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A. INTRODUCTION

1. Summary of Procedure

Aminoglycosides (AMGs) residues are extracted from tissues using a buffer containing ammonium acetate / trichloroacetic acid as a protein precipitation. The extract is neutralized, cleaned using a weak-cation dispersive solid-phase extraction media, and analytes are captured with 10% formic acid in water. The final extract is analyzed using ion-pair reverse phase ultra high performance liquid chromatography (UHPLC) with detection by triple quadrupole mass spectrometry (MS/MS) using electrospray ionization in the positive mode (ESI+).

2. Applicability

This method is suitable for the screening of the following aminoglycosides: amikacin, apramycin, dihydrostreptomycin, gentamycin, hygromycin B, kanamycin, neomycin B, spectinomycin (as spectinomycin hydrate) and streptomycin in bovine, porcine, poultry, ovine and caprine kidney and bovine, porcine, poultry, equine, ovine and caprine muscle at levels found in Section J.1. in Table 5.

Note: Refer to 21CFR for tolerance values set by FDA and 40CFR for tolerance values set by EPA.

B. EQUIPMENT

Note: Equivalent equipment may be substituted.

1. Apparatus
   a. Centrifuge – Thermo IEC, Centra GP-8
   b. Cutting board and knives for mincing and removal of tendons and fat.
   c. Vortex Mixer – Scientific Products, S8220
   d. pH meter – with Ag/AgCl combination electrode Orion, Model 370
   e. Top Loading Balance – Mettler, Model PB302
   f. Analytical Balance – Mettler, Model X-205 Dualrange
   g. Centrifuge tubes – polypropylene (PP), 50 mL, Falcon Part number 352070
   h. Centrifuge tubes – polypropylene (PP), 15 mL, Falcon Part number 352096
   i. Whatman Mini-UniPrep syringeless filter vials – VWR 0.2 µm, PVDF, Cat. No. 12000-524. Note: Avoid glass if the Mini-UniPrep filter vials are substituted with syringe filters and autosampler vials, and substitutes must be checked for possible retention of analytes.
j. Cryogenic tubes – Nalgene, 1.2 mL, Mfr. No. 5011 0012
k. Nalgene FEP bottle – Nalgene, 30 mL, Mfr. No. 1600 00901
l. Filters for mobile phases – VWR, Supor membrane disc filters, 47 mm i.d., 0.2 µm, Cat. No. 28147-978
m. Sorbent Selectra Bulk Sorbents – CUCCX1(carboxylic Acid) 40-63 µm, Part Number CUCCXOOK
n. Magnetic stirrer – Corning, Cat No PC-351
o. Repeating pipettes and tips – 25 µL and 2.5 mL-Eppendorf, 100 µL and 200 µL-Gilson, 1000 µL-VWR
p. Shaker – Eberbach, Cat. No. 6010
q. Glassware – Class A
u. PVDF filter disk – Xpertek, 0.2µm, Mfr. No. 9474051
v. Syringe filter – Becton Dickenson, 3mL, Mfr. No. 309657

2. Instrumentation
   a. Waters UPLC-MS/MS TQD system with MassLynx operating software.
   b. UPLC Column – Waters UPLC BEH C18, 2.1 x 50 mm, 1.7µm with VanGuard Pre-column UHPLC BEH C18, 2.1 x 5.0 mm, 1.7 µm.

C. REAGENTS AND SOLUTIONS

Note: Equivalent reagents / solutions may be substituted. The stability time frame of the solution is dependant on the expiration date of the components used or the listed expiration date, whichever is soonest.

