

Ophthalmic Drug Delivery

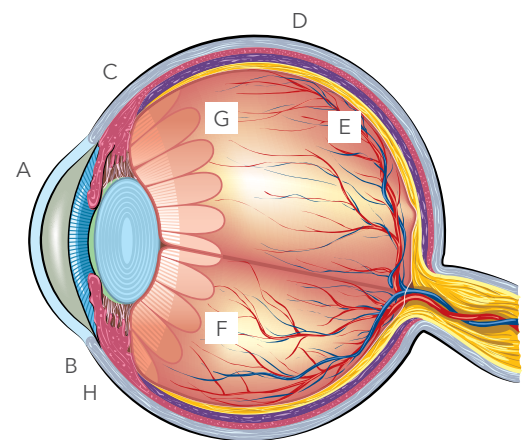
Lubrizol Life Science's Health business (LLS Health) offers full-service pharmaceutical Contract Development & Manufacturing Organization (CDMO) services and has over 20 years of experience working with complex drug products, including intravitreal injectables, topical suspensions, and ocular implants, 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

Formulation Development and Manufacturing Expertise across all Dosage Forms (A-H)



- | | |
|-----------------------------------|----------------------------|
| A. Eye drops, gels, and ointments | E. Suprascleral injections |
| B. Scleral and punctal plugs | F. Intravitreal implants |
| C. Subconjunctival implants | G. Intravitreal injections |
| D. Suprachoroidal implants | H. Ocular inserts |

Ophthalmic Excipients

Ophthalmic Excipients	Residual Solvent	United States (USP/NF)	Europe (Ph. Eur.) ²	Japan (JPE) ³	Thickening Ability	Suspending Ability	Emulsification O/W	Lubrication/Moisturization	Bioadhesion
Carbopol® 971P NF	Ethyl Acetate	Carbomer Homopolymer Type A	Carbomers	Carboxyvinyl Polymers	•	•		•	•
Carbopol® 974P NF	Ethyl Acetate	Carbomer Homopolymer Type B	Carbomers	Carboxyvinyl Polymers	•	•		•	•
Carbopol® 5984 EP	Cosolvent ¹	Carbomer Homopolymer Type B	Carbomers	Carboxyvinyl Polymers	•	•		•	•
Carbopol® 980 NF	Cosolvent	Carbomer Homopolymer Type C	Carbomers	Carboxyvinyl Polymers	•	•		•	•
Carbopol® 981 NF	Cosolvent	Carbomer Homopolymer Type A	Carbomers	Carboxyvinyl Polymers	•	•		•	•
Carbopol® Ultrez 10 NF	Cosolvent	Carbomer Interpolymer Type A			•	•		•	•
Carbopol® ETD 2020 NF	Cosolvent	Carbomer Interpolymer Type B			•	•	•	•	•
Pemulen™ TR-1 NF	Cosolvent	Carbomer Copolymer Type B			•	•	•	•	•
Pemulen™ TR-2 NF	Cosolvent	Carbomer Copolymer Type A			•	•	•	•	•
Noveon® AA-1 USP	Ethyl Acetate	Polycarbophil			•	•		•	•

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

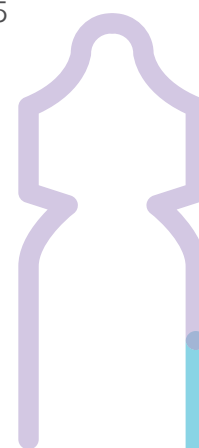
- Small and large molecules
- Highly potent compounds
- Controlled substances

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.