



*The Cyclodextrin Company*



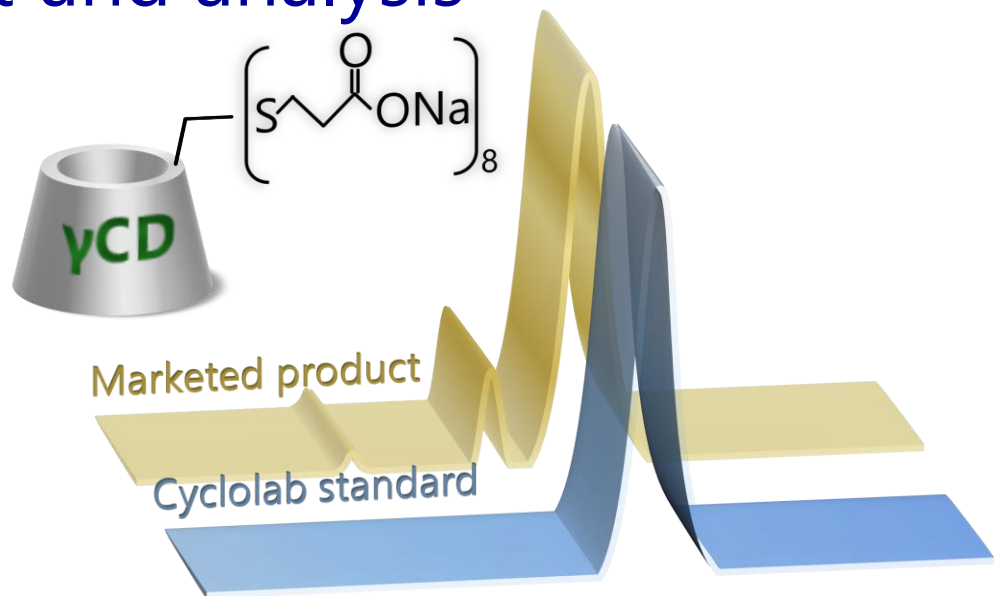
# Sugammadex

Contract services: synthesis, process and formulation development and analysis

Standards:

process intermediates

process impurities





# Sugammadex

Sugammadex is one of the greatest successes in the history of cyclodextrins. There is an increasing interest for this product and for the development of Sugammadex since the recent approval by the FDA resulted in a 3-4-fold increase in the global sales of the product.

CycloLab has vast experience in the production of Per-6-halogen-gamma-CD intermediates and have performed developed Sugammadex via various process routes and related compounds, supported by sensitive analytical tools to characterize the products.