1. Reagents
   b. Acetonitrile (MeCN) – LC grade, CHROMASOLV, 99.9% Sigma-Aldrich, Cat. No. HP 412.
   c. Water (H₂O), LC grade – house deionized water passed through Barnstead E-pure 4 cartridge system.
   d. Heptafluorobutyric Acid (HFBA) – Sigma, Cat. No. 77249.
2. Solutions
   a. 1 N HCl:
      Dilute concentrated HCl 1:12 with LC water (e.g. add 7 mL acid to 77 mL water in
         a 100mL glass bottle for storage).
   b. 30% w/v NaOH:
      Add 30 g NaOH to a 100 mL graduated cylinder containing 90 mL of LC water.
      Mix with a magnetic stirbar then remove with retriever.
      Caution: This is an exothermic reaction; let the solution cool before adjusting to
      the 100 mL final volume. Store this solution in a plastic container.
   c. 1 N NaOH:
      Add 4 g NaOH to a 100 mL graduated cylinder containing 95 mL of LC water.
      Mix with a magnetic stirbar then remove with retriever.
      Caution: This is an exothermic reaction; let solution cool before adjusting to the
      100 mL final volume. Store this solution in a plastic container.
   d. Mobile Phase B (20 mM HFBA in MeCN):
      Measure 2.6 mL of HFBA and dilute to 1 L with LC grade MeCN. Filter through a
      0.2 μm filter disc if necessary and transfer into UHPLC Reservoir B.
   e. Mobile phase A (20mM HFBA in 95/5 water/MeCN):
      Measure 2.47 mL of HFBA and 50 mL of the solution prepared in 2.d. (20 mM
      HFBA in MeCN) and dilute to 1 L with LC water. Filter through a 0.2 μm filter disc
      if necessary and transfer into UHPLC Reservoir A.
   f. Extraction solvent mixture (10 mM NH₄OAc, 0.4 mM EDTA, 0.5% NaCl and 2%
      TCA in water):
      Add 1.54 g of NH₄OAc to 2 L graduated cylinder. Dilute to 1.95 L with LC water
      and adjust the pH to 4.0 with 1 N HCl and/or 1 N NaOH using a calibrated pH
      meter to measure. Add 0.3 g Na₂EDTA•2H₂O, 10 g of NaCl, and 40 g TCA. Mix
to ensure salts dissolve and adjust final volume to 2 L with LC water. Store in >2 L glass bottle.

g. 10% FA in water:

Add 10 mL of formic acid (FA) to a 100 mL volumetric flask containing 80 mL LC water, then fill to mark with LC water.

D. STANDARD(S)

Note: Equivalent standards / solutions may be substituted. Purity and counterions are to be taken into account when calculating standard concentrations. The stability time frame of the solution is dependant on the expiration date of the components used or the listed expiration date, whichever ends sooner.

1. Standard Information

Amikacin, Sigma (A-1774) Kanamycin Sulfate, Sigma (K-1876)
Apramycin HCl, Sigma (A-2024) Neomycin B Sulfate, Sigma (N-1876)
Dihydrostreptomycin Sulfate, USP (1203008) Spectinomycin HCl, USP (1618003)
Gentamicin Sulfate, Sigma, (G-3632) Tobramycin (int. std.), Sigma, (T-4014)
Streptomycin Sulfate, USP (1623003) Hygromycin B, Sigma, (H-7772)

2. Preparation of Standard Solution(s)

a. Individual AMG stock solutions (2000 µg/mL in water):

For each stock solution, calculate the amount of material that contains 20 mg AMG base, accounting for purity and/or water and sulfate content. Weigh this amount to the nearest 0.1 mg. Transfer to a 30 mL Nalgene FEP bottle and add by weight (1 g/mL density for water) the exact amount of water (≈10 mL) to yield 2000 µg/mL concentration of the pure drug. Mix well. This standard is stable for 3 months when stored at < -10°C.

b. Intermediate standard mixture of AMGs in water (50 µg/mL)

Pipet 250 µL each of amikacin, apramycin, hygromycin B, kanamycin, gentamicin, and spectinomycin into a 30 mL FEP bottle. Add 8.50 mL of water. Mix well. This standard is stable for 3 months when stored at < -10°C.

c. Mixed AMG calibration/spiking solution in water:

Following Table 1, combine the amounts of 2,000 µg/mL AMG stock solution for streptomycin, dihydrostreptomycin, neomycin and for Intermediate standard mixture of AMGs in water (50 µg/mL) to prepare the mixed working standards in a 30 mL FEP bottle for kidney, or muscle (use given volumes depending on matrix):
Table 1 AMG Calibration/ Spiking Solutions Preparation

