



**Nanostructured lipid-based liquid  
crystalline systems for controlled release  
of drug substances**

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**[www.camurus.com](http://www.camurus.com)**

# Topics

- **Brief company presentation**
- **Technology**
- **FluidCrystal® Injection Depot**
- **FluidCrystal® Nanoparticles**

# Camurus - Snapshot profile

- **Headquarter in Lund, Sweden – “Medicon Valley”**
- **Member of GS Development group**
- **Strong committed investor**
- **Broad late/mid stage drug product pipeline**
- **Global technology leader in lipid-based drug delivery**
- **Strategic corporate partnerships**



# Camurus - Advancing pipeline

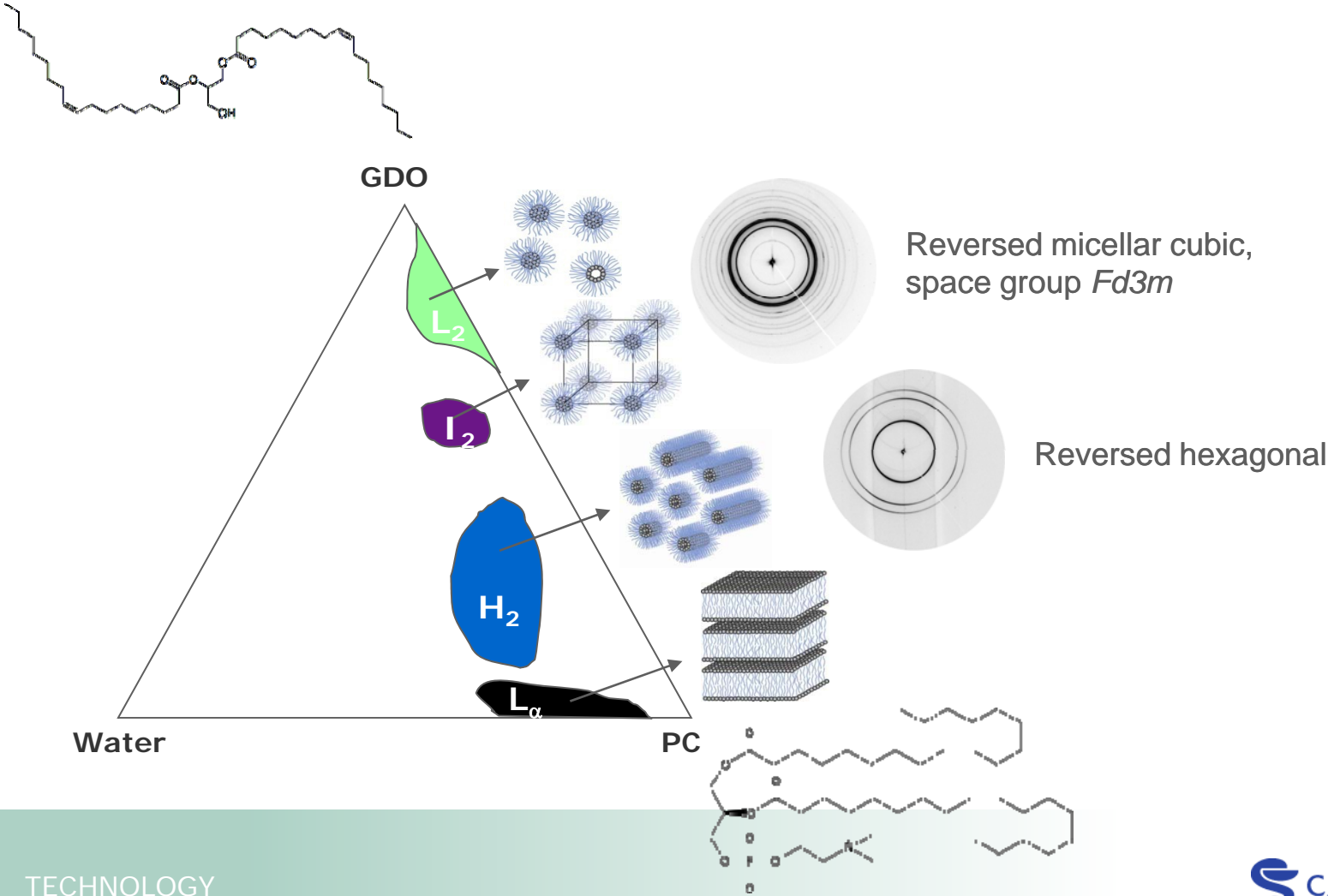
■ In-House project ■ Partner project ■ Out-licensed / divested

PRODUCTS	PRECLINICAL	PHASE I	PHASE II	PHASE III	REGISTRATION	PARTNERS
Elyzol® dental gel Parodontitis »	Out-licensed / divested					Colgate-Palmolive
Salinum® Xerostomia (dry mouth) »	Out-licensed / divested					Sinclair Pharma
Episil® (CAM2028) Oral mucositis »	In-House project					IS Pharma (EU)
Prosenze® (CAM2032) Prostate cancer »	In-House project					
CAM2029 Acromegaly, Cancer »	In-House project					
CAM2038 Drug addiction, Pain »	In-House project					
CAM2036 Diabetes type II »	In-House project					
Undisclosed products Oncology, anaesthesia, metabolic disease, pain »	Partner project					Multiple partners



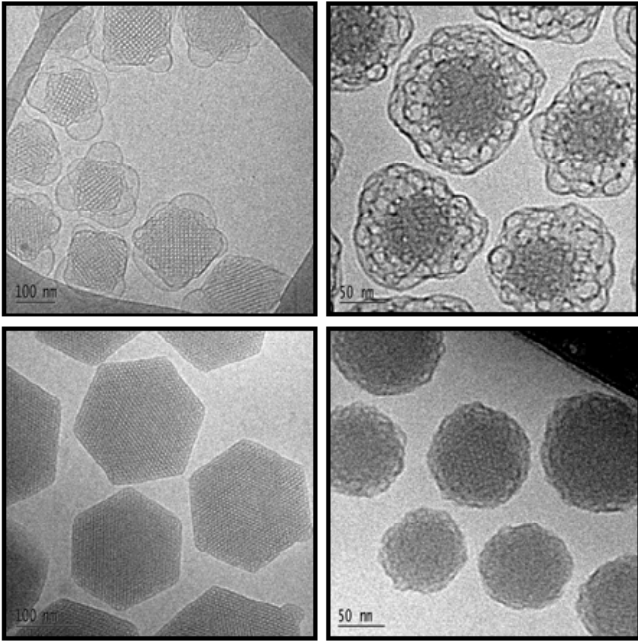
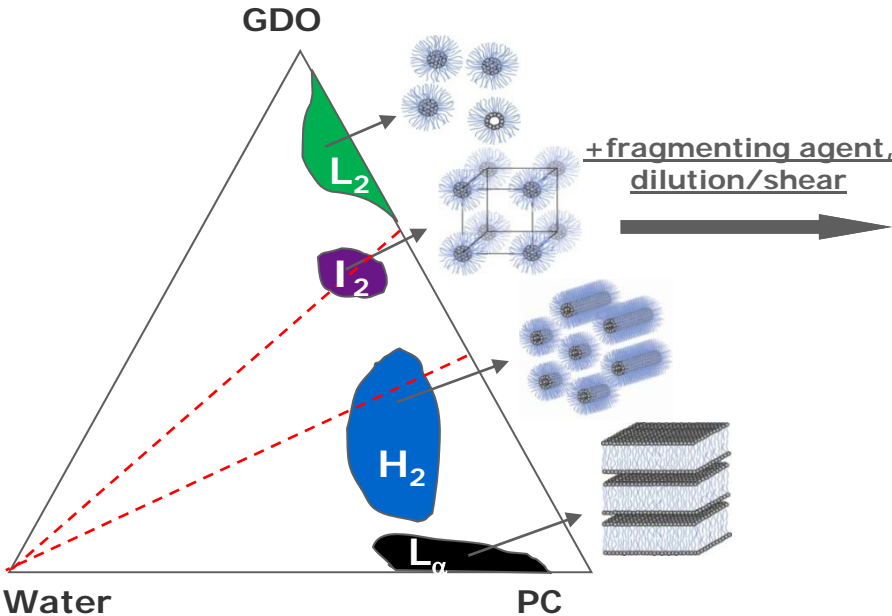
# Technology

# Controlling lipid self-assembly



# Controlling lipid self-assembly

- Nanoparticle formation – FluidCrystal® NP



Cubosome® , Flexosome® , Hexosome®

# Camurus' Drug Delivery Platforms



## **FluidCrystal®** Injection depot

The new generation parenteral depot featuring prefilled syringe compatibility



## **FluidCrystal® NP** Injection nanoparticles

High drug loads and degradation protection for parenteral drug compounds



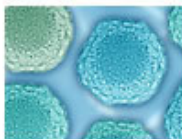
## **FluidCrystal®** Topical bioadhesive

Superior bioadhesion and sustained release for topical drug compounds



## **FluidCrystal® NP** Transdermal nanoparticles

Enhanced transdermal flux through flexible liquid crystal nanoparticles



## **FluidCrystal® NP** Oral nanoparticles

Increased bioavailability for poorly soluble and degradation sensitive drug compounds