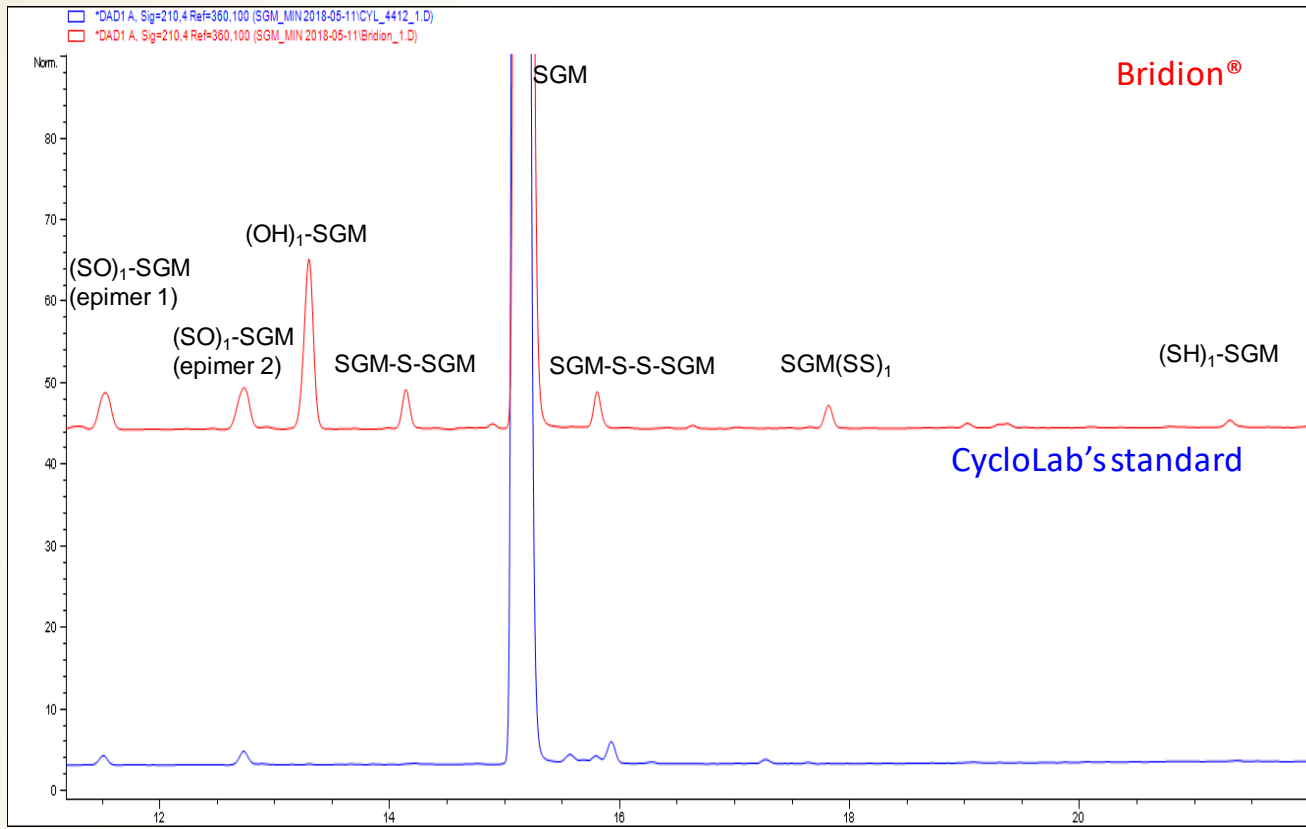
# What does CycloLab offer?

- Supplying the key intermediates (Per-6-halogen-gamma-CDs) for the synthesis of the API (on commercial scale)
- Assisting in the optimization of the API production (from chemical and purification perspectives)
- Comparing samples (both API and final formulations) using sensitive analytical methods (capable of separating 20-30 potential impurities in the API)
- Providing high purity standards (intermediates, Sugammadex, key process impurities) to quantify the true and accurate purity of the compounds
- Providing formulation development and analytical services for the final product



