Preservation of Synovial Fluid with Dimethyl Sulfoxide (DMSO)

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The Synovial Fluid RCPAQAP provides 25µl aliquots of synovial fluid (SF), most containing urate or calcium pyrophosphate crystals, to laboratories to assess accuracy of SF examination for crystals. The educational and quality assurance value of the samples is influenced by the integrity of the SF cells at the time of examination, after travelling by post/courier for up to several days to destinations throughout Australia, New Zealand and internationally. The aim of this study was to assess whether addition of dimethyl sulfoxide (DMSO), a cryoprotective chemical used in stem cell transplantation, would help maintain SF cellular morphology.

Methods
1. SFs obtained for routine clinical care, irrespective of underlying condition, were collected.
2. Each SF was aliquoted into 24 samples, with half having DMSO added to achieve 10% concentration (“+DMSO”). Half the fluids were stored at room temperature (RT) and half at -80°C.
3. Samples were photographed (40x objective) by KP at 1, 2, 3, 6, 7, & 8 weeks. The photographs were de-ordered and cellular morphology was graded by NM.
4. Data analysis via SPSS with help from statistician; ordinal logistic regression used to compare cellular morphology grade across groups.

Results
15 Patients recruited with preliminary analysis of 7 complete studies and 4 “in progress” studies. >200 photographs.

Cell Grade
Relative to +DMSO -80°C: Odds of +DMSO RT having worse cell grade is 2.5x greater (p=.039, 95% CI 1.05–5.91)
Odds of -DMSO -80°C having worse cell grade is 1.3x greater (p=.467, 95% CI 0.66–2.50)
Odds of -DMSO RT having worse cell grade is 2.2x greater (p=.151, 95% CI 0.76–6.15)
Trend: DMSO -80°C > No DMSO -80°C > No DMSO RT > DMSO RT

Presence of Artefact

<table>
<thead>
<tr>
<th></th>
<th>+DMSO -80°C</th>
<th>+DMSO RT</th>
<th>-DMSO -80°C</th>
<th>DMSO RT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number (%)</td>
<td>6 (11.1%)</td>
<td>12 (22.2%)</td>
<td>7 (13.0%)</td>
<td>7 (13.0%)</td>
</tr>
<tr>
<td>Pearson Chi-Square</td>
<td>p=.358</td>
<td>p=.358</td>
<td>p=.358</td>
<td>p=.358</td>
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</tbody>
</table>

Presence of Clumping

<table>
<thead>
<tr>
<th></th>
<th>+DMSO -80°C</th>
<th>+DMSO RT</th>
<th>-DMSO -80°C</th>
<th>DMSO RT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number (%)</td>
<td>10 (18.5%)</td>
<td>15 (27.8%)</td>
<td>7 (13.0%)</td>
<td>11 (20.4%)</td>
</tr>
<tr>
<td>Pearson Chi-Square</td>
<td>p=.283</td>
<td>p=.283</td>
<td>p=.283</td>
<td>p=.283</td>
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</tbody>
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Conclusions
- Preservation of synovial fluid with DMSO at -80°C seems to be helpful for maintaining cellular morphology.
- No significant differences between groups for artefacts and clumping; thus, no adverse effect from DMSO.
- Further assessments are in progress.