

CYCLOLAB



The Cyclodextrin Company

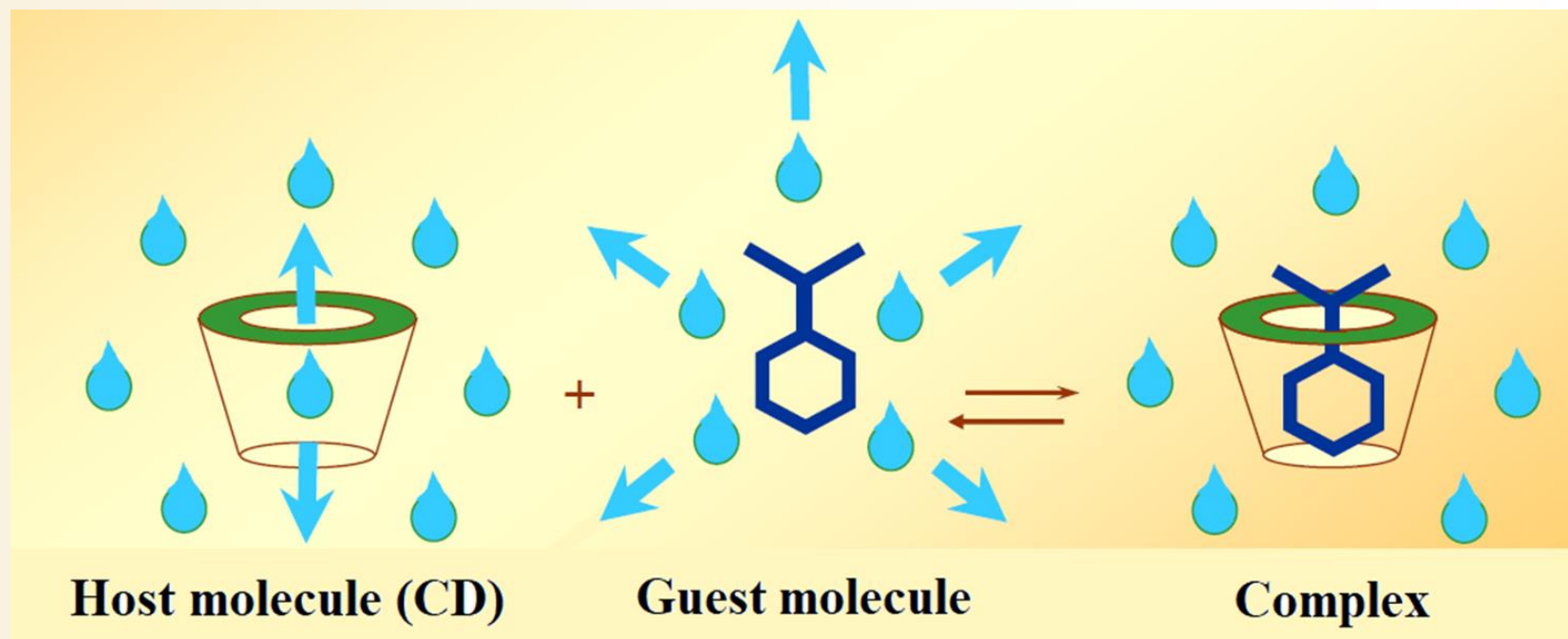


Cyclodextrins in *veterinary* use



What are cyclodextrins (CDs)?

- **Composed of sugars**
- **Cyclic molecules**
- **Naturally occurring compounds**
- **Used in food, pharmaceuticals, drug delivery, chemical industries, agriculture, etc.**



Why use cyclodextrins?

- **Significant solubility enhancement**
- **Improvement of chemical stability**
- **Increased bioavailability, facilitated delivery**
- **Reduced aggregation**
- **Moderated irritation or reduced side-effects**
- **Maximized safety, complete renal elimination**
- **Enables formulation of water-insoluble APIs in all dosage forms**
- **Lower API doses can be achieved**
- **Potential antidote for organophosphate poisonings**



The Cyclodextrin Company

Who we are and what can we offer?