# Technology and analysis

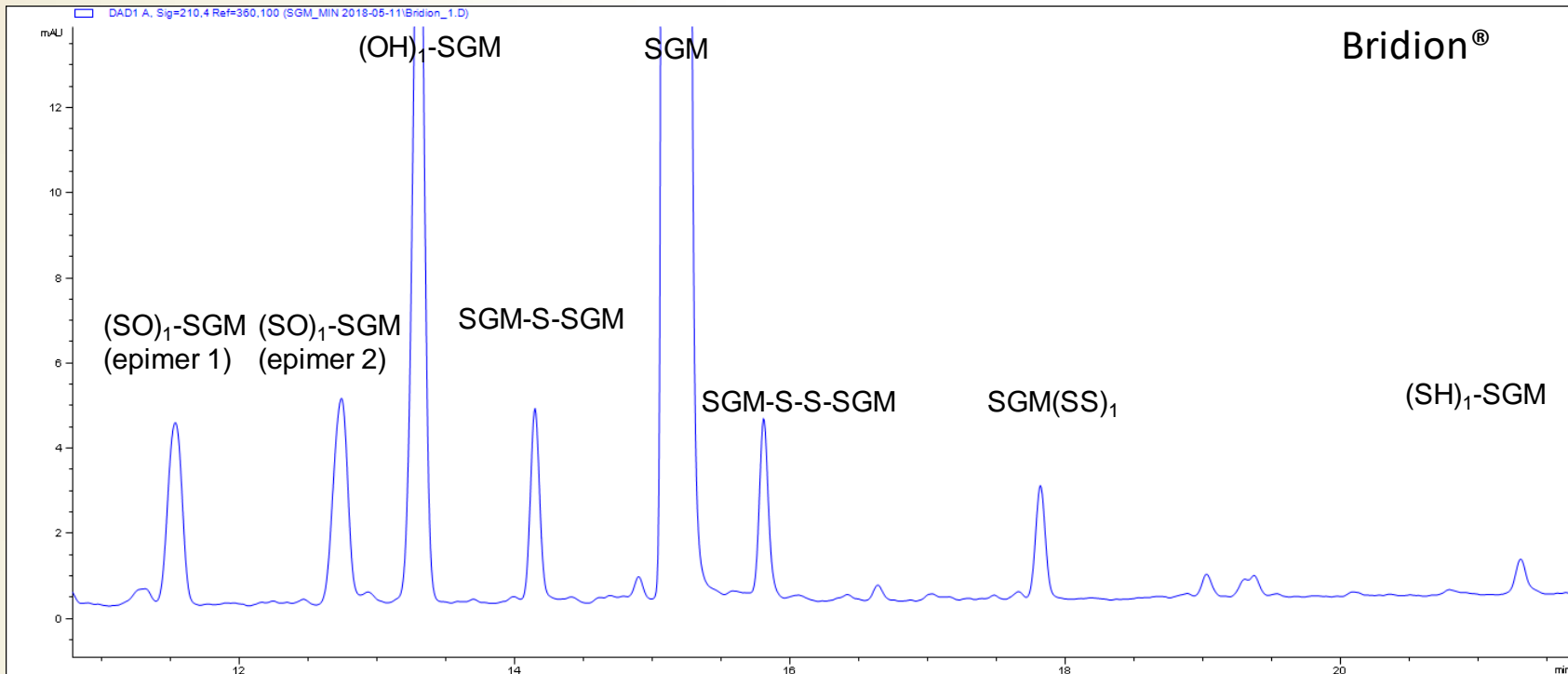
Using Cyclolab's technology, a standard material with exceptional quality outperforming the originator's in all aspects can be achieved.





# Technology and analysis

Bridion itself is claimed to potentially contain 14 cyclodextrin related impurities (public regulatory information), while other synthetic approaches generate just as many different ones. The accurate analysis of such an API is not possible without proper methods and standard materials.



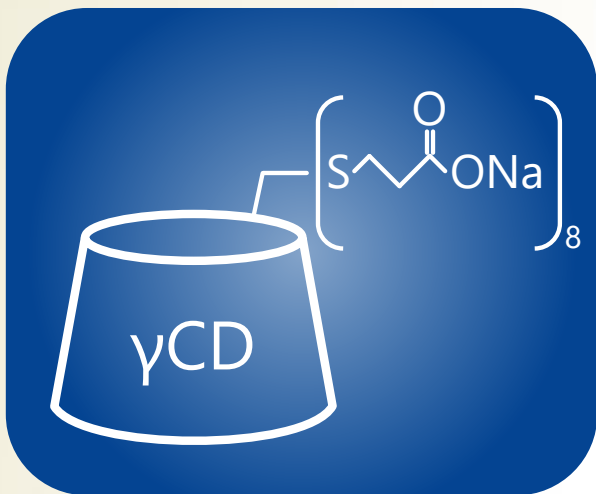


# Raw material and product standards



Gamma-cyclodextrin Working Standard:

