
<td>c.s.</td>
</tr>
<tr>
<td>Hydrochloric acid</td>
<td>c.s.</td>
</tr>
</tbody>
</table>

Pharmacology

Pyrophosphate-Sn is a complex consisting of Pyrophosphate and Sn$^{2+}$. The $^{99m}$Tc-Pirofosfato complex is formed by adding a solution of $^{99m}$TcO$_4^-$ to a vial containing the lyophilized, which exhibits marked attraction for normal bony tissue when administered intravenously. On the other hand, its distribution throughout the body reflects metabolic changes around lesions, a phenomenon which occurs before the accumulation and re-absorption of calcium by the bone and observable with a radiographic system. Therefore this procedure can be used for the early diagnosis of bone metastasis. The exact structure of the complex is not known.

Following the endovenous administration of a solution of Pyrophosphate –Sn, Sn$^{2+}$ diffuses into the red blood cells circulating in the system. When Na$^{99m}$TcO$_4$ is injected into the system, $^{99m}$Tc is reduced with the subsequent formation of a chelate with the beta chain of the globulin molecule. The red blood is now labeled. After 15 minutes, approximately 98% of the activity is located in the red blood cells. After 18 hours, over 97% of the red blood cells have been labeled. Under these conditions, it is possible to obtain images of the choroid plexus and of the heart cavity.

$^{99m}$Tc-Sn-Pirofosfato accumulates in the mitochondria of muscle cells in areas where acute myocardial infarction has occurred. During Gammagrapy of the heart, pyrophosphate fixation intensity in septal infarcts dating less than 8 days is practically proportional to the creatine-phosphokinase peak. After 8 days, fixation is either weak or null. In the case of primary infarcts, the product is fixed in only 60% of the cases. Fixation is not stable in the case of threat or anguish syndrome.

Pharmacokinetics

$^{99m}$Tc-Pyrophosphate accumulates selectively in the damaged myocardium and in imperfect osteogenic zones of the skeleton. Uptake of this preparation is minimum or null in soft tissue.

TEXT: The Pyrophosphate - $^{99m}$Tc complex binds mainly to globulins and fibrinogen. Plasma concentration reaches its maximum value 3-5 minutes after administration, with a half-life of 9.8 h. A total of 60% of the complex is excreted intact through the urine after 24 hours. The following table shows the dose absorbed in humans following an injection of $^{99m}$Tc-Sn-Pyrophosphate.

<table>
<thead>
<tr>
<th>Organ</th>
<th>Dose Absorbed $\mu$Gy .MBq-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skeleton</td>
<td>15</td>
</tr>
<tr>
<td>Bone Marrow</td>
<td>10</td>
</tr>
<tr>
<td>Entire Body</td>
<td>3</td>
</tr>
<tr>
<td>Kidneys</td>
<td>13</td>
</tr>
<tr>
<td>Bladder</td>
<td>86</td>
</tr>
<tr>
<td>Liver</td>
<td>4</td>
</tr>
<tr>
<td>Ovaries</td>
<td>4</td>
</tr>
<tr>
<td>Testicles</td>
<td>4</td>
</tr>
</tbody>
</table>

Indications

Used for In vivo labeling of circulating red blood cells with $^{99m}$Tc for visualizing the cavities of the heart using Gammagrapy and nuclear ventriculography; visualization of the choroid plexus, diagnosis of occult bleeding and bone gammagrapy.

Contraindications

- Hypersensitivity to any of the components in the formulation.
- Arterial hypertension.
- Patients with sodium-free diets.
- This preparation should not be administered to nursing mothers as sodium pertechnetate$^{99}$ is passed on to the maternal milk.

Precautions
• This preparation should be administered only by qualified personnel duly authorized to handle radioisotopes.
• Administer to pregnant women only when strictly necessary as it is not known if this radiopharmaceutical can cause fetal damage or affect fertility.

Warnings

• Make sure that both the patient and clinical staff working with radiopharmaceuticals receive as little radiation as possible.
• This preparation is sterile and non-pyrogenic and must therefore be handled aseptically.
• Do not use after 2 hours following reconstitution. Keep at room temperature.
• Do not administer through a plastic catheter or tubes.
• Labeling reactions with $^{99m}$Tc must keep tin ions in their reduced state and consequently Sodium Pertechnetate $^{99m}$Tc injections containing oxidants should not be administered.

Interactions with other medications

Low labeling efficiency has been reported due to the co-administration of: digoxin; metyldopa, nifedipine, quinidine, prazosin and iodine contrast media.

Adverse reactions

Administration of radiopharmaceuticals to patients will inevitably generate a certain amount of radiation, however somatic changes or genetic damage have been reported only during long term treatments. Although this risk may initially seem insignificant it must be borne in mind whenever treating a patient with radiopharmaceuticals. The use of these preparations is justified as long as the benefits outweigh the possible risks posed by the use of radioactive material.

Allergic reactions due to the use of radiopharmaceuticals in most cases exhibit several clinical symptoms such as fever, flush, nauseas and a variety of rashes such as urticaria and erythema. Other types of allergic reactions associated with the endovenous administration of the radiopharmaceuticals such as pain or irritation at the administration site of the preparation.

Dose

Intravenous administration of the entire solution to patients weighing over 50kg. Administer half of the solution to patients whose body weight is less or equal to 50 kg. After 20 minutes, inject a solution of $^{99m}$TcO$_4^-$ with 15 MBq/kg body weight (0.43 mCi/kg).

Overdose

There are no reports regarding the symptoms due to an overdose while using this product. Medial studies with radionuclides are conducted using very small concentrations of the radiopharmaceutical which consequently have no pharmacological effects. The only possible effect resulting from an overdose would be the additional radiation of the patient. The dose absorbed from an injection of Pyrophosphate - $^{99m}$Tc is low and safe and consequently additional actions are not required in the event of an overdose.

Instructions for use

Pour 4 - 5 ml of, sterile non-pyrogenic injection water into the vial with the lyophilized Pyrophosphate-Sn preparation. Eliminate the air in the needle as much as possible. Shake the vial for 1 or 2 minutes until the lyophilized has completely dissolved. The solution must be colorless and transparent.

Storage

The product is stored at 2- 8°C. After reconstitution, the preparation must be stored at room temperature in an armored lead casing.

Radiological safety measures

The same measures normally used when handling open source diagnostic preparations, in keeping with the regulations in force in the country.

Presentation:

Code: 2010 Kit with 5 vials
PIROFOSFATO -Sn para marcaje con $^{99m}$Tc
Liofilizado para inyección iv.

CENTRO DE ISÓTOPOS: Ave. Monumental y Carretera La Rada, Km 3 ½, Guanabacoa, Ciudad de la Habana, Cuba.
Telef.: (53) (7) 682 1836 y 682 9524; Pizarra: (53) (7) 682 9563 al 70 ext. 176 y 112 Fax: (53) (7) 866 9821; (53) (7) 682 7850 E-mail: comercial@centis.edu.cu