Tc-99m Leukocyte Imaging

**Primary Indications:** Tc-99m labeled leukocytes, In-111 labeled leukocytes and Ga-67 citrate can all be used for the detection and localization of infection and inflammation. See the procedure for “Radiopharmaceutical Selection for Infection/Inflammation Imaging” for guidance in choosing the preferred radiopharmaceutical for particular clinical applications.

**Rationale:** Labeled leukocytes migrate to sites of infection and inflammation, especially in acute stages when a granulocyte response predominates and before the infection/inflammation has been suppressed by treatment.

**Interfering Conditions:** A blood leukocyte count exceeding 3,000/mm3 is necessary to ensure a reasonable chance of successful cell labeling.

**Precautions:** To ensure that the correct radiolabeled leukocytes are re-injected into the correct patient, a leukocyte-labeling patient-verification form must be completed, an ID bracelet must be placed on the patient, and ALL blood samples must be labeled. The ID number on the radiolabeled leukocytes to be re-injected and on the patient ID bracelet must match before the radiopharmaceutical is re-injected.

**Radiopharmaceutical:** Tc-99m autologous leukocytes (prepared with Tc-99m HMPAO)

**Adult Dose:** 10 - 20 mCi

Note: a wide range of doses is permitted because of the wide variability in labeling efficiency.

**Pediatric Dose:** 140 -280 μCi/kg

Note: a wide range of doses is permitted because of the wide variability in labeling efficiency.

**Radiation Dosimetry:** Adult (20 mCi): critical organ (spleen) 11.1 rem; effective dose 1.3 rem
Infant (1 year; 2.7 mCi): critical organ (spleen) 8.7 rem; effective dose 0.92 rem.

**Route of Administration:** Intravenous

**Patient Scheduling:** Requests for leukocyte imaging should be directed to the attending nuclear medicine physician or a nuclear medicine resident. This individual should obtain the relevant clinical history, determine whether it is appropriate to perform this examination, determine the availability of leukocyte labeling for the time of study request, and schedule labeling with radiopharmacy staff. All required scheduling information should be entered on the
Patients should be told that study requires the withdrawal of approximately 60 mL of blood, and that the labeling procedure takes 3-4 hours. In addition, early images are generally required with Tc-99m leukocytes; therefore, outpatients may have to spend the entire first day in or near the nuclear medicine division. Additional images may be required at 24 hours.

**Patient Preparation:** None

**Equipment Setup:** Gamma Camera: Whole-body, LFOV or SPECT depending on the clinical setting
Collimator: LEAP (mobile camera) or high resolution (LFOV camera)
Energy Window: 140 keV with 20% window

**Patient Positioning:** Usually supine

**Procedure:** Early (1-2 hr) and delayed (24 hr) whole-body imaging, spot imaging or SPECT may be necessary depending on the clinical setting as follows.

**Fever of Unknown Origin:** Ga-67 is the preferred radiopharmaceutical. If Tc-99m leukocytes are used, perform whole-body imaging at 2 hours.

**Bacteremia or Suspected Pyogenic Soft Tissue Infection:** Perform whole-body imaging at 2 hours, with detailed spot images of symptomatic site(s).

**Suspected Abdominal Abscess:** In-111 leukocytes is the preferred radiopharmaceutical. If Tc-99m leukocytes are used, perform whole-body imaging at 2 hours.

**Suspected Osteomyelitis of the Foot:** Combined Tc-99m MDP and In-111 leukocyte imaging is the preferred technique. If Tc-99m leukocyte imaging is used, perform spot images at 2 hours. Perform the Tc-99m MDP imaging on the day before or the day after Tc-99m leukocyte imaging.

**Suspected Osteomyelitis of a Hip, Knee, or Shoulder Prosthesis:** Combined In-111 leukocyte and Tc-99m sulfur colloid imaging is the preferred technique. If Tc-99m leukocyte imaging is used, perform spot images at 2 hours. Perform the Tc-99m sulfur colloid imaging on the day before or the day after Tc-99m leukocyte imaging.

**Suspected subacute or chronic osteomyelitis in bone with underlying abnormality:** Either Ga-67 scintigraphy combined with bone scintigraphy or In-111 leukocyte scintigraphy combined with bone marrow scintigraphy is preferred. If Tc-99m leukocyte imaging is used, perform spot images at 2 hours. Perform Tc-99m sulfur colloid imaging on the day before or the day after Tc-99m leukocyte imaging.

**Inflammatory Bowel Disease:** Perform whole-body and spot abdominal images at 1-2 hours. Spot images of the lungs and head at this time may help to disclose potential sources of swallowed leukocytes.

**Suspected Vascular Graft Infection:** In-111 leukocyte imaging is preferred. If Tc-99m leukocytes are used, perform spot images at 1-2 hours.


<table>
<thead>
<tr>
<th><strong>Spot images</strong></th>
<th>256 x 256 matrix, word mode; 5 minutes per view</th>
<th><strong>Spot image format</strong></th>
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<td><strong>Whole-body images</strong></td>
<td>256 x 1024 matrix, word mode; 30-min acquisition (8 cm/min)</td>
<td><strong>Dual-intensity display</strong></td>
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<tr>
<td><strong>SPECT</strong></td>
<td>See “SPECT Acquisition and Filtering Guidelines”</td>
<td><strong>To be filmed by physician</strong></td>
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**Items Required For Complete Study:**

1. Routine whole-body imaging: anterior and posterior whole-body images.

2. Limited examination: planar images of area of interest in projections directed by physician

3. SPECT: reconstruction and filtering of digital data.

4. All images transferred to the archival computer.

**Images must be reviewed by a nuclear medicine physician before the patient leaves the department.**