# FluidCrystal® Injection Depot

# ***"The best dose is the one you don't give"***

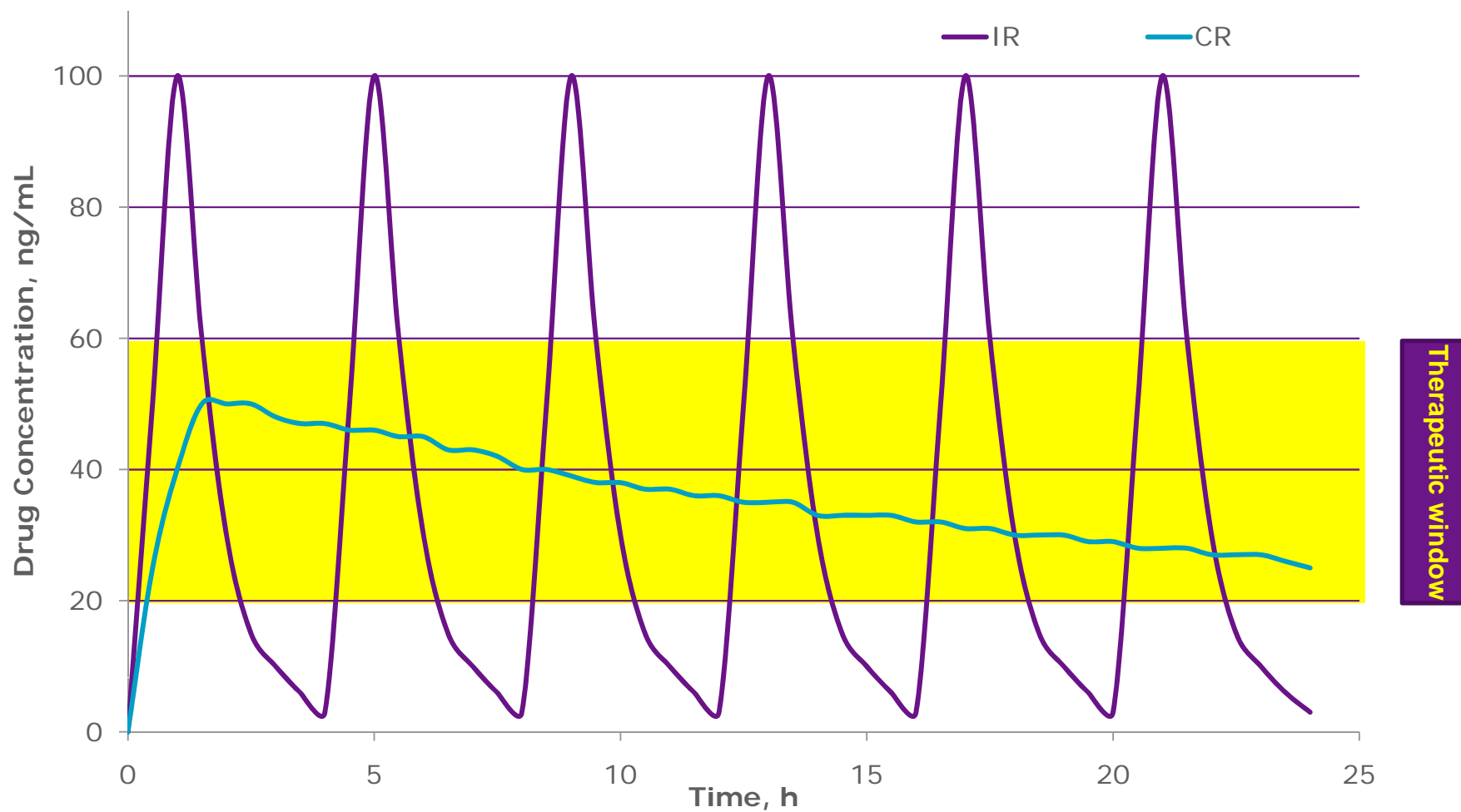
Reduced frequency of administration is vital in an increasingly competitive marketplace

- Patient convenience
- Increased adherence / compliance
- Enhanced safety profile
- Dose sparing
- Life-cycle management strategies
- Enable development & new indication



***"I stopped taking the medicine because I prefer the original disease to the side effects."***

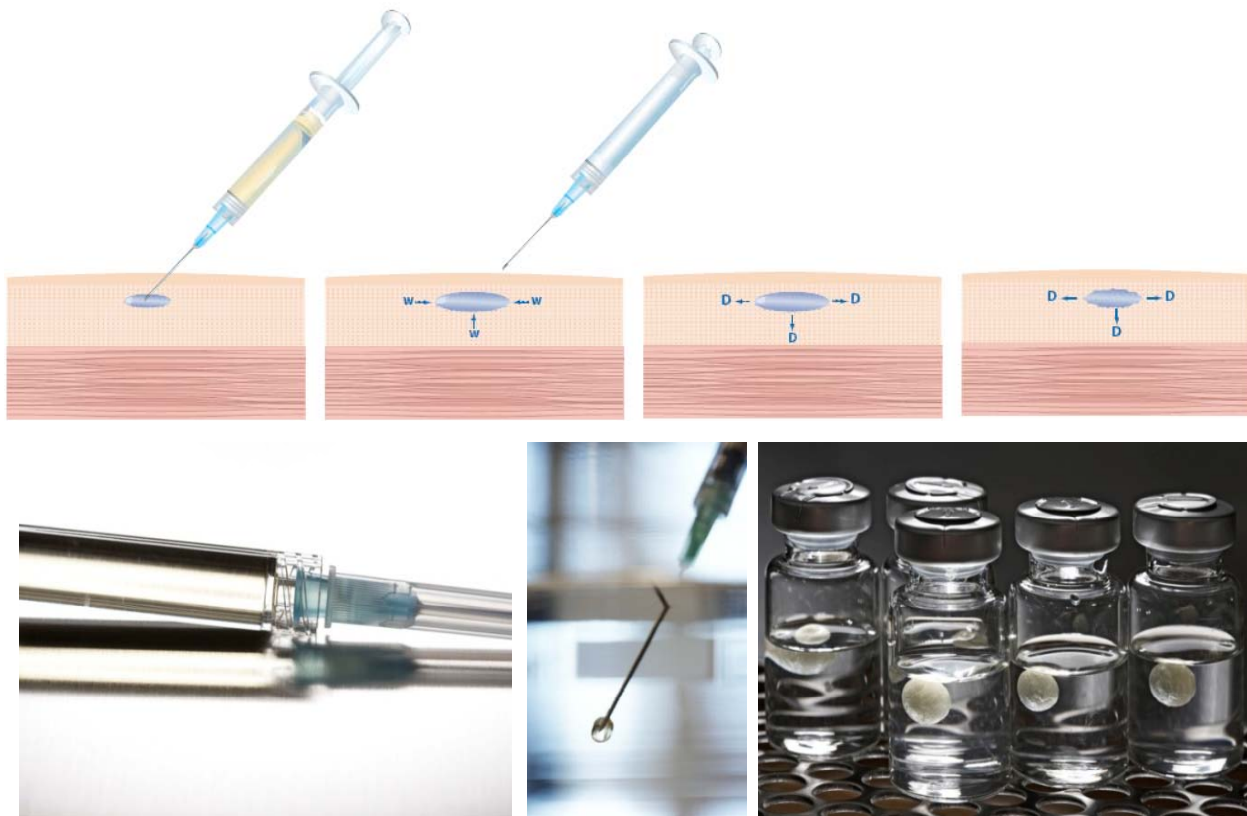
# Controlled- vs. Immediate-release



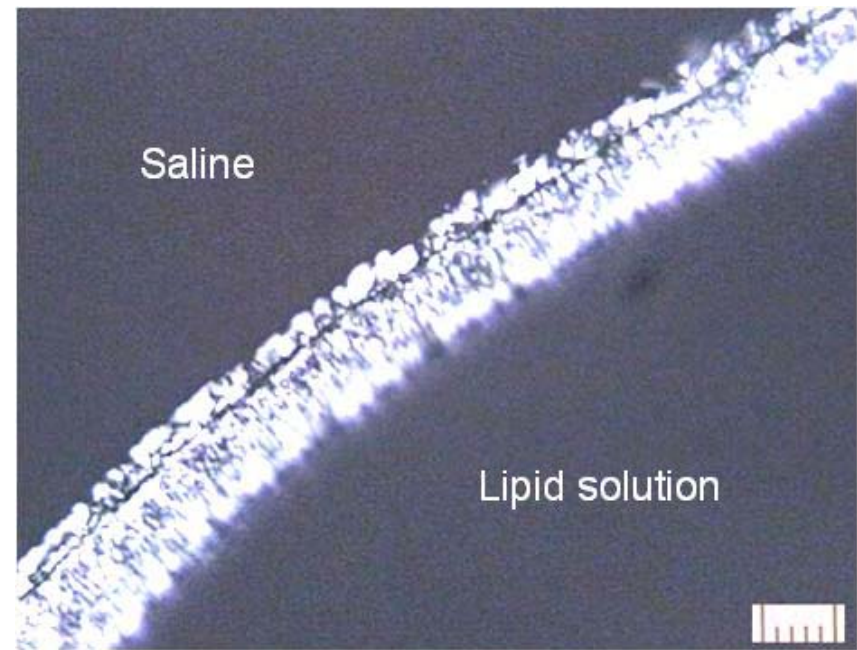
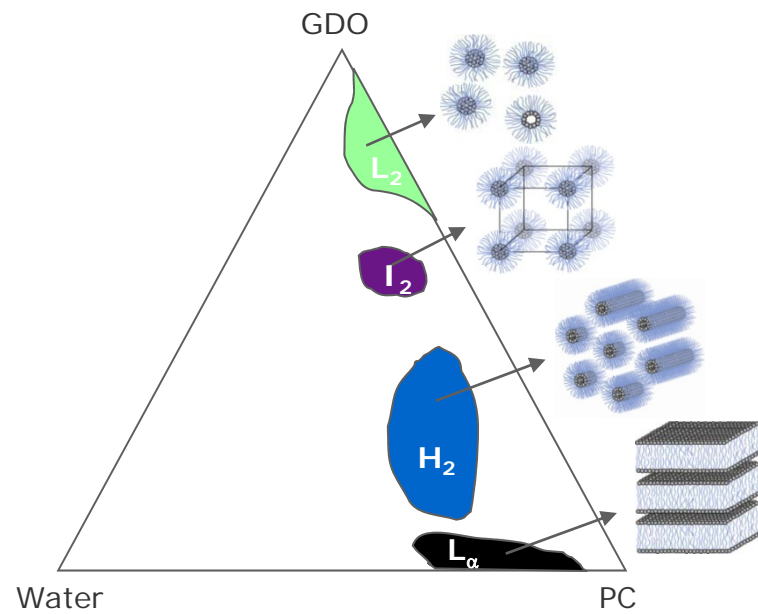
# Essential requirements