- Declaration by CycloLab

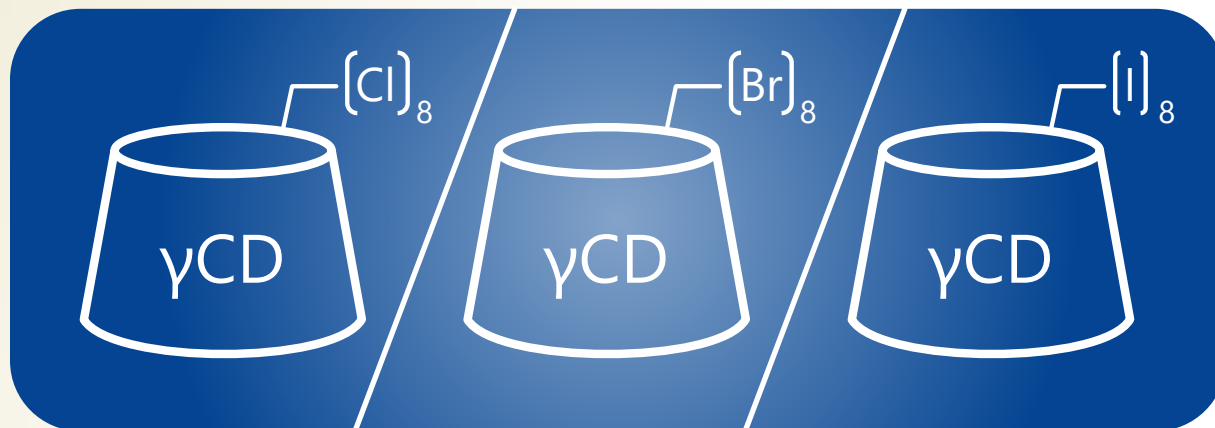


Sugammadex Primary reference standard:

- >99.0% purity (on dry substance)
- Identification by NMR, IR, HPLC and HPLC-MS



# Process intermediate standards



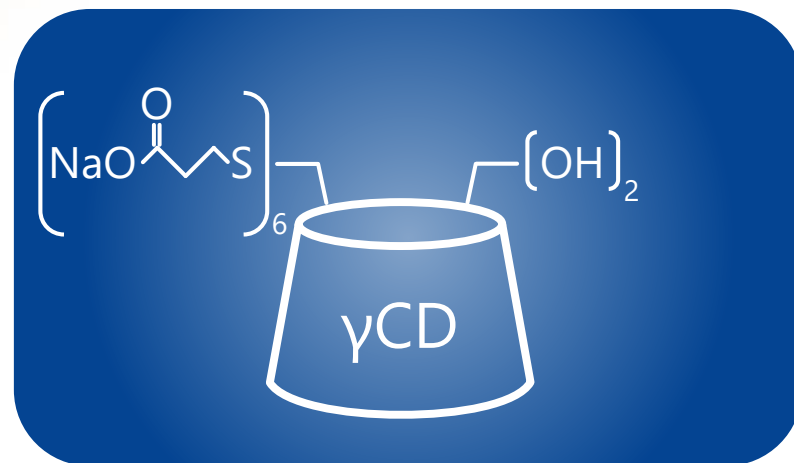
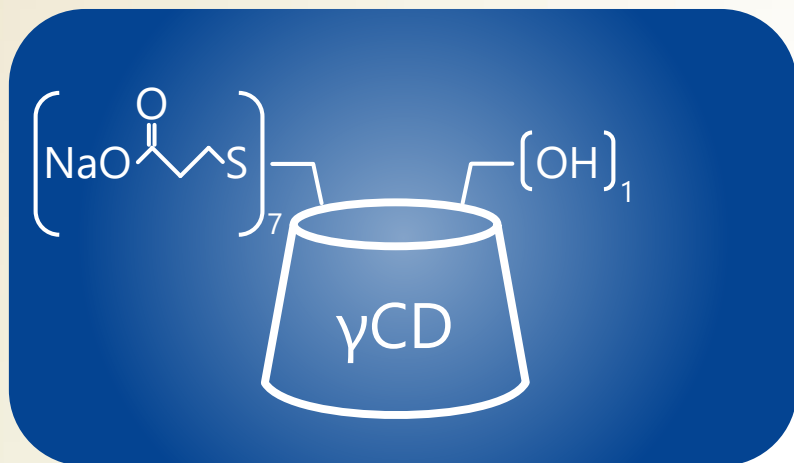
Per-6-halogen-gamma-cyclodextrin primary standards:

