Lubrizol Life Science’s Health business (LLS Health) offers full-service pharmaceutical Contract Development & Manufacturing Organization (CDMO) services and has over 20 years of experience working with complex drug products, including intravitreal injectables, topical suspensions, and ocular implants, among others. We offer formulation development, finished dosage form manufacturing, regulatory and technical support as well as high-performance, mucoadhesive topical excipients.

As the natural protective mechanisms of the human eye can create challenges for drug delivery, ophthalmic drug products are quickly moving towards more complex systems. Selecting optimal excipients and an experienced and comprehensive development and manufacturing partner is essential to your success.

Specialties Include:
- Formulation development and manufacturing for injectables, topicals, and drug-eluting devices
- Micro and nanoparticulate formulation
- Aseptic processing and sterile fill-finish
- Bioadhesive, monograph-compliant topical excipients

A. Eye drops, gels, and ointments
B. Scleral and punctual plugs
C. Subconjunctival implants
D. Suprachoroidal implants
E. Suprascleral injections
F. Intravitreal implants
G. Intravitreal injections
H. Ocular inserts
## Ophthalmic Excipients

<table>
<thead>
<tr>
<th>Ophthalmic Excipients</th>
<th>Residual Solvent</th>
<th>United States (USP/NF)</th>
<th>Europe (Ph. Eur.)</th>
<th>Japan (JPE)</th>
<th>Thickening Ability</th>
<th>Suspending Ability</th>
<th>Emulsification O/W</th>
<th>Lubrication/Moisturization</th>
<th>Bioadhesion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbopol® 971P NF</td>
<td>Ethyl Acetate</td>
<td>Carbomer Homopolymer Type A</td>
<td>Carbomers Carbomer Polyvinyl Polymers</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Carbopol® 974P NF</td>
<td>Ethyl Acetate</td>
<td>Carbomer Homopolymer Type B</td>
<td>Carbomers Carbomer Polyvinyl Polymers</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Carbopol® 5984 EP</td>
<td>Cosolvent¹</td>
<td>Carbomer Homopolymer Type B</td>
<td>Carbomers Carbomer Polyvinyl Polymers</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Carbopol® 980 NF</td>
<td>Cosolvent</td>
<td>Carbomer Homopolymer Type C</td>
<td>Carbomers Carbomer Polyvinyl Polymers</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Carbopol® 981 NF</td>
<td>Cosolvent</td>
<td>Carbomer Homopolymer Type A</td>
<td>Carbomers Carbomer Polyvinyl Polymers</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Carbopol® Ultrez 10 NF</td>
<td>Cosolvent</td>
<td>Carbomer Interpolymer Type A</td>
<td>Carbomers Carbomer Polyvinyl Polymers</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Carbopol® ETD 2020 NF</td>
<td>Cosolvent</td>
<td>Carbomer Interpolymer Type B</td>
<td>Carbomers Carbomer Polyvinyl Polymers</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Pemulen™ TR-1 NF</td>
<td>Cosolvent</td>
<td>Carbomer Copolymer Type B</td>
<td>Carbomers Carbomer Polyvinyl Polymers</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Pemulen™ TR-2 NF</td>
<td>Cosolvent</td>
<td>Carbomer Copolymer Type A</td>
<td>Carbomers Carbomer Polyvinyl Polymers</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Noveon® AA-1 USP</td>
<td>Ethyl Acetate</td>
<td>Polycarbophil</td>
<td>Carbomers Carbomer Polyvinyl Polymers</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

¹Cosolvent is a mixture of ethyl acetate and cyclohexane. ²The Carbomers Monograph in the European Pharmacopeia stipulates that benzene is limited to 2 ppm. ³Based on customer request, Lubrizol certifies select lots of product against the JPE Carboxyvinyl Polymer Monograph.

### Carbopol®, Pemulen™ and Noveon® polymer excipients
- Versatile, efficient in topical formulations
- Bioavailability enhancement via mucoadhesion
- Monograph-compliant

### Pathway™ Thermoplastic Polyurethane (TPU)
- Biodurable, pharmaceutical-grade
- Flexible chemistry for customizability
- Compatibility with a variety of APIs
- Suitable for implants, punctal plugs, etc.

### CDMO Capabilities Snapshot:

#### APIs
- Small and large molecules
- Highly potent compounds
- Controlled substances

#### Facilities
- GMP/GLP compliant
- FDA-registered
- DEA-licensed for Schedule 1-5

#### Containers
- Multidose bottles
- Vials
- Pre-filled syringes
- Cartridges

All LLS Health ocular excipients are manufactured under GMPs in ISO:9001 certified facilities, have established DMFs, and have been extensively tested for biocompatibility and safety.

For more information, visit lubrizolcdmo.com or call us toll free at +1 610-861-4701.