<table>
<thead>
<tr>
<th>AMG</th>
<th>Standard</th>
<th>Concentration (µg/mL)</th>
<th>Volume for Kidney, Fortification Standard, (mL)</th>
<th>Kidney Fortification Standard (µg/mL)</th>
<th>Volume for Muscle Fortification Standard, (mL)</th>
<th>Muscle Fortification Standard (µg/mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neomycin Stock</td>
<td>2000</td>
<td>0.72</td>
<td>144</td>
<td>0.12</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Streptomycin Stock</td>
<td>2000</td>
<td>0.2</td>
<td>40</td>
<td>0.05</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Dihydrostreptomycin Stock</td>
<td>2000</td>
<td>0.2</td>
<td>40</td>
<td>0.05</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Hygromycin B Mix AMG I.S.</td>
<td>50</td>
<td>0.4</td>
<td>2</td>
<td>0.4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Amikacin</td>
<td>Mix AMG I.S.</td>
<td>50</td>
<td>0.4</td>
<td>2</td>
<td>0.4</td>
<td>2</td>
</tr>
<tr>
<td>Kanamycin</td>
<td>Mix AMG I.S.</td>
<td>50</td>
<td>0.4</td>
<td>2</td>
<td>0.4</td>
<td>2</td>
</tr>
<tr>
<td>Apramycin</td>
<td>Mix AMG I.S.</td>
<td>50</td>
<td>0.4</td>
<td>2</td>
<td>0.4</td>
<td>2</td>
</tr>
<tr>
<td>Gentamicin</td>
<td>Mix AMG I.S.</td>
<td>50</td>
<td>0.4</td>
<td>2</td>
<td>0.4</td>
<td>2</td>
</tr>
<tr>
<td>Spectinomycin</td>
<td>Mix AMG I.S.</td>
<td>50</td>
<td>0.4</td>
<td>2</td>
<td>0.4</td>
<td>2</td>
</tr>
<tr>
<td>Water</td>
<td>N/A</td>
<td>N/A</td>
<td>8.48</td>
<td>N/A</td>
<td>9.38</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Mix well. This standard is stable for 3 months when stored at < -10 °C.

The calibration/spiking solution is used for a spiking solution (recoveries and checks) and for preparation of calibration standards.

Note: the calibration/spiking solution should be portioned into polypropylene centrifuge tubes in quantities such that the volume in each tube is consumed on a sample set thus minimizing losses due to thawing and refreezing.

Table 2 provides AMG concentrations for each analyte when 100 µL of the appropriate fortification standard is spiked into 4 g of tissue.
Table 2 Analyte Concentrations as Fortified.

<table>
<thead>
<tr>
<th>AMG</th>
<th>Kidney (μg/g)</th>
<th>Muscle (μg/g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neomycin</td>
<td>3.6</td>
<td>0.6</td>
</tr>
<tr>
<td>Spectinomycin</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>Streptomycin</td>
<td>1</td>
<td>0.25</td>
</tr>
<tr>
<td>Dihydrostreptomycin</td>
<td>1</td>
<td>0.25</td>
</tr>
<tr>
<td>Gentamicin</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>Hygromycin B</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>Amikacin</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>Kanamycin</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>Apramycin</td>
<td>0.05</td>
<td>0.05</td>
</tr>
</tbody>
</table>

d. Tobramycin Internal standard (IS) in water (40 μg/mL)

Pipet 200 μL of 2000 μg/mL tobramycin stock solution from D.2.a into 9.8 mL of water in a 15 mL polypropylene centrifuge tube. Mix well. This standard is stable for 3 months when stored at < -10 °C.

Note: Thorough mixing is critical for the preparation of these standards.

e. AMG External Standard in 9% FA Solution:

Add 50 μL of appropriate kidney or muscle calibration/spiking solutions plus 50 μL of the 40 μg/mL IS solution to the labeled bottom portions of Whatman Mini-Uniprep autosampler vials. Add 0.400 mL of 10% FA in water. Filter the reagent-only calibration standard by placing the upper filter caps on the bottom portion of the vials. Mix well by vortexing. Inject external or recovery standard prior to each day’s run of samples to determine the instrument’s suitability.

