

# Canine tin-117m colloid intra-articular injection release guidance



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## Abstract

Radiosynoviorthesis using a tin-117m (Sn-117m) colloid is proving to be an effective treatment of osteoarthritis of the canine elbow. This study used clinical measurements of external exposure and Monte Carlo simulations in order to develop guidelines for the release of treated dogs from radiation safety isolation based upon the public dose limit of 100 mR (1 mSv).

## Methods

Twelve adult client owned dogs were treated with the tin-117m colloid for Grade 3 osteoarthritis of the elbow. The nominal dosage of 1.75 mCi to an elbow of a 50 pound dog was adjusted by weight-based body surface area and capped at 3 mCi. Nine dogs were treated in both elbows and three were treated in just one. They weighed 73.8±16.4 [50-101] pounds and received 3.7±1.3 [1.6-5.6] mCi in all.

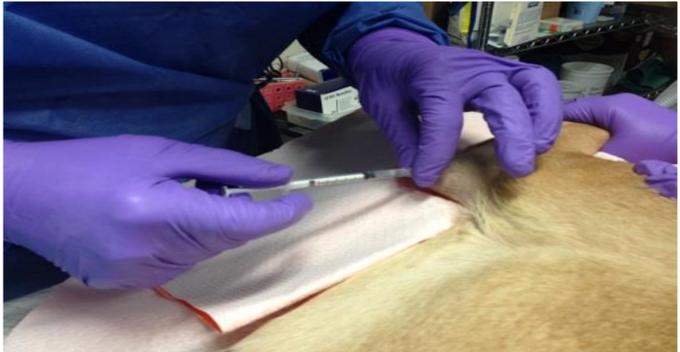


Figure 1 Injection of a canine elbow with Sn-117m colloid.



Figure 2 Ludlum 9DP ionization meter with crystal location marked by a star.

The external exposure rate was measured using a Ludlum 9DP ionization meter laterally at distances of 5 cm and 1 m and cranially at a distance of 1 m as soon as the dogs awoke from sedation and again on the next day. These situations were simulated in a stylized fashion using the Gate Monte Carlo software. For release calculations, walking and playing with a dog were modeled as separation by 3 feet while feeding and petting a dog were modeled as separation by 1 foot.

| Sn-117m Colloid |                |                            |                                  |
|-----------------|----------------|----------------------------|----------------------------------|
| Admin Act       | 9.00 mCi =     | 333.0 MBq                  |                                  |
| Dose Limit      | 100 mrem =     | 1 mSv                      |                                  |
| Isolation       | 0.0 hours =    | 0.0 days                   |                                  |
| followed by     |                |                            |                                  |
| Time @ 3 ft     | 2.00 hrs/day + | 0.25 hrs/day @ 1ft ->      | 94.8 mrem                        |
| or              | 44.6 mrem      | 50.2 mrem                  |                                  |
| Time @ 3 ft     | 3.50 hrs/day + | 0.11 hrs/day @ 1 ft ->     | 100.0 mrem                       |
| or              | 78.0 mrem      | 22.0 mrem                  |                                  |
| Time @ 1 ft     | 0.33 hrs/day + | 1.51 hrs/day @ 3 ft ->     | 100.0 mrem                       |
| or              | 66.2 mrem      | 33.8                       |                                  |
| Time @ 3 ft     | 2 hrs/day      | and waiting 28 days before | 1.1 hrs/day @ 1 ft -> 100.0 mrem |
|                 | 44.6 mrem      |                            | 55.4 mrem                        |

Figure 3 Large dog (≥ 120 lbs.) treatment of 2 elbows (3 mCi each) followed by retreatment of 1 elbow in same calendar year.

## Results

All actual exposure measurements (Figure 4) were below 500 µR/hr at 1 meter which allowed for immediate release. These findings agreed with the model results.

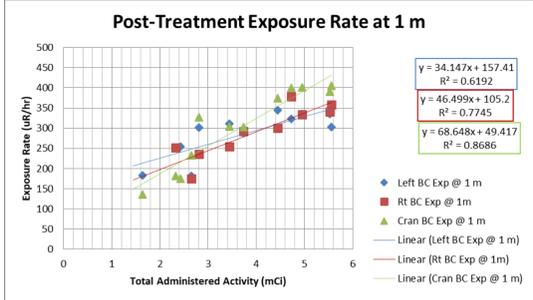


Figure 4 Exposure rate measurements at 1 m from tin-117m intra-articular injection of one or both canine elbows.

The restrictions on an individual person's interacting with dogs that were given the maximum dosage of this cohort or the nominal dosage for modeled exposure times while keeping the person's total dose below 1 mSv are tabulated in figure 5. After ten weeks (or five physical half-lives), more relaxed restrictions would typically allow a further exposure dose of only 15 mR or less.



| Treatment Scenario                   | Dosage per Treatment (mCi) | Human Dose per Treatment (mSv) | Time at 3 ft (hr/day) | Time at 1 ft (min/day) |
|--------------------------------------|----------------------------|--------------------------------|-----------------------|------------------------|
| 110 lb, both elbows, twice in a year | 6                          | 0.5                            | 2                     | 6                      |
| 110 lb, both elbows once             | 6                          | 0.66                           | 2                     | 7                      |
| 110 lb, then one elbow again         | 3                          | 0.34                           | 2                     | 7                      |
| 50 lb, both elbows, twice in a year  | 3.5                        | 0.50                           | 2                     | 12                     |
| 50 lb, one elbow, twice in a year    | 1.75                       | 0.50                           | 2                     | 38                     |

Figure 5 Chart of client guidance following 5 treatment scenarios.

## Conclusion

Dogs that have been treated by radiosynoviorthesis using tin-117m colloid may be released from radiation safety isolation immediately after treatment with tolerable restrictions on human interactions.

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