- Available for any chosen synthetic route (chloro-, bromo- or iodo derivative)
- >90% content
- Identification by NMR, IR

Main impurities (as Mono-OH-perhalogen-GCDs) are also available as impurity enriched materials



# Process impurities regularly on stock



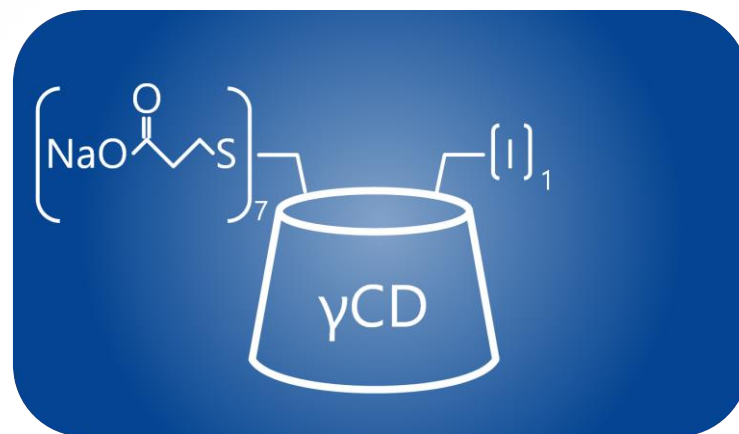
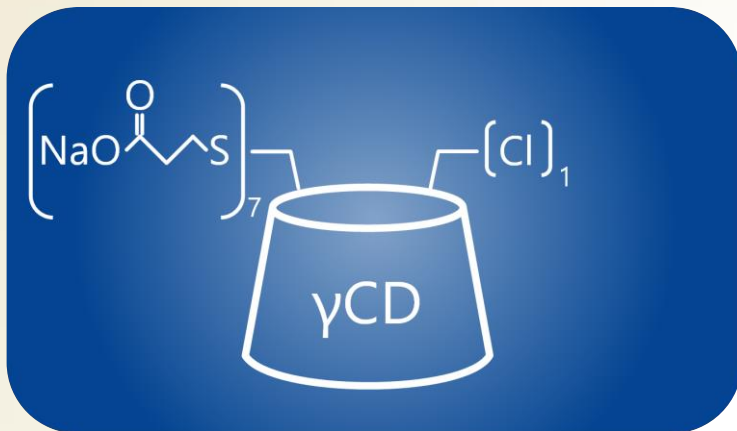
Mono-OH- and Di-OH-Sugammadex:

- >95% (Area %) with proprietary HPLC method, DAD detection, peak purity proven by LC-MS
- Identification by NMR, IR, HPLC-MS
- Residual solvents by TGM-MS and residual salts by CE