- **Compatibility with administration device/route**
- **Demonstrated safety and tolerability**
- **Demonstrated *in vivo* functionality**
- **Product storage stability**
- **Manufacturability at commercial scales**

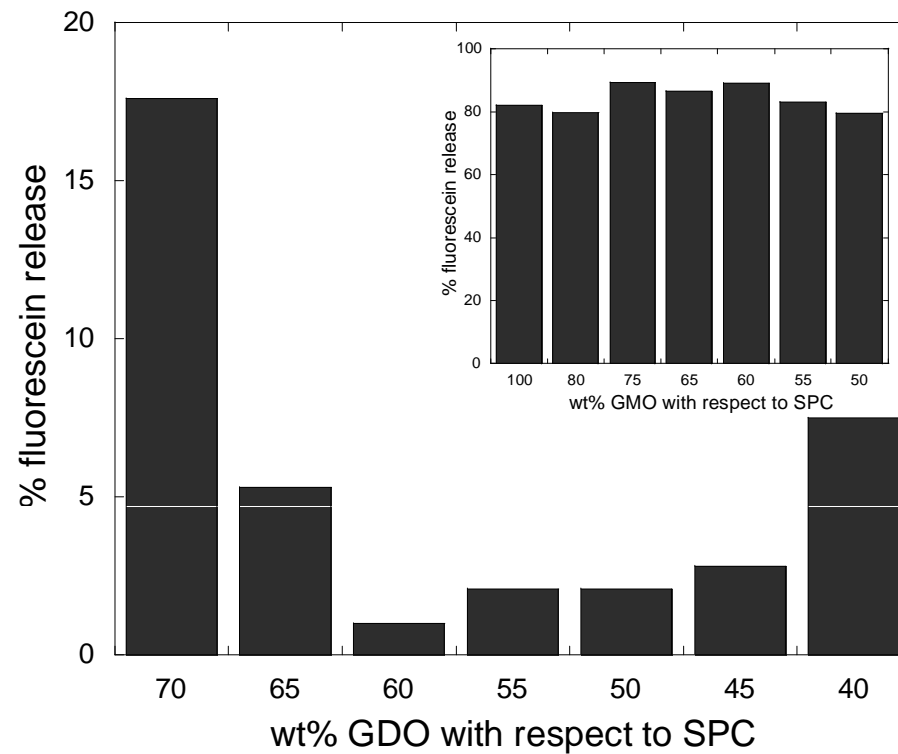
# Illustration of depot product principle



# LC phase structure vs time

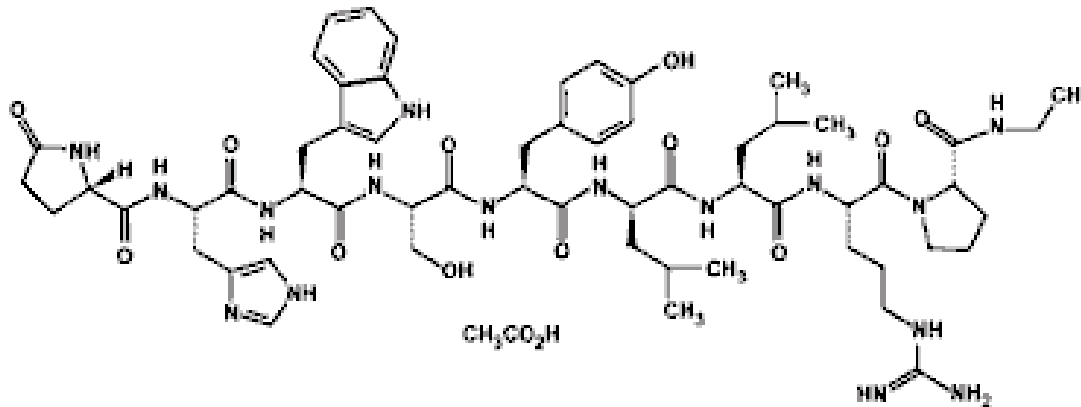


# *In vitro* release vs composition



# Leuprolide FluidCrystal®

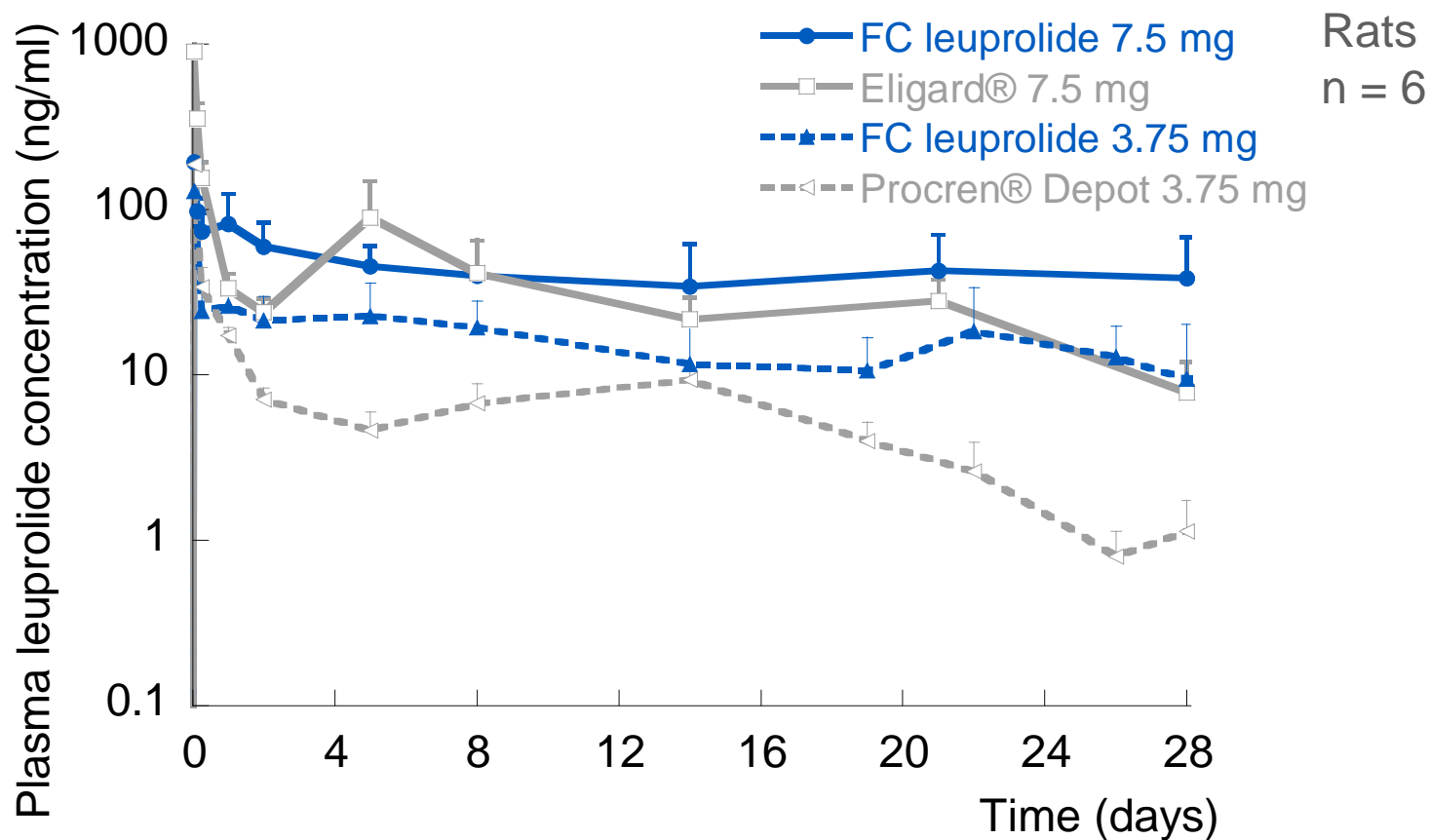
- Leuprolide: gonadorelin (LHRH) analogue, linear nonapeptide