CycloLab is the world's only all-around Cyclodextrin Service Provider

Our services include:

- **Supplying cyclodextrins for commercial products and product development**
- **Screening cyclodextrin derivatives to find the right candidate for target API.**
- **Providing formulation development services, composition optimization, stability assessment.**
- **Offering analytical services to characterize complexes and products.**
- **Preparing pilot-scale amounts for cyclodextrin-API complexes under GMP for development purposes.**
- **Assisting in compilation of regulatory documentation.**

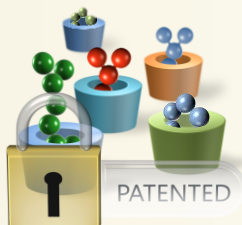
For more information please click [here](#)



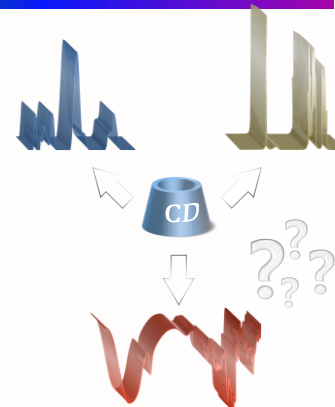
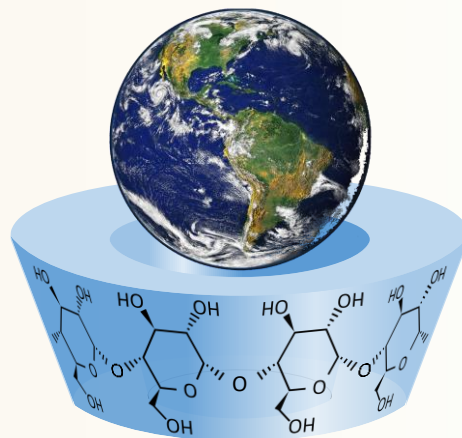
What is CycloLab?



