# Tin-117m is a unique conversion electron radioisotope[1]—

## *A veterinary therapeutic in an injectable colloidal suspension*

### Tin-117m

Synovetin OA® is a conversion electron-emitting therapeutic veterinary device of tin-117m microparticles in a colloidal, sterile suspension.[2]

- pH between 6.5 and 9.0
- At least 90% of the particles sized between 1.5 µm and 20 µm (HORIBA light scatter instrument)

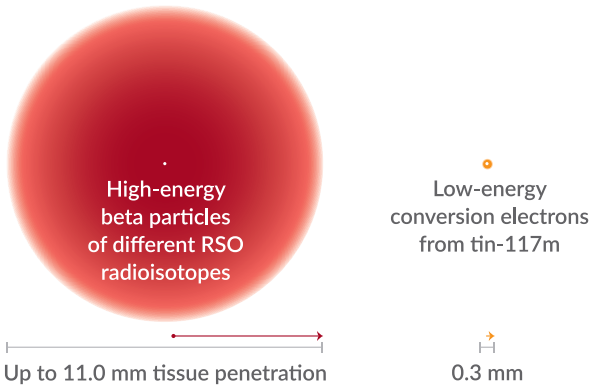
Two principal forms of energy are emitted by tin-117m as it decays:[3]

- Monoenergetic conversion electrons (significant energies 127–158 keV; emission probability 113%)
- Imageable gamma radiation (159 keV, 86% abundant)
- Accompanying low-energy emissions are Auger electrons (<21 keV) and X-rays (<30 keV)

### Duration of effect

Tin-117m is metastable, indicated by the "m" suffix[3]

- A radioisotope with an energetic nucleus and a half-life of 14 days
- Distinct from highly unstable radionuclides with shorter half-lives
- Provides an ideal duration of effect to achieve therapeutic results and short-term stability during storage and handling
- Decays to inert tin and is removed via the lymphatics

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### Unique Advantages

Tin-117m is a unique radionuclide without the disadvantages of high-energy beta-emitting radionuclides.[4]

- Distinct from high-energy beta particles that have a wide tissue penetration range (50–11,000+ µm).
- The ultra-narrow, discrete radiation range of tin-117m enables more precise dosimetry and avoids adverse effects on adjacent tissues that can occur with beta-emitting radionuclides.

### Comparison of two radionuclides in therapeutic veterinary application[3-7]

| Iodine-131— Radioactive drug used to treat feline hyperthyroidism | Tin-117m— Conversion electron device used to treat canine osteoarthritis |
|---|---|
| **Half-life:** 8 days | **Half-life:** 14 days |
| **Maximum therapeutic energy:** 807 keV | **Maximum therapeutic energy:** 158 keV |
| **Max. tissue penetration of beta:** 3 mm | **Max. tissue penetration of CE:** 0.3 mm |
| **Therapeutic emission:** Beta | **Therapeutic emission:** Conversion electrons |
| **Diagnostic emission:** Gamma (364, 637 keV) | **Diagnostic emission:** Gamma (159 keV) |

**Systemic treatment:**

- Systemic penetration; affects all bodily fluids: feces, urine, sweat, saliva, blood
- Current federal guidance suggests cats should be quarantined for no less than 4 days*

**Local/targeted treatment:**

- Limited penetration; 99.1% is retained in the joint space; does not affect fur, feces, or urine
- The treated dog can go home the same day
- No need for confinement or rehabilitation

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### Diagnostic Properties

In addition to conversion electrons, tin-117m emits gamma radiation, a zero-mass unit of electromagnetic radiation that results from nuclear decay of a radionuclide.[1]

- Gamma radiation is readily detectable in tissue by imaging methods such as scintigraphy.
- Tin-117m emits gamma radiation at 159 keV that can be used diagnostically to detect the distribution and duration of its presence in tissue of treated patients.
- Similar gamma energy to technetium-99m ($^{99m}$Tc), a common systemic radionuclide with gamma emissions of 140 keV used in diagnostic procedures, including cardiac, lung, and bone studies.

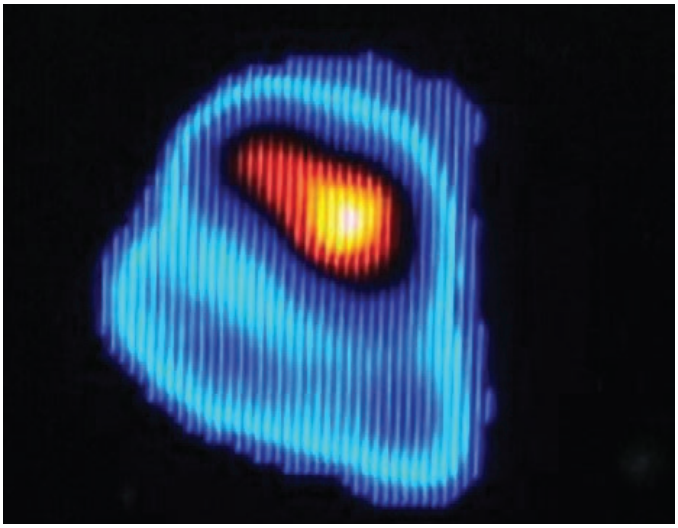

*Image courtesy of Jimmy Lattimer, DVM, MS, DACVR*

Scintigraphy of a canine elbow shows high dose-retention of the tin-117m with minimal uptake in the draining lymph node after administration. Retention over the first 6-week time period was measured at >99% in synovial tissue, indicating a continuous therapeutic effect consistent with the 14-day half-life.

### Use in RSO

Radiosynoviorthesis, or RSO, offers a minimally invasive procedure that lowers bleeding risk in cases of synovitis and avoids problems with systemic therapies.[8-10]

- RSO in relatively small canine joints is advantageous for canine elbow dysplasia that is difficult to treat.[11]
- A key aspect of RSO using tin-117m is the ability to accurately deliver energy of sufficient duration and intensity to achieve removal of the inflamed cells.

Tin-117m conversion electrons have a short, well-defined tissue penetration range. This allows precise dosimetry and avoids exposure of non-target tissues for a significant anti-inflammatory effect with no negative effects.[7]

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Synovetin OA® is marketed by:

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