# Process impurities regularly on stock

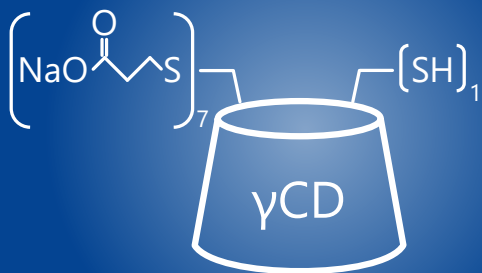


## Mono-halogen-Sugammadex:

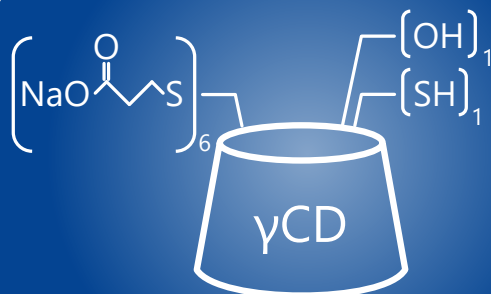
- Available for various synthetic routes
- Minimum >85% (Area %) with proprietary HPLC method, DAD detection, peak purity proven by LC-MS
- Identification by NMR, IR, HPLC-MS
- Residual solvents by TGM-MS and residual salts by CE



# Process impurities regularly on stock



Mono-thio-Sugammadex



Mono-thio-mono-OH-Sugammadex



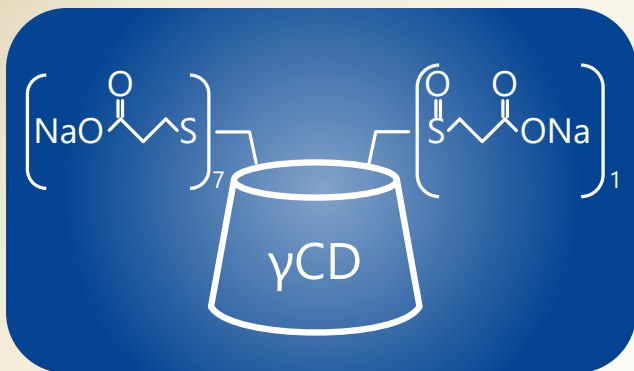
Mono-disulfide-Sugammadex

## Typical analysis:

- Minimum >80% (Area %) with proprietary HPLC method, DAD detection, peak purity proven by LC-MS
- Identification by NMR, IR, HPLC-MS
- Residual solvents by TGM-MS and residual salts by CE

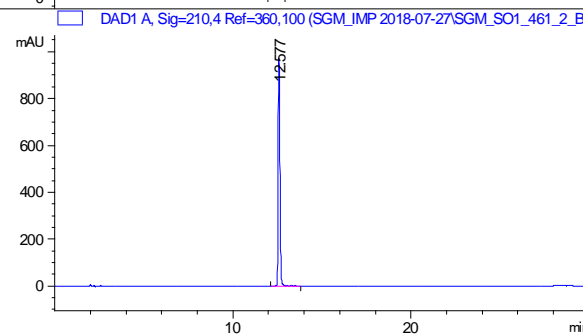
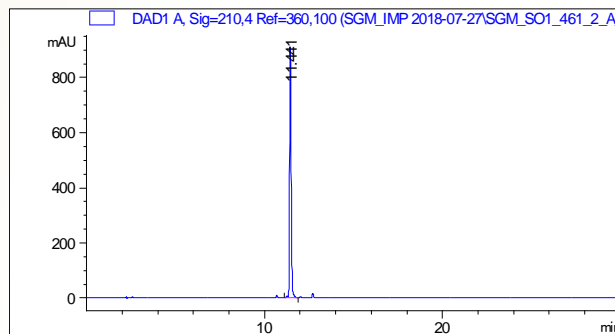
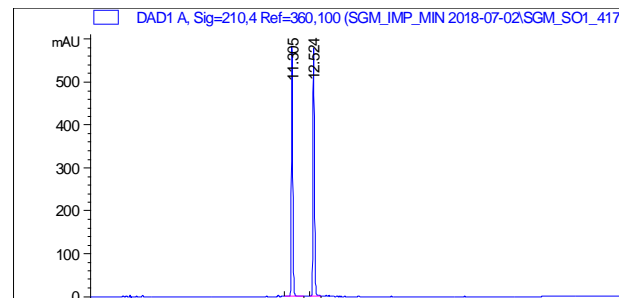


# Process impurities regularly on stock



Mono-sulfoxide-Sugammadex

This compound is a mixture of two epimers. With our purification method these epimers were separated. The epimer mixture and the separate epimers are commercial available.