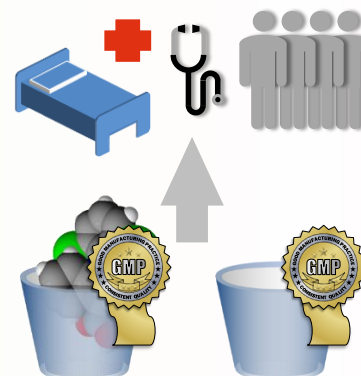
Early phase drug development



IP services & consultancy

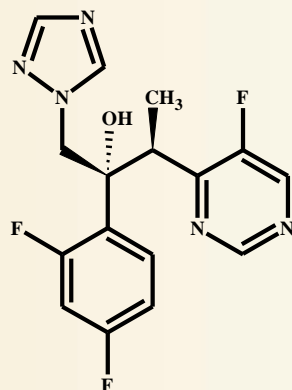


Analytical services

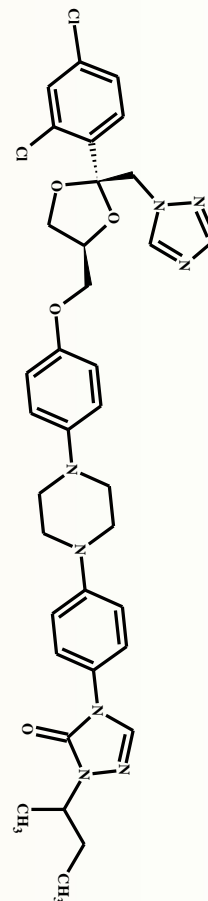


GMP synthesis and production

Antifungal agents



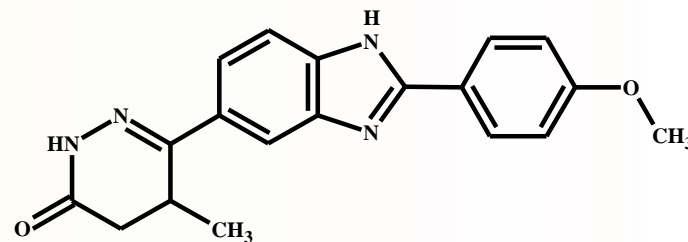
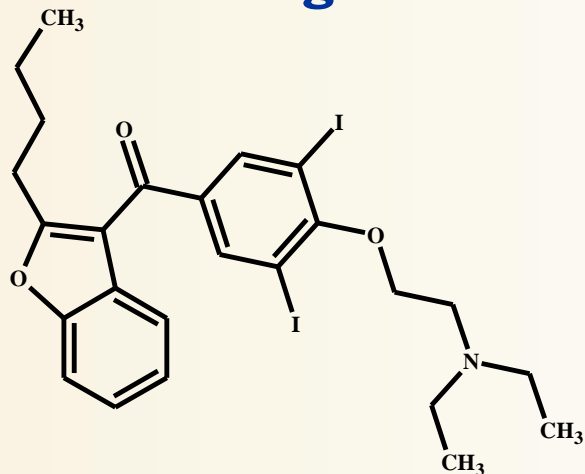
- **Voriconazole** is an antimycotic drug for both human and veterinary use.
- In the formulation, *sulfobutyl-ether-beta-cyclodextrin (Dexolve™)* is used as an excipient.



- **Itraconazole** (Itrafungol™), it is used as antimycotic drug in cats.
- In the formulation, *(2-hydroxypropyl)-beta-cyclodextrin* is used as an excipient.



Drugs affecting the cardiovascular system

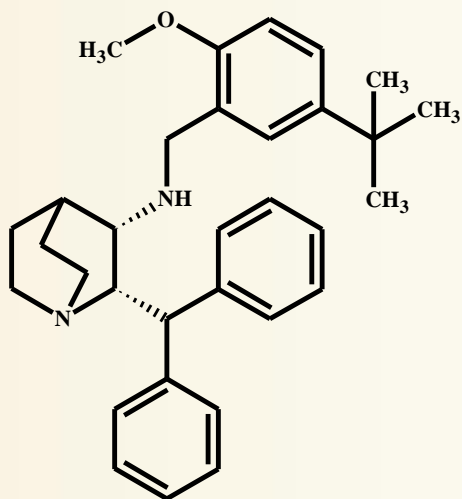


- **Amiodarone** is an antiarrhythmic drug. It has several indications, and it is used in humans and in veterinary medication.

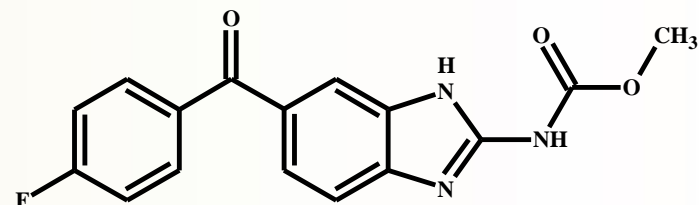
- A new formulation (Nexterone™, PM101) contains *sulfobutyl-ether-beta-cyclodextrin* as a solubilizing agent instead of Polysorbate 80.

- Does not cause hypotension
- Safe for bolus administration
- Plastic-friendly allows for prefilled non-glass syringes in future
- Currently FDA-approved only in glass syringe

- **Pimobendan** (Vetmedin™), is a calcium sensitizer and a selective inhibitor of phosphodiesterase 3 (PDE3) with positive inotropic and vasodilator effects, used for the treatment of heart failure in dogs.
- A new patent by Boehringer Ingelheim describes a formulation that consists of modified *cyclodextrins*¹.

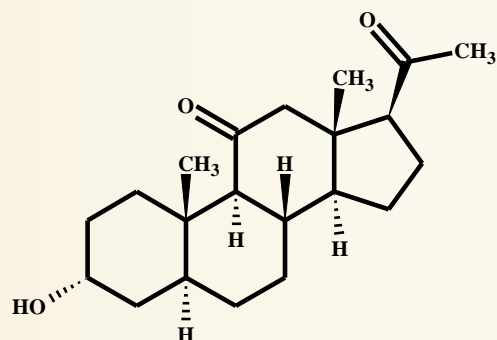


- **Maropitant** (Cerenia™), a drug used for the treatment of motion sickness and vomiting in dogs.
- In the formulation, *sulfobutyl-ether-beta-cyclodextrin* is used as a solubilizing agent.