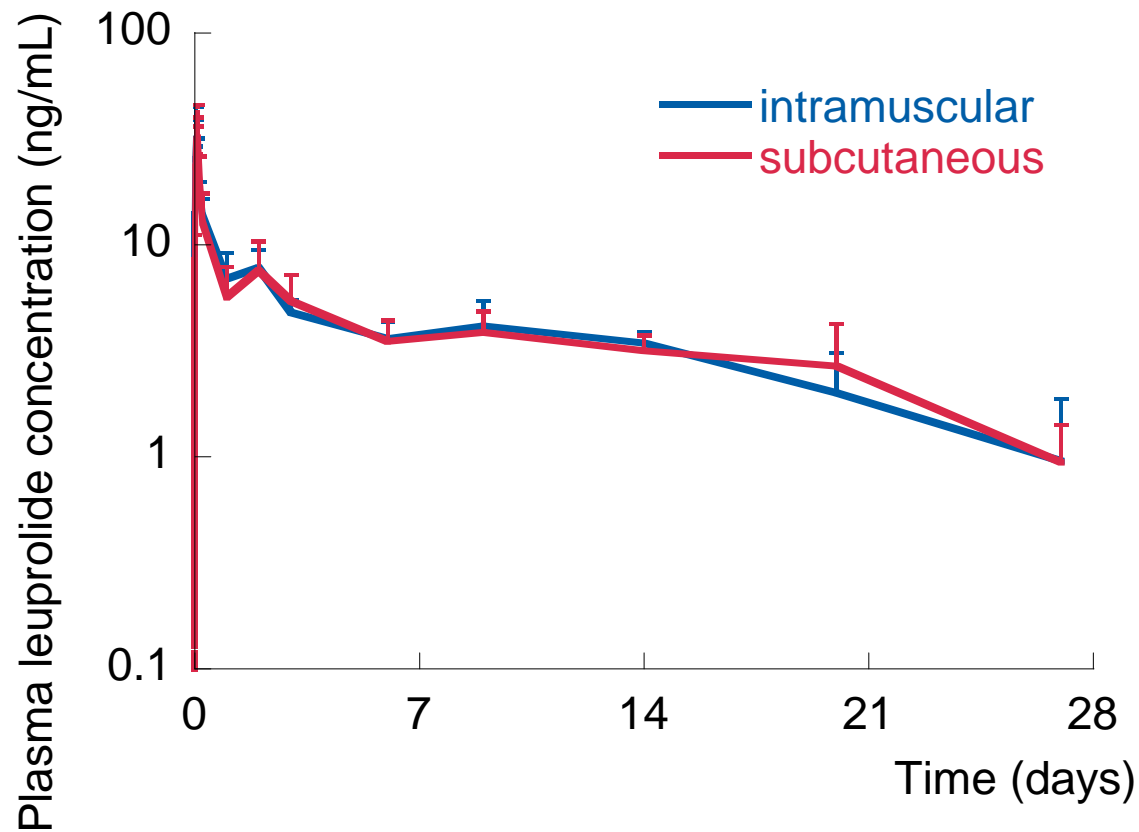
- The active ingredient in Procren® and Eligard®, approved for treatment of prostate cancer



# Leuprolide FluidCrystal®: *one month target duration* *FC leuprolide versus marketed products*

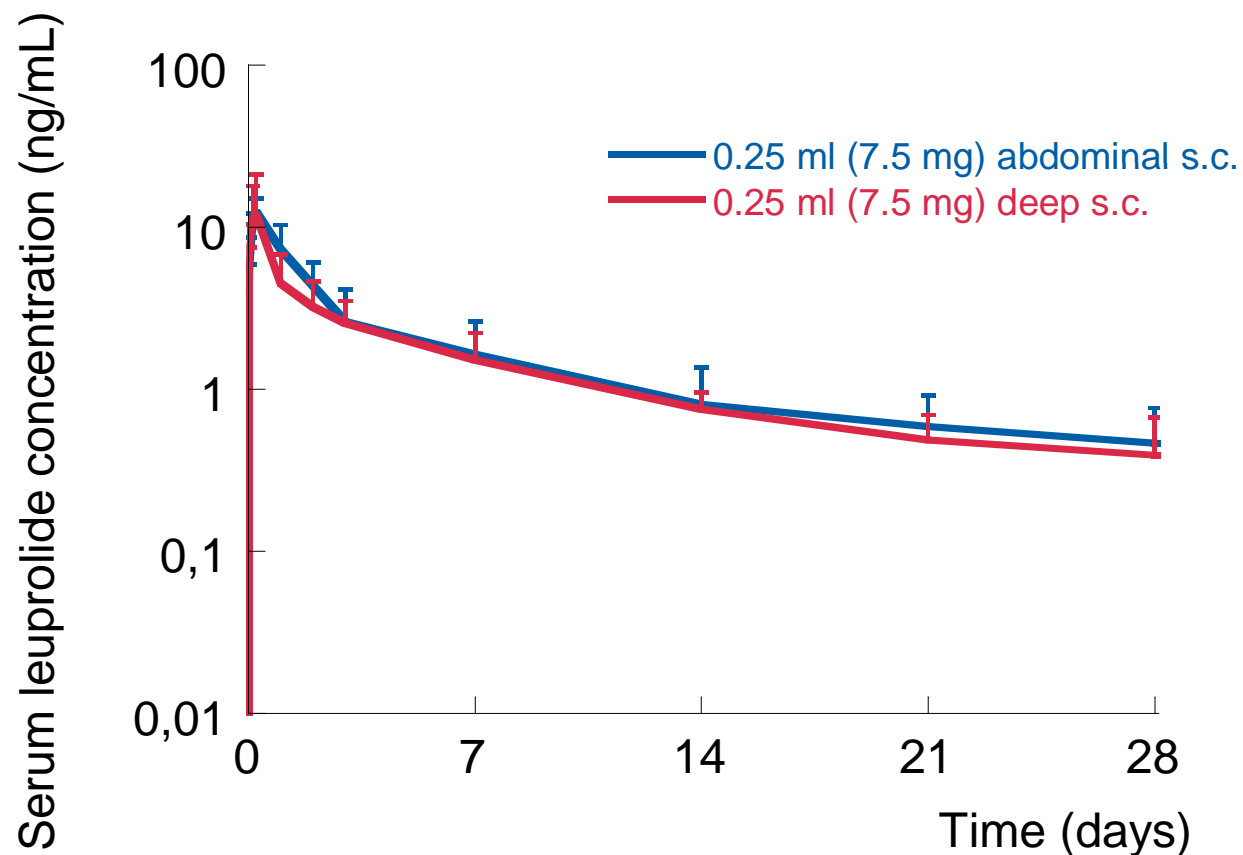


# Leuprolide FluidCrystal®: *one month target duration - s.c. versus i.m.*

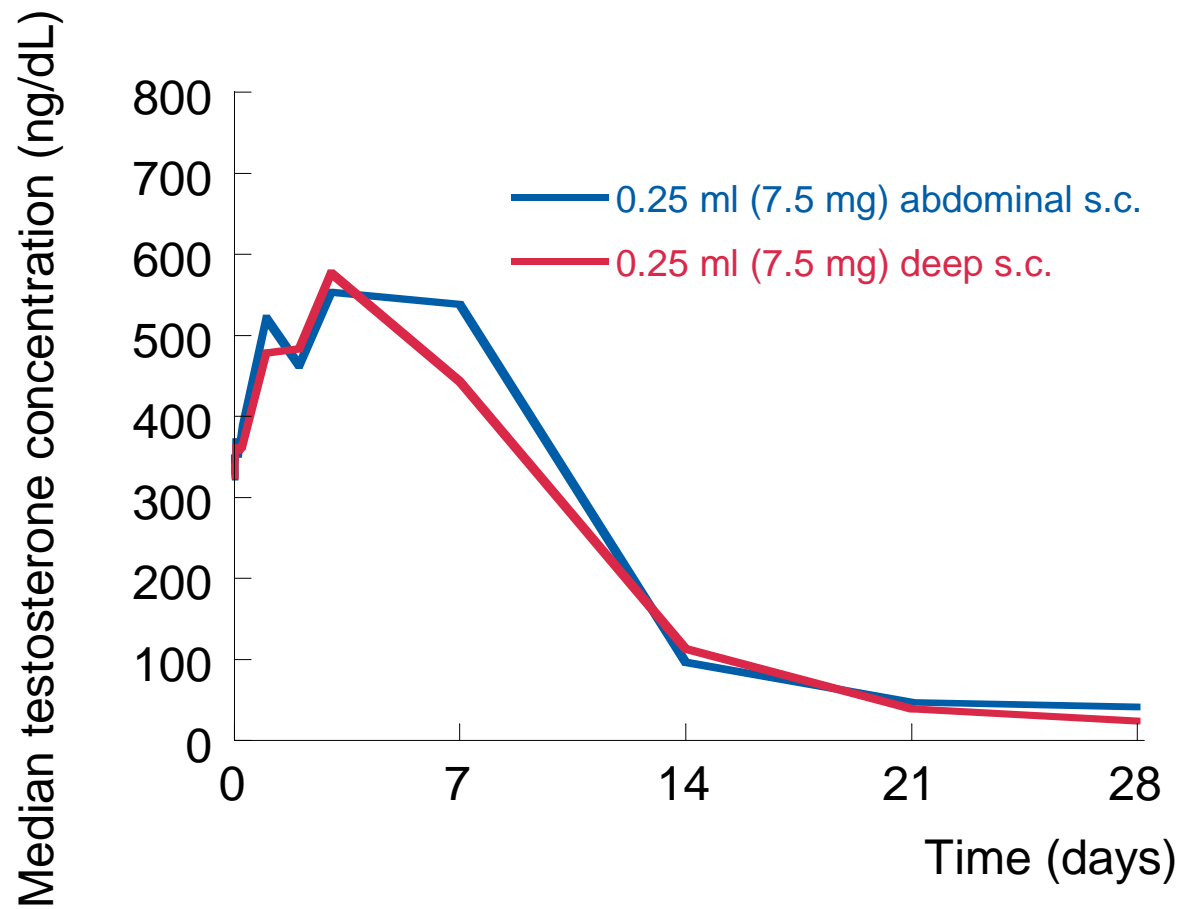


Dogs  
n = 6 (SC)  
n = 4 (IM)