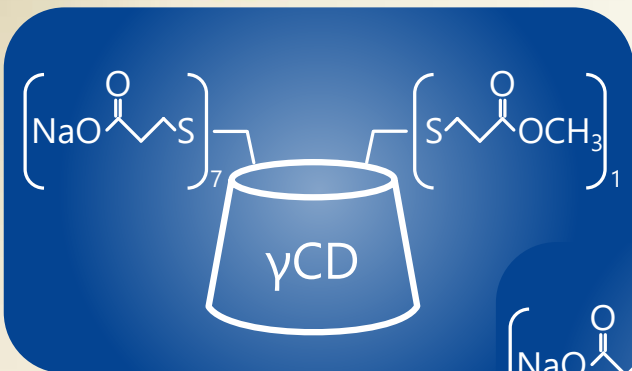


## Typical analysis:

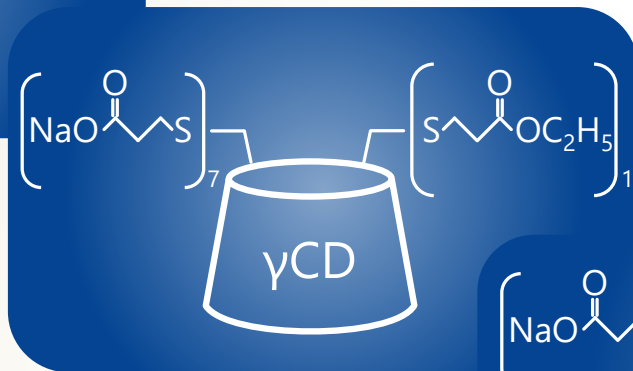
- Minimum >90% (Area %) with proprietary HPLC method, DAD detection, peak purity proven by LC-MS
- Identification by NMR, IR, HPLC-MS
- Residual solvents by TGM-MS and residual salts by CE