These solutions can be stored at 2 - 8 °C and re-used for five days for routine monitoring.

Note: Solutions are stable for three months when stored at <-10 °C, five days when stored at 2 - 8 °C, and one day at ambient temperatures. The autosampler tray on the instrument keeps the solutions cold during analysis.

E. SAMPLE PREPARATION

Samples collected fresh must be kept cold before and during shipping to the laboratory. Once received at the laboratory, samples must be frozen (<10 °C) prior to grinding if they cannot be prepared on the day of receipt. Once frozen, the sample should be allowed to thaw, while keeping it as cold as possible. Dissect away fat and connective tissue from kidney or liver. Grind tissue in blender or vertical cutter-mixer. Store samples frozen (<-10 °C).
F. ANALYTICAL PROCEDURE

1. Preparation of Controls and Samples
   a. Weigh 4.0 ± 0.1 g of known blank tissue into a 50 mL polypropylene centrifuge tube, allow tissue to thaw and do the following described below:
      i. Screening – Prepare one each for a blank (negative control), a decision level recovery, a recovery (positive control), and a check sample if necessary. Prepare recoveries by fortifying with 100 μL of the appropriate fortification standard.

2. Extraction Procedure
   a. Weigh 4.0 ± 0.1 g of tissue into a 50 mL polypropylene centrifuge tube, allow tissue to thaw, if necessary.
   b. Add 20 mL of NH₄OAc/EDTA/NaCl/TCA buffer to each tube.
   c. Add 200 µL of the 40 µg/mL tobramycin IS to yield 2 µg/g in the tissue.
   d. Shake for 10 minutes.
   e. Centrifuge at approximately 4000 rpm for 5 minutes. If floating material is observed, remove it with a spatula.
   f. Decant supernatant into another labeled 50 mL PP tube.
   g. Using a calibrated pH meter, adjust pH of the sample extracts to 7.50 ± 0.25 with a few drops of 30% NaOH followed by 1 N NaOH and/or 1 N HCl for fine adjustment.
      Note: Using more dilute concentrations of NaOH and HCl, such as 0.5 N, is allowable for fine adjustment of the pH.
   h. Centrifuge at approximately 4000 rpm for 3 minutes.
   i. Decant each extract into a pre-labeled 50 mL polypropylene centrifuge tubes containing approximately 0.50 g of CUCCX1 Sorbent.
   j. Cap tubes and vortex on a platform vortex for 3 minutes.
   k. Centrifuge tubes at 4000+ rpm for 3 minutes.
   l. Aspirate sample extract to waste.
   m. Add 2 mL 10% Formic Acid to each tube containing sorbent, cap and vortex on a platform vortex for 3 minutes.
   n. Centrifuge tubes at 4000+ rpm for 3 minutes.
   o. For the samples and controls, place 500 μL of each final extract into bottom piece of Mini Uni-Prep PVDF syringeless filter vial. Then insert top filter vial and press together.
3. Instrumental Settings

Note: The instrument parameters may be optimized to ensure system suitability.

UHPLC-MS-MS Analysis

Instrument operating Parameters – UHPLC System

a. Mobile phases for AMG analysis:

Mobile Phase A – 95% water / 5% MeCN / 20 mM HFBA
Mobile Phase B – 100% MeCN / 20 mM HFBA

Flush column with 1:1 A/B at a flow rate of 0.5 mL/min for 3 minutes. Change the mobile phase initial conditions to 100% A. Allow column to equilibrate until the “delta” value on the pressure reading is < 20.

b. UHPLC gradient program: (Table 3)

Flow rate: 0.5 mL/min
Pressure Limits: 200 psi minimum; 12,000 psi maximum
Run time: 3.00 min