# Leuprolide FluidCrystal®: Demonstrated long-term release in men



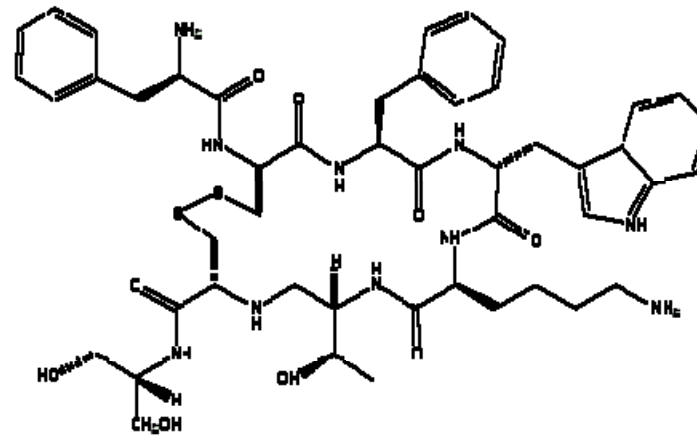
# Leuprolide FluidCrystal: Demonstrated testosterone suppression



Phase IIa data  
n/group – 6  
n=27

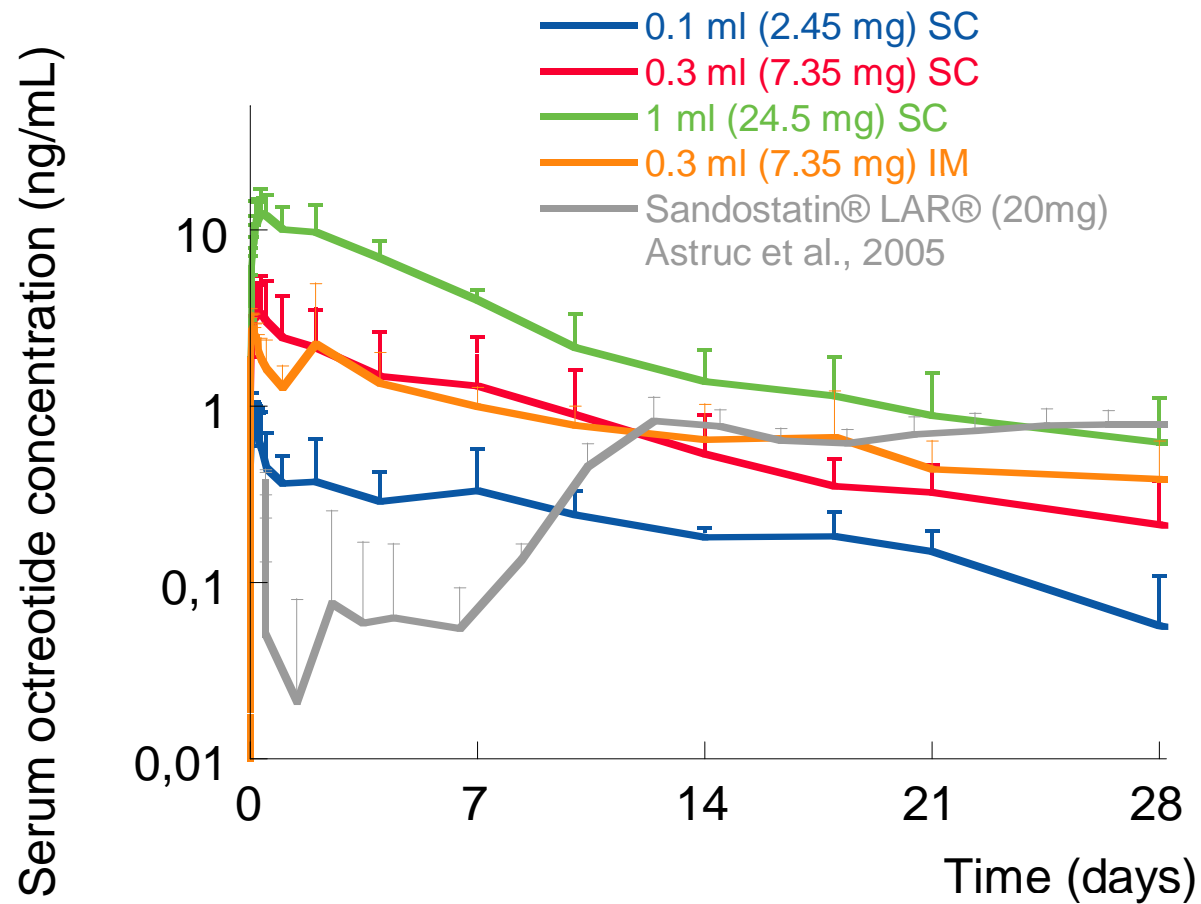
# Octreotide FluidCrystal®

- Octreotide: somatostatin analogue, cyclic octapeptide



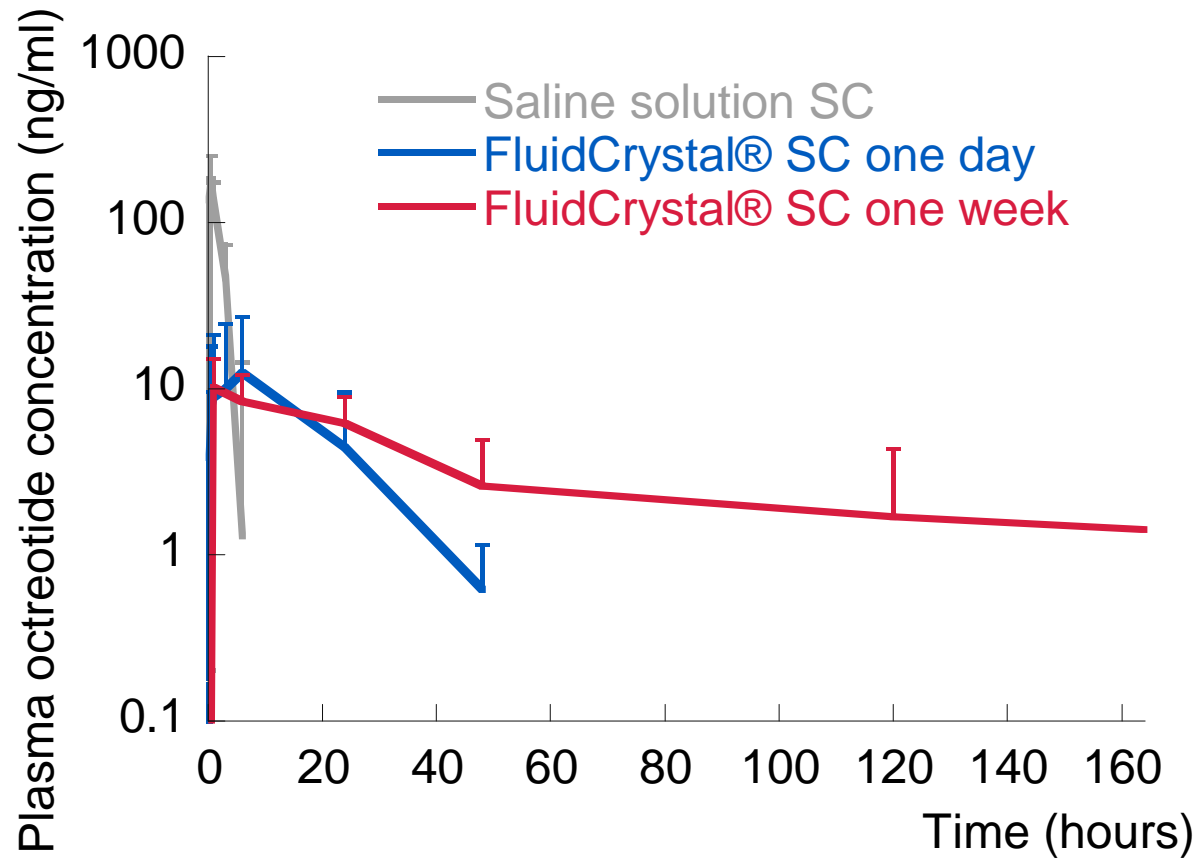
- The active ingredient in Sandostatin® and Sandostatin® LAR® (Novartis), approved for treatment of acromegaly and carcinoid syndrome