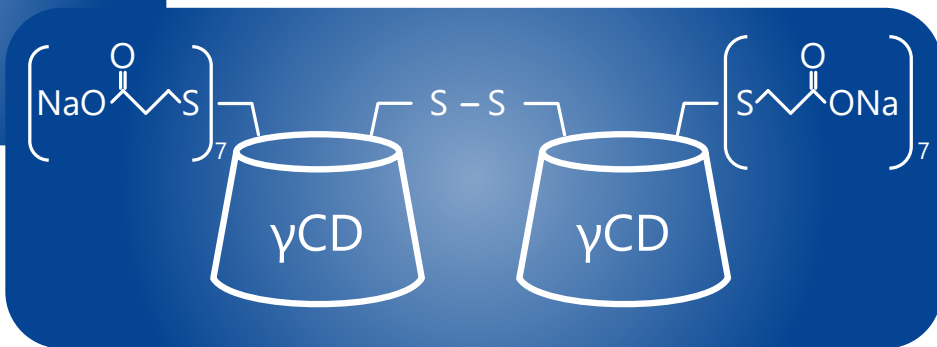
# Process impurities regularly on stock



Mono-methylester-Sugammadex



Mono-ethylester-Sugammadex



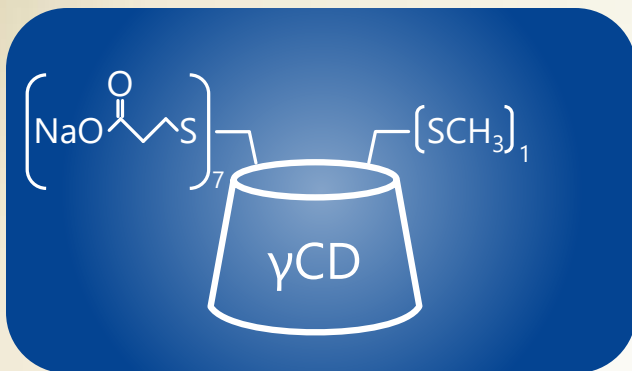
Disulfide-Sugammadex-dimer

## Typical analysis:

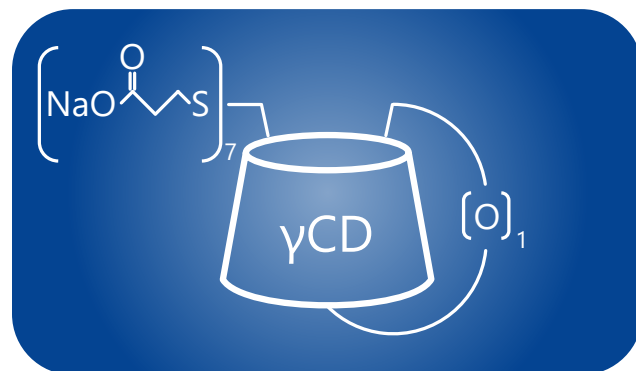
- >90% (Area %) with proprietary HPLC method, DAD detection, peak purity proven by LC-MS
- Identification by NMR, IR, HPLC-MS
- Residual solvents by TGM-MS and residual salts by CE



# Process impurities regularly on stock



Mono-methylthio-Sugammadex



Mono-anhydro-Sugammadex

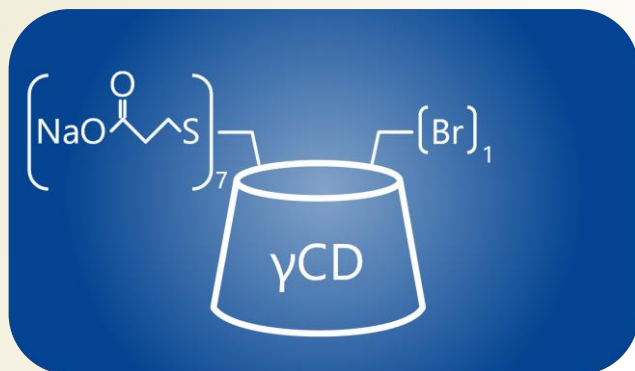
## Typical analysis:

- >90% (Area %) with proprietary HPLC method, DAD detection, peak purity proven by LC-MS
- Identification by NMR, IR, HPLC-MS
- Residual solvents by TGM-MS and residual salts by CE

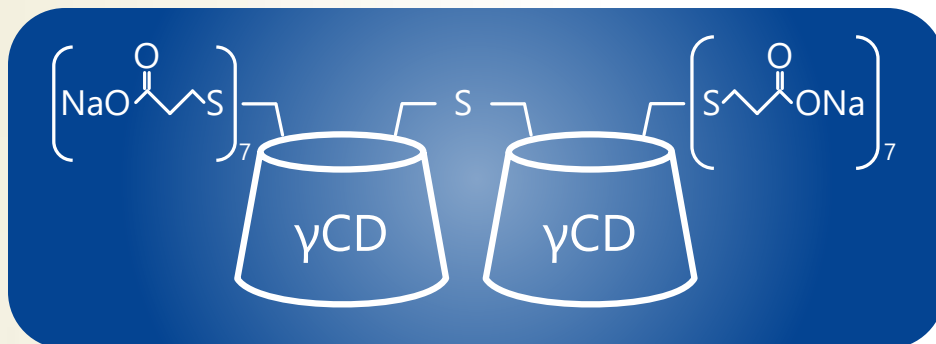


# Process impurities under development

Contact us for any other impurities you identified in your generic Sugammadex!



Mono-bromo-Sugammadex



Monosulfide-Sugammadex-dimer



# Sugammadex

## Company contacts:

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**CD „Octopus”**