Table 3 – LC gradient

<table>
<thead>
<tr>
<th>Time (min)</th>
<th>% Mobile Phase A</th>
<th>% Mobile Phase B</th>
<th>Gradient</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>100</td>
<td>0</td>
<td>none</td>
</tr>
<tr>
<td>0.50</td>
<td>80</td>
<td>20</td>
<td>linear</td>
</tr>
<tr>
<td>1.00</td>
<td>80</td>
<td>20</td>
<td>none</td>
</tr>
<tr>
<td>2.00</td>
<td>60</td>
<td>40</td>
<td>linear</td>
</tr>
<tr>
<td>2.05</td>
<td>10</td>
<td>90</td>
<td>linear</td>
</tr>
<tr>
<td>2.50</td>
<td>10</td>
<td>90</td>
<td>none</td>
</tr>
<tr>
<td>2.55</td>
<td>100</td>
<td>0</td>
<td>linear</td>
</tr>
<tr>
<td>3.00</td>
<td>100</td>
<td>0</td>
<td>none</td>
</tr>
</tbody>
</table>

c. Autosampler program:

i. Run time: 3.0 min
ii. Injection loop: 20 µL
iii. Loop option: Partial loop needle overfill
iv. Injection Volume: 15 µL
v. Weak wash solvent: Mobile Phase A
vi. Weak wash volume: 500 µL
vii. Strong wash solvent: Mobile Phase B
viii. Strong wash volume: 500 µL
ix. Sample temperature: 7 °C
x. Column manager:
   (a) Column valve position: To match column location
   (b) Column manager temperature: 40 °C
   (c) Use divert valve to divert eluant to waste 0.25 minutes prior to first peak and 0.25 minutes after last analyte peak.

d. Instrument Operating Parameters – Mass Spectrometer
i. Mass spectrometer calibration and resolution were done according to the manufacturer’s specification using the manufacturer’s supplied calibration solution.
ii. Type: MS/MS
iii. Electrospray Source Parameters:
   Capillary (kV): 3.0
   Cone (V): Variable - analyte dependent
   Extractor (V): 3.0
   RF (V): 0.10
   Source Temperature (°C): 150
   Desolvation Temperature (°C): 450
   Cone Gas Flow (L/hr): 20
   Desolvation Gas Flow (L/hr): 900
   Collision Gas Flow (mL/min): 0.20
iv. Analyzer Parameters:
   LM1 Resolution 12.50
   HM 1 Resolution: 12.50
   MSMS Mode Entrance: -5
   MSMS Mode Collision Energy: Variable – analyte dependent
   MSMS Mode Exit: 1
   LM 2 Resolution: 12.50
   HM 2 Resolution: 12.50
v. MS Method Parameters:

Type: MRM
Ion Mode: ES+
Dwell (s): 0.005
Start time (min): 0.8
End time (min): 2.6

<table>
<thead>
<tr>
<th>Start–End Time (min)</th>
<th>Dwell Time (ms)</th>
<th>Compound</th>
<th>Precursor ion (m/z)</th>
<th>Product ions (m/z)</th>
<th>Cone (V)</th>
<th>Collision Energy (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.9-1.2</td>
<td>66</td>
<td>Spectinomycin Hydrate</td>
<td>351.24</td>
<td>333.33</td>
<td>40</td>
<td>20</td>
</tr>
<tr>
<td>1.1-1.3</td>
<td>66</td>
<td>Hygromycin B</td>
<td>528.20</td>
<td>177.05</td>
<td>44</td>
<td>30</td>
</tr>
<tr>
<td>1.2-1.4</td>
<td>44</td>
<td>Streptomycin</td>
<td>582.17</td>
<td>263.09</td>
<td>70</td>
<td>32</td>
</tr>
<tr>
<td>1.2-1.4</td>
<td>52</td>
<td>Dihydrostreptomycin</td>
<td>584.17</td>
<td>263.09</td>
<td>70</td>
<td>30</td>
</tr>
<tr>
<td>1.5-1.7</td>
<td>150</td>
<td>Amikacin</td>
<td>586.43</td>
<td>163.21</td>
<td>30</td>
<td>35</td>
</tr>
<tr>
<td>1.6-1.8</td>
<td>150</td>
<td>Kanamycin A</td>
<td>485.36</td>
<td>163.22</td>
<td>30</td>
<td>20</td>
</tr>
<tr>
<td>1.9-2.1</td>
<td>33</td>
<td>Apramycin</td>
<td>540.41</td>
<td>217.20</td>
<td>35</td>
<td>25</td>
</tr>
<tr>
<td>2.0-2.1</td>
<td>22</td>
<td>Tobramycin (IS)</td>
<td>468.36</td>
<td>163.19</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>2.0-2.2</td>
<td>33</td>
<td>Gentamicin c1a</td>
<td>450.39</td>
<td>160.16</td>
<td>35</td>
<td>25</td>
</tr>
<tr>
<td>2.0-2.2</td>
<td>33</td>
<td>Gentamicin c2+c2a</td>
<td>464.42</td>
<td>160.23</td>
<td>35</td>
<td>25</td>
</tr>
<tr>
<td>2.0-2.3</td>
<td>33</td>
<td>Gentamicin c1</td>
<td>478.42</td>
<td>157.25</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>2.1-2.3</td>
<td>22</td>
<td>Neomycin B</td>
<td>615.30</td>
<td>163.38</td>
<td>52</td>
<td>35</td>
</tr>
</tbody>
</table>

