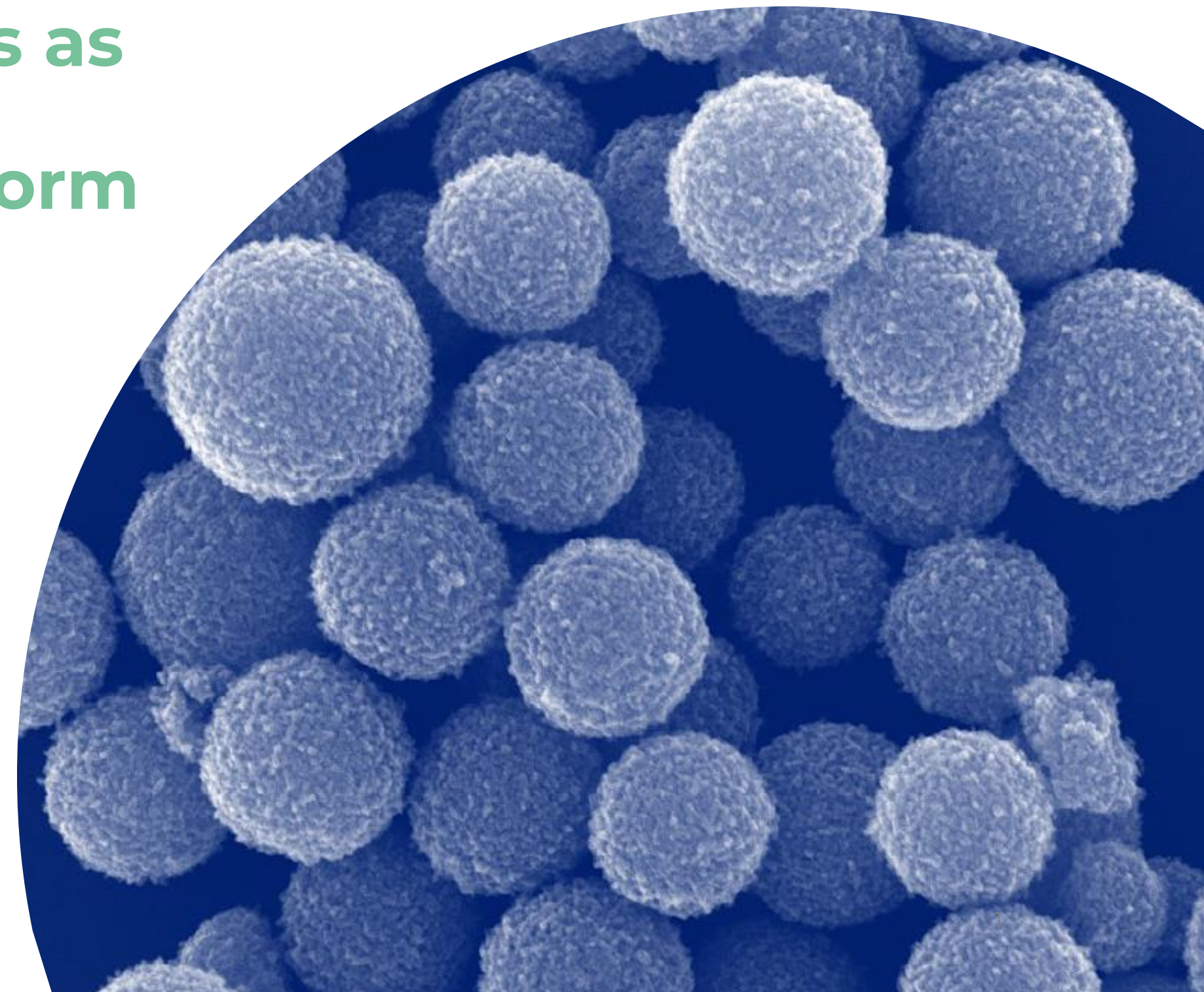




## Engineered Mesoporous Materials as Value-Adding Technology & Platform

*Andrea Castellin PhD, COO*



# Showcases of Brenta Mesoporous Platform



# Showcase of Brenta Mesoporous Platform

1

Antibiotic

Nitrofurantoin + NAC



Our Results

- Potency Drug alone vs Platform combination **1:10<sup>3</sup>**
- Biofilm Log Reduction **6.0**

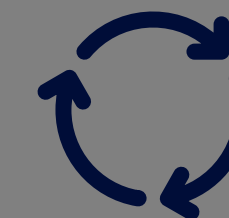
2

Diuretic



3

Anti-inflammatory





# 1 Brenta Platform + Nitrofurantoin + NAC

## Synergetic enhancement of Biofilm Eradication

### Key Figures



**Antimicrobial resistance** (AMR) is a growing global crisis.