# Octreotide FluidCrystal® versus Sandostatin® LAR



# Octreotide FluidCrystal®:

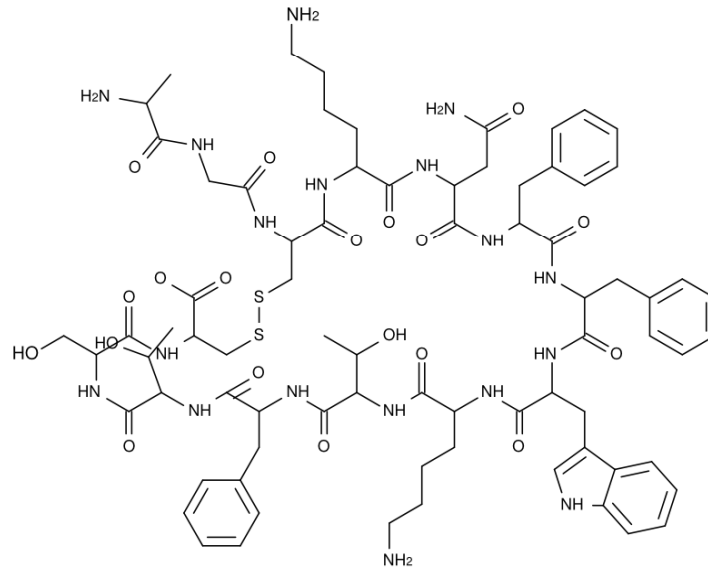
*Tuning of release duration – 24 hours vs. 1 week*



Rats  
n = 6 (SC)

# Somatostatin FluidCrystal®

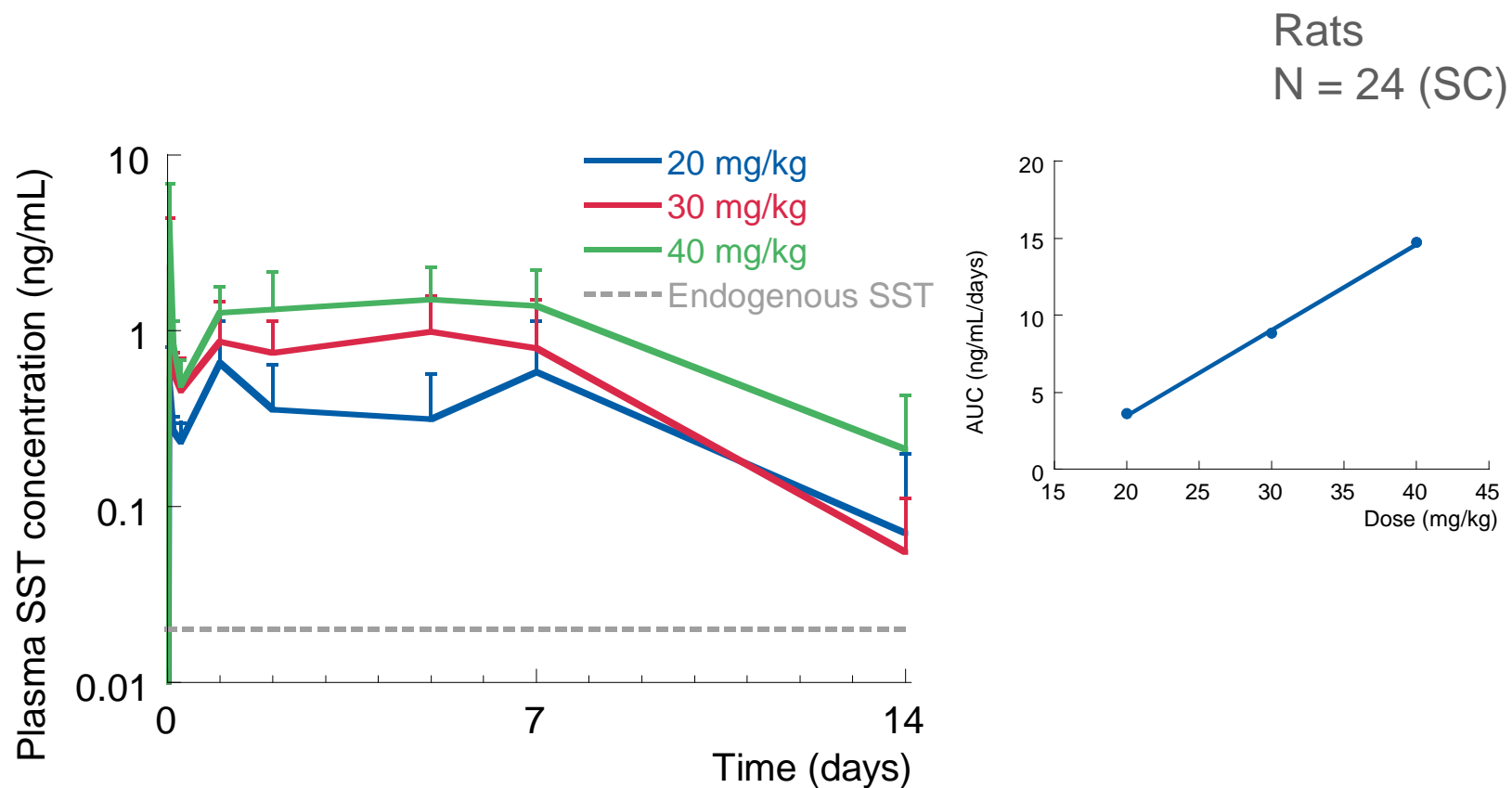
- **Somatostatin: peptide hormone (14 amino acids, cyclic) with ubiquitous distribution, regulating the endocrine system and neurotransmission**



- **Possible applications in acromegaly, Cushing's syndrome, different types of cancer, etc.**

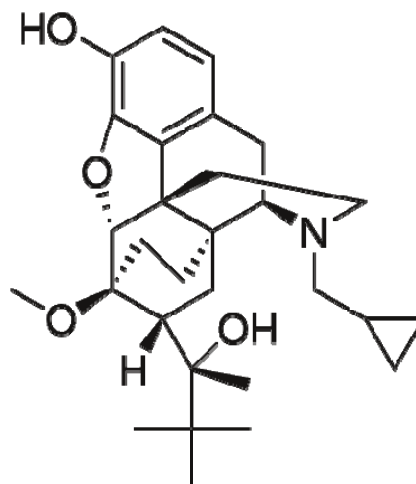


# Somatostatin (1-14) FluidCrystal®: *one week target duration*



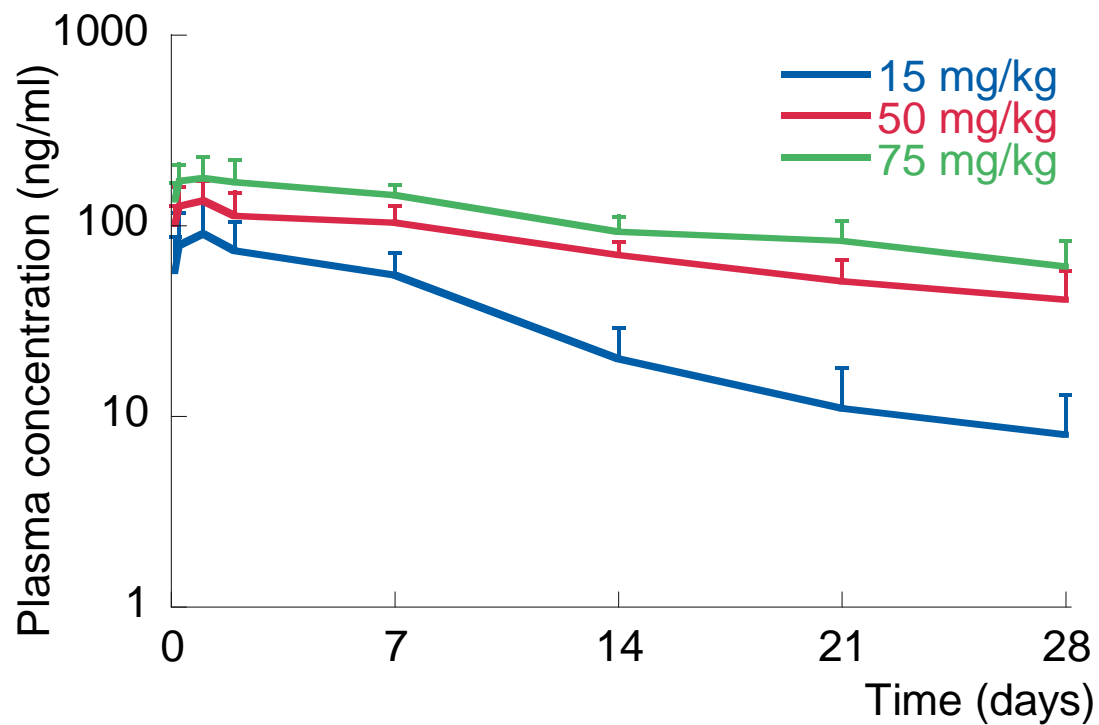
# Buprenorphine FluidCrystal®

- **Buprenorphine: partial  $\mu$ -opioid receptor agonist with a wider safety window than other opioids**