See Appendix for diagrams of proposed fragmentation patterns for each analyte.

Note: Screening of the presence of spectinomycin hydrate is considered to be screening of the parent spectinomycin. Screening for the presence of Gentamicin is determined when at least one of the complexes are present (i.e. either c1, c1a, or c2 + c2a).

e. UHPLC-MS/MS Analytical Procedure

i. Turn on UHPLC pump, set mobile phase to 100% A at a flow rate of 0.50 mL/min. Perform column equilibration for five minutes. Verify backpressure of column gives “delta” value < 20 in pressure fluctuations.

ii. Turn on MS and load appropriate MS Tune file (.ipr). Turn on API gas flow. Allow MS to achieve designated gas flow and desolvation temperature. Place MS valve position to LC.

iii. Inject 15 μL of external standard (appropriate for the tissue to be analyzed), followed by two injections of 10% FA in water (solvent blank). Verify the retention time, divert valve switching time, and detection of MS/MS ions using the TargetLynx sample processing program.
iv. Then inject recovery(ies), blank, followed by samples. One may want to put solvent blanks in between samples in case of high finding leads to carry-over.

v. As a test of retention time and instrument response stability, re-inject a calibration standard at the end of the injection sequence. Depending on instrument variability, additional injection of control standards may be interspersed mid-sample sequence.

vi. Column, Pump and ES interface care: At the end of set of analyses, the column should be flushed for 5-10 minutes with Acetonitrile. Then the instrument performs a shutdown procedure, turning off LC flow and MS desolvation temperature and gas flow. Inspect entrance cone for cleaning, following manufacturer’s specification for cleaning the surfaces.

4. Sample Set
   a. Screening set
      i. External Standard (optional)
      ii. Decision Level recovery
      iii. Recovery (Positive control)
      iv. Check sample (if necessary)
      v. Blank
      vi. Up to 44 Samples
      vii. External standard or positive control

G. CALCULATIONS / IDENTIFICATION

1. Screening
   a. The retention time for the recoveries and samples must match the retention time of the decision level recovery standard within 5%.
   b. Blank must be less than 10% of the decision level recovery.
   c. The screening ion for a given analyte must be present. The required ion for each compound is listed in Table 4.
   d. The screening ion must have a signal-to-noise ratio $\geq 3$. This may be verified by visual inspection.
e. A sample is screened positive if the following criteria are met:
   i. The fortified recovery of the analyte must exceed 10% of the decision level recovery.
   ii. The sample response equals or exceeds the level of interest recovery (positive control) level.