- **Flubendazole** is an antihelmintic drug, used both in veterinary and human medication.
- *(2-hydroxypropyl)-beta-cyclodextrin* can be used as a solubilizing agent, to improve water solubility².





• **Alfaxalone** (Alfaxan™), is a neuroactive steroid molecule with general anesthetic effects. It is used only in veterinary practice.

• In the formulation, *(2-hydroxypropyl)-beta-cyclodextrin* is used as a solubilizing agent



Cyclodextrins are also used in vaccines



Live freeze-dried vaccine,
Hitchner B1 strain

For the active immunization of chickens
against Newcastle Disease



As an excipient , *(2-hydroxypropyl)-beta-cyclodextrin* is used.

- Suvaxyn PCV TM contains inactivated recombinant Porcine Circovirus type 1, expressing the Porcine Circovirus type 2 ORF2 protein. This vaccine is used for the active immunization of pigs over the age of 3 weeks against Porcine Circovirus type 2 (PCV2)
- *Sulfolipo-cyclodextrin (SLCD)* is used as an adjuvant

Other possibilities for cyclodextrin usage

Vitamins and cyclodextrins³

- **β -cyclodextrins** improve pharmacokinetics of α -tocopherol in heifers³
- Cyclodextrin encapsulated vitamin K (K_1 , K_2) can reduce osteochondral effects in animals⁴

Essential oils and cyclodextrins

Several patents are about essential oil formulations with cyclodextrins⁵, e.g.:

- Camphor oil (-respiratory stimulant⁶)
- Lemon oil (-flavor enhancer)
- Cinnamon oil (-flavor enhancer)
- Garlic oil (-antimicrobial)

Cryopreservation

- Cholesterol-loaded cyclodextrins can prevent cryosurvival of animal sperms^{7,8}
- Cholesterol-loaded cyclodextrins improve quality of stallion spermatozoa⁹

Effects of cyclodextrin complexes on methane production in heifers¹⁰

- The **β -cyclodextrin** complex with guest materials appears to be a promising solution to mitigate methane emissions without reducing energy intake.

³ Bontempo V. et al. Kinetic behavior of three preparations of α -tocopherol after oral administration to postpubertal heifers, *American Journal of Veterinary Research*, 2000, 61(5):589-93

⁴ Nibbitt JR and Regtop H, Method for increasing bone density and/or reducing any osteochondral defects in an animal and a composition including vitamin K, 2015, US 8999962 B2

⁵ Geetika W. et al., Essential oil-cyclodextrin complexes: an updated review, *Journal of Inclusion Phenomena and Macrocyclic Chemistry*, 2017, 89(1):39-58

⁶ <https://www.drugs.com/vet/camphor-injection-can.html>

⁷ E. Mocé and J. K. Graham, Cholesterol-loaded cyclodextrins added to fresh bull ejaculates improve sperm cryosurvival, *Journal of Animal Sciences*, 2005, 84(4):826-833

⁸ Chuaychu-Noo N et al., Supplementing rooster sperm with Cholesterol-Loaded-Cyclodextrin improves fertility after cryopreservation, *Cryobiology*, 2017, 74:8-12

⁹ Moraes EA et al., Cholesterol-loaded-cyclodextrin improves the quality of stallion spermatozoa after cryopreservation, *Animal Reproduction Science*, 2015, 158:19-24

¹⁰ Rajaraman B et al., Effects of caprylic acid and β -cyclodextrin complexes on digestibility, energy balance, and methane production in Korean Hanwoo heifers, *Animal Feed Science and Technology*, 2017, 234:72-77

Company contacts:

CycloLab Cyclodextrin Research & Development Laboratory Ltd.

Budapest, P.O. Box 435, H-1525 Hungary

Location: Illatos út 7., Budapest, H-1097 Hungary

TEL: (+36) 1-347-60-70;

FAX: (+36) 1-347-60-68

E-mail: info@cyclolab.hu; Homepage: <http://cyclolab.hu/>



**Contact person:
Tamas Sohajda**

R&D Director

info@cyclolab.hu

Tel: (+36) 1-347-60-72