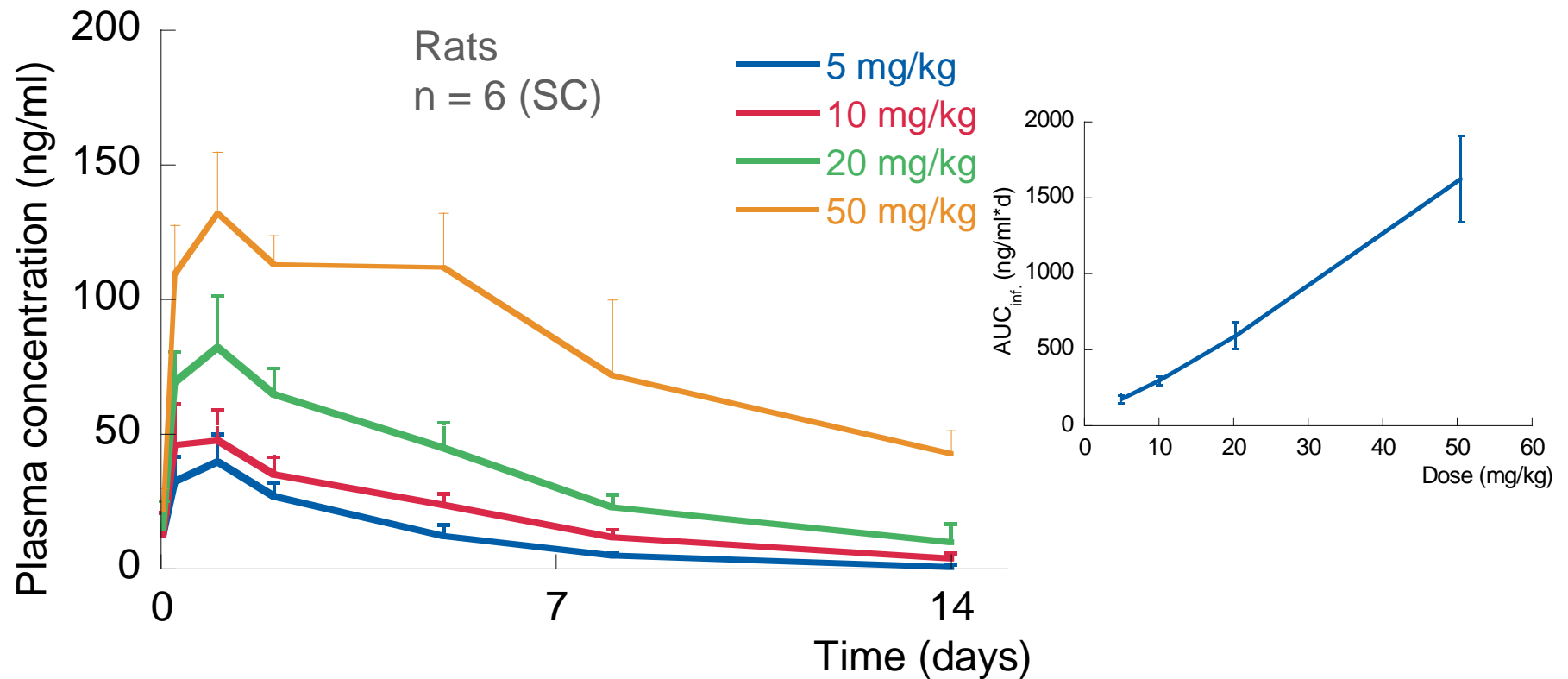
- **Existing products: sublingual tablets Subutex® and Subuxone®, and in the s.c implant Probuphine®.**
- **Approved for treatment of drug abuse and management of pain**

# Buprenorphine FluidCrystal®: *one month target duration*



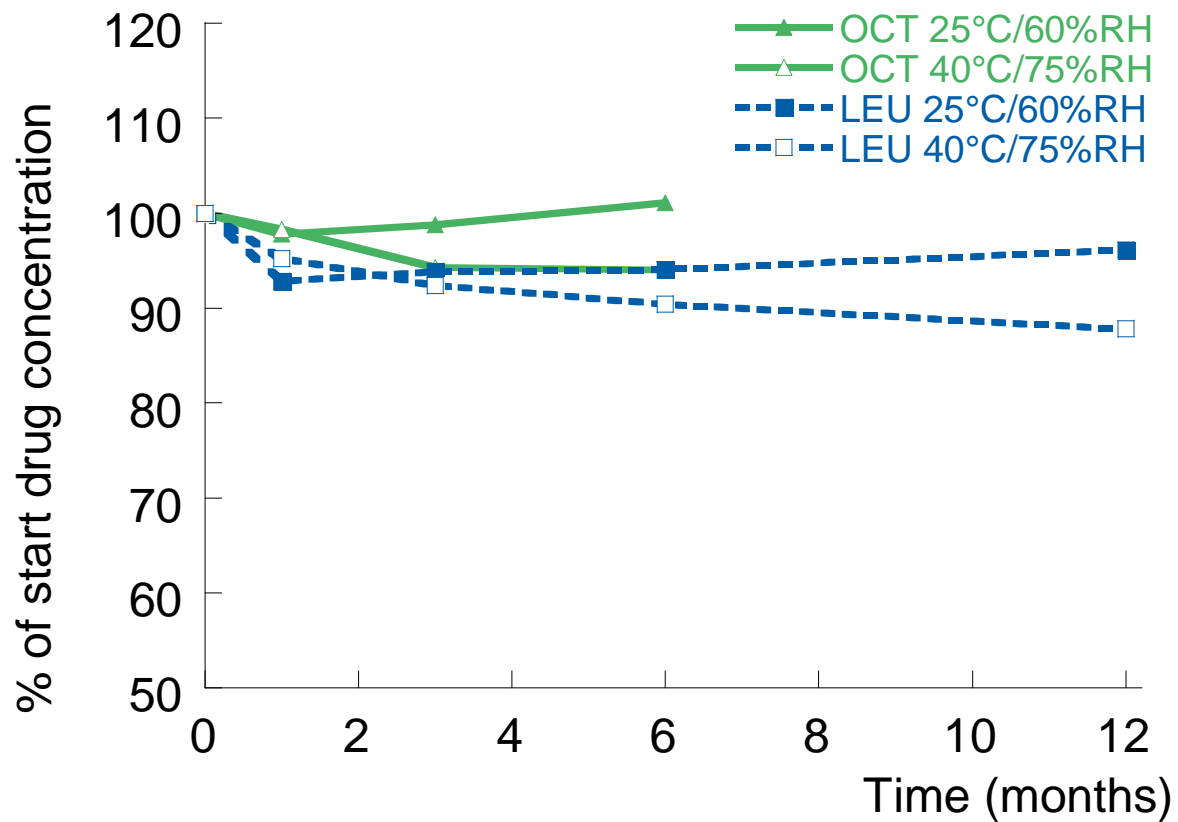
Rats  
n = 10 (SC)

# Buprenorphine FluidCrystal®: *one week target duration*



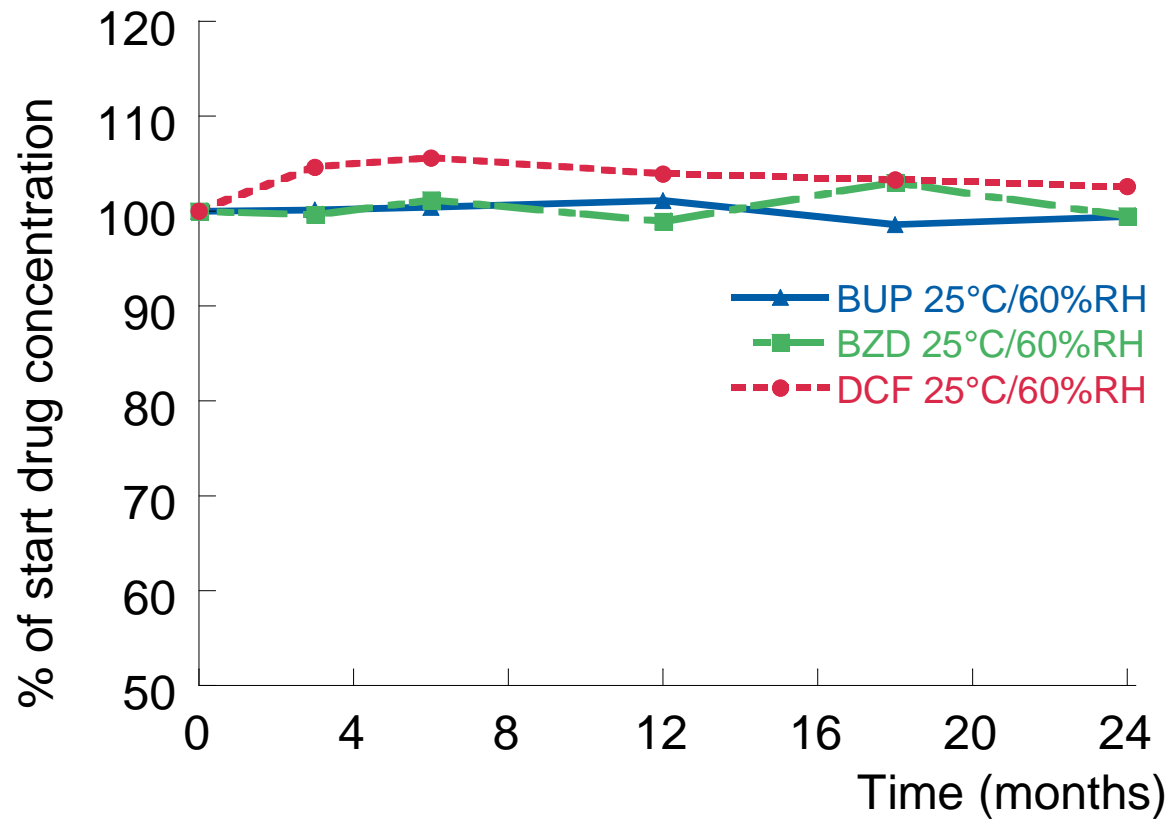
# Peptide storage stability

## *octreotide and leuprolide in prefilled syringes*



# Small molecule storage stability

*buprenorphine, benzydamine and diclofenac*



# Easy manufacturing by standard processes

## Step 1: Weighing and Mixing

- Combine API, co-solvent and lipids in a suitable mixing vessel
- Mix with a rotor mixer at ambient RT; apply nitrogen in head-space: Mixing time typically 1-8 hours



## Step 2: Sterile filtration

- Pressure-driven sterile filtration using sterile 0.2 micron filters



## Step 3: Aseptic filling

- Filling in vials, pre-filled syringes or cartridges

# FluidCrystal® Injection depot: Competitive landscape example

## *Leuprolide products*

Procren® Depot 3.75 mg  
1 mL/25G/reconstitution/s.c.