H. SAFETY INFORMATION AND PRECAUTIONS

1. Required Protective Equipment — Protective clothing, eyewear, and gloves, where applicable.

2. Hazards

<table>
<thead>
<tr>
<th>Procedure Step</th>
<th>Hazard</th>
<th>Recommended Safe Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMG Standards</td>
<td>Ototoxic. Standards can cause kidney damage</td>
<td>Wear protective clothing and gloves when handling standards.</td>
</tr>
<tr>
<td>Acetonitrile</td>
<td>Flammable. Explosive hazard. Vapors will explode if ignited. Irritating to skin and mucous membranes.</td>
<td>Keep container tightly closed and away from fire. Use under a fume hood. Avoid breathing vapors.</td>
</tr>
<tr>
<td>NaOH and solutions made from same</td>
<td>Corrosive substances Danger of chemical burns.</td>
<td>Wear gloves when preparing solutions, and take care to avoid splashes or spills.</td>
</tr>
</tbody>
</table>

3. Disposal Procedures
   Follow local, state and federal guidelines for disposal.

I. QUALITY ASSURANCE PLAN

1. Performance Standard
   a. For Screening:
      i. For set acceptance, the nine analytes in the fortified recovery (positive control) must meet screening criteria.
      ii. The blank (negative control) must be negative using the criteria in Section G.
2. Critical Control Points and Specifications

None known

3. Intralaboratory Check Samples

a. System, minimum contents.
   i. Frequency: One per week per analyst when samples analyzed.
   ii. Records are to be maintained.

b. Acceptability criteria.
   Refer to I. 1.

   If unacceptable values are obtained, then:
   i. Investigate following established procedures.
   ii. Take corrective action as warranted.

4. Sample Condition upon Receipt

Cool or frozen
### J. APPENDIX

1. Screening levels
   a. Screening

   **Table 5 Screening level per species**

<table>
<thead>
<tr>
<th>AMG</th>
<th>Matrix</th>
<th>Bovine (µg/g)</th>
<th>Porcine (µg/g)</th>
<th>Poultry (µg/g)</th>
<th>Equine (µg/g)</th>
<th>Ovine (µg/g)</th>
<th>Caprine (µg/g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amikacin</td>
<td>Kidney</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>N/App</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>Amikacin</td>
<td>Muscle</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>Apramycin</td>
<td>Kidney</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>N/App</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>Apramycin</td>
<td>Muscle</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>Dihydrostreptomycin</td>
<td>Kidney</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>N/App</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Dihydrostreptomycin</td>
<td>Muscle</td>
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<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
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<tr>
<td>Gentamicin</td>
<td>Kidney</td>
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<td>0.05</td>
<td>0.05</td>
<td>N/App</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>Gentamicin</td>
<td>Muscle</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>Hygromycin B</td>
<td>Kidney</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>N/App</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>Hygromycin B</td>
<td>Muscle</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
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<td>0.05</td>
</tr>
<tr>
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<td>Kidney</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>N/App</td>
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<td>0.05</td>
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<tr>
<td>Kanamycin</td>
<td>Muscle</td>
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<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>Neomycin</td>
<td>Kidney</td>
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<td>N/App</td>
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<td>3.6</td>
</tr>
<tr>
<td>Neomycin</td>
<td>Muscle</td>
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<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>Spectinomycin</td>
<td>Kidney</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>N/App</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>Spectinomycin</td>
<td>Muscle</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>Streptomycin</td>
<td>Kidney</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>N/App</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Streptomycin</td>
<td>Muscle</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
</tr>
</tbody>
</table>

   N/App = Not applicable

2. Chromatograms/spectra
   Reserved
3. Proposed Fragmentation Pattern

**Amikacin**

Formula: C_{22}H_{43}N_{5}O_{13}  \ MW:  585.60 \text{ g/mol}

- m/z 586.43 → m/z 247.37
- m/z 586.43 → m/z 163.21
- m/z 586.43 → m/z 101.98

\[ \begin{array}{c}
\text{m/z 586} \\
\text{m/z 247} \\
\text{m/z 163} \\
\text{m/z 101}
\end{array} \]

**Apramycin**

Formula: C_{21}H_{41}N_{5}O_{11}  \ MW:  539.28 \text{ g/mol}

- m/z 540.41 → m/z 378.31
- m/z 540.41 → m/z 217.20
- m/z 540.41 → m/z 199.35

\[ \begin{array}{c}
\text{m/z 540} \\
\text{m/z 378} \\
\text{m/z 217} \\
\text{m/z 199}
\end{array} \]
Dihydrostreptomycin  
Formula: C<sub>21</sub>H<sub>41</sub>N<sub>7</sub>O<sub>12</sub>  MW:  583.21 g/mol  

\[ m/z \ 548.17 \rightarrow m/z \ 263.09 \]  
\[ m/z \ 548.17 \rightarrow m/z \ 246.05 \]  
\[ m/z \ 548.17 \rightarrow m/z \ 176.00 \]  

---

Gentamicin C<sub>1</sub>  
Formula: C<sub>21</sub>H<sub>43</sub>N<sub>5</sub>O<sub>7</sub>  MW:  477.32 g/mol  

\[ m/z \ 478.42 \rightarrow m/z \ 322.42 \]  
\[ m/z \ 478.42 \rightarrow m/z \ 160.16 \]  
\[ m/z \ 478.42 \rightarrow m/z \ 157.25 \]
Gentamicin C_{1a}  
Formula: C_{19}H_{39}N_{5}O_{7}  MW:  449.29 g/mol  
$m/z$ 450.39 $\rightarrow$ $m/z$ 322.37  
$m/z$ 450.39 $\rightarrow$ $m/z$ 160.16  
$m/z$ 450.39 $\rightarrow$ $m/z$ 112.17

Gentamicin C_{1a} + C_{2a}  
Formula: C_{20}H_{41}N_{5}O_{7}  MW:  463.30 g/mol  
$m/z$ 464.42 $\rightarrow$ $m/z$ 322.39  
$m/z$ 464.42 $\rightarrow$ $m/z$ 163.14  
$m/z$ 464.42 $\rightarrow$ $m/z$ 160.23
Hygromycin B  
Formula: C_{20}H_{37}N_{3}O_{13}  MW:  527.23 g/mol  
m/z 528.20 → m/z 352.03  
m/z 528.20 → m/z 257.00  
m/z 528.20 → m/z 177.05

Kanamycin A  
Formula: C_{18}H_{33}N_{4}O_{11}  MW:  484.24 g/mol  
m/z 485.36 → m/z 324.33  
m/z 485.36 → m/z 163.22  
m/z 485.36 → m/z 102.14
Neomycin B

Formula: C_{23}H_{46}N_{6}O_{13}  MW: 614.31 g/mol

\[ m/z \ 615.30 \rightarrow m/z \ 293.03 \]
\[ m/z \ 615.30 \rightarrow m/z \ 163.38 \]
\[ m/z \ 615.30 \rightarrow m/z \ 160.53 \]

Spectinomycin

Formula: C_{14}H_{24}N_{2}O_{7}  MW: 332.16 g/mol

\[ m/z \ 333.00 \rightarrow m/z \ 189.21 \]
\[ m/z \ 333.00 \rightarrow m/z \ 140.10 \]
\[ m/z \ 333.00 \rightarrow m/z \ 122.15 \]
**Spectinomycin Hydrate**  
Formula: C_{14}H_{26}N_{2}O_{8}  MW: 350.17 g/mol  
m/z 351.24 → m/z 333.33  
m/z 351.24 → m/z 140.10  
m/z 351.24 → m/z 98.00

**Streptomycin**  
Formula: C_{21}H_{39}N_{7}O_{12}  MW: 581.27 g/mol  
m/z 582.17 → m/z 263.09  
m/z 582.17 → m/z 246.05  
m/z 582.17 → m/z 176.00
**Tobramycin**  
Formula: $C_{18}H_{37}N_{5}O_{9}$  
MW: 467.26 g/mol  
$m/z$ 468.36 → $m/z$ 163.19  
$m/z$ 468.36 → $m/z$ 145.10

K.  
**APPROVALS AND AUTHORITIES**


2. Issuing Authority: Director, Laboratory Quality Assurance Staff.