Prosenze® 7.5 mg  
0.25 mL/27G/ready-to-use/s.c.

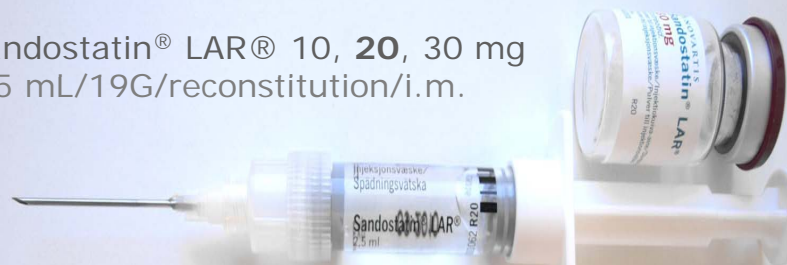


Eligard® 7.5 mg  
0.25 mL/20G/reconstitution/s.c.

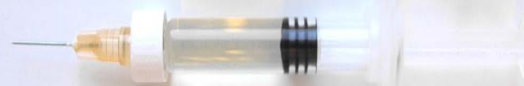


## *Octreotide products*

Sandostatin® LAR® 10, 20, 30 mg  
2.5 mL/19G/reconstitution/i.m.



CAM2029 10, 20, 30 mg  
0.33-1.0 mL/25G/ready-to-use/s.c.



Somatuline® Autogel® 60, 90, 120 mg  
0.3-0.5 mL/16G/ready-to-use/deep s.c.



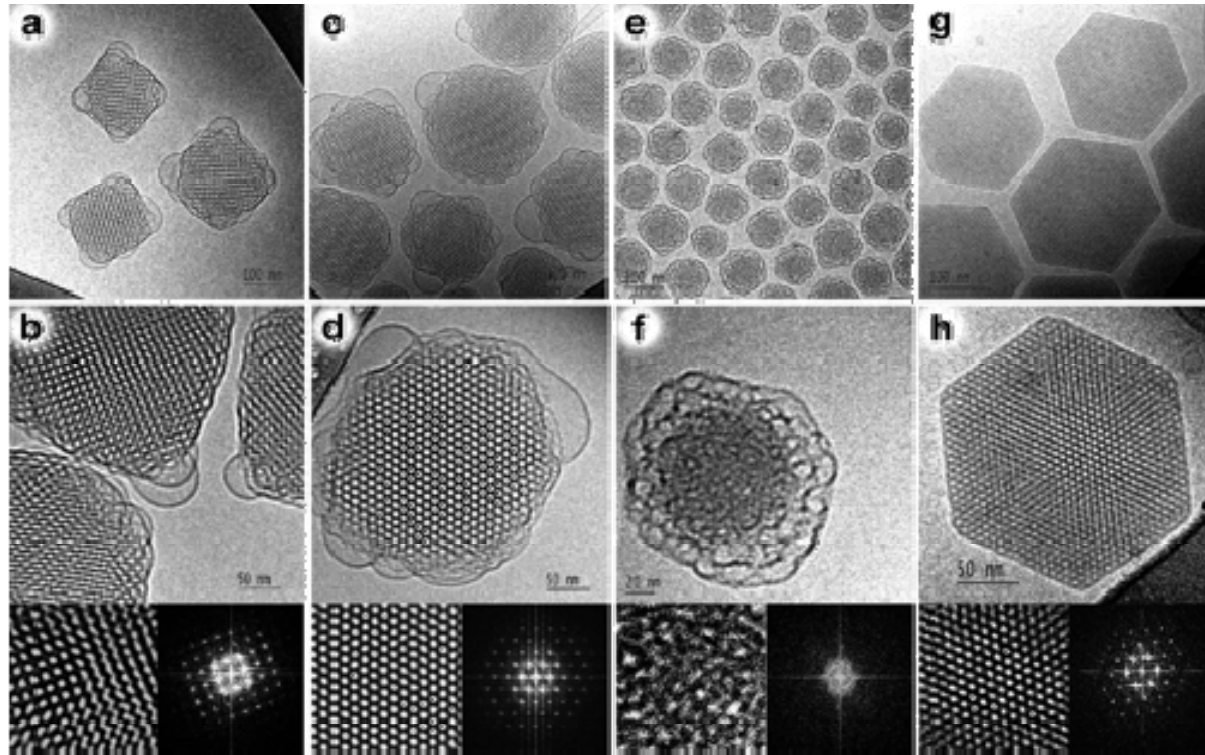


# FluidCrystal® Injection depot

## Key competitive features:

- Strong intellectual property
- True ready-to-use product design
- Easy manufacturing by standard processes
- High drug payloads, easily dose adjustable
- Subcutaneous and intramuscular administration
- Small needle size (23-27 gauge)
- Low dose dumping, consistent release
- Tuneable duration from one day to several months
- Good stability of loaded drug in the lipid matrix
- Demonstrated safety in clinical trials

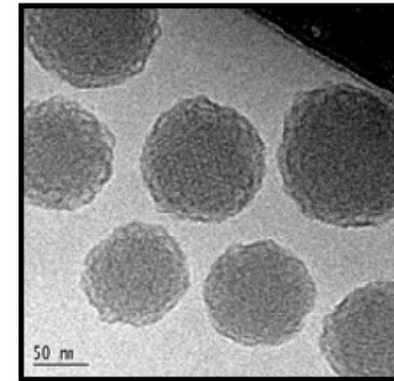
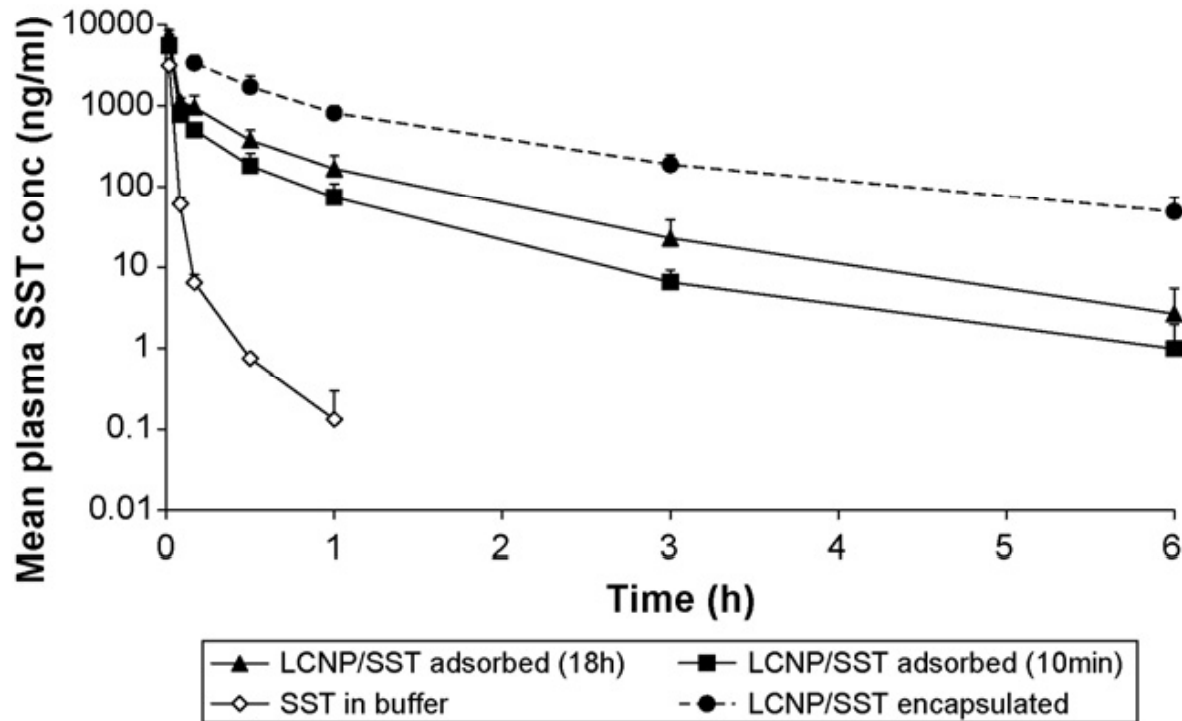
# Self-assembled lipid superstructures: Beyond emulsions and liposomes



Barauskas J, Johnsson M, Tiberg F  
NANO LETTERS , 5 (8),1615-1619 , 2005

# Extended somatostatin circulation time by association with reverse micellar cubic phase nanoparticles

SPC/GDO/P80 (40/40/20 w/w)



Cervin C, Vandoolaeghe P, et. al.  
EUROPEAN JOURNAL OF  
PHARMACEUTICAL SCIENCE  
36 (4-5), 377-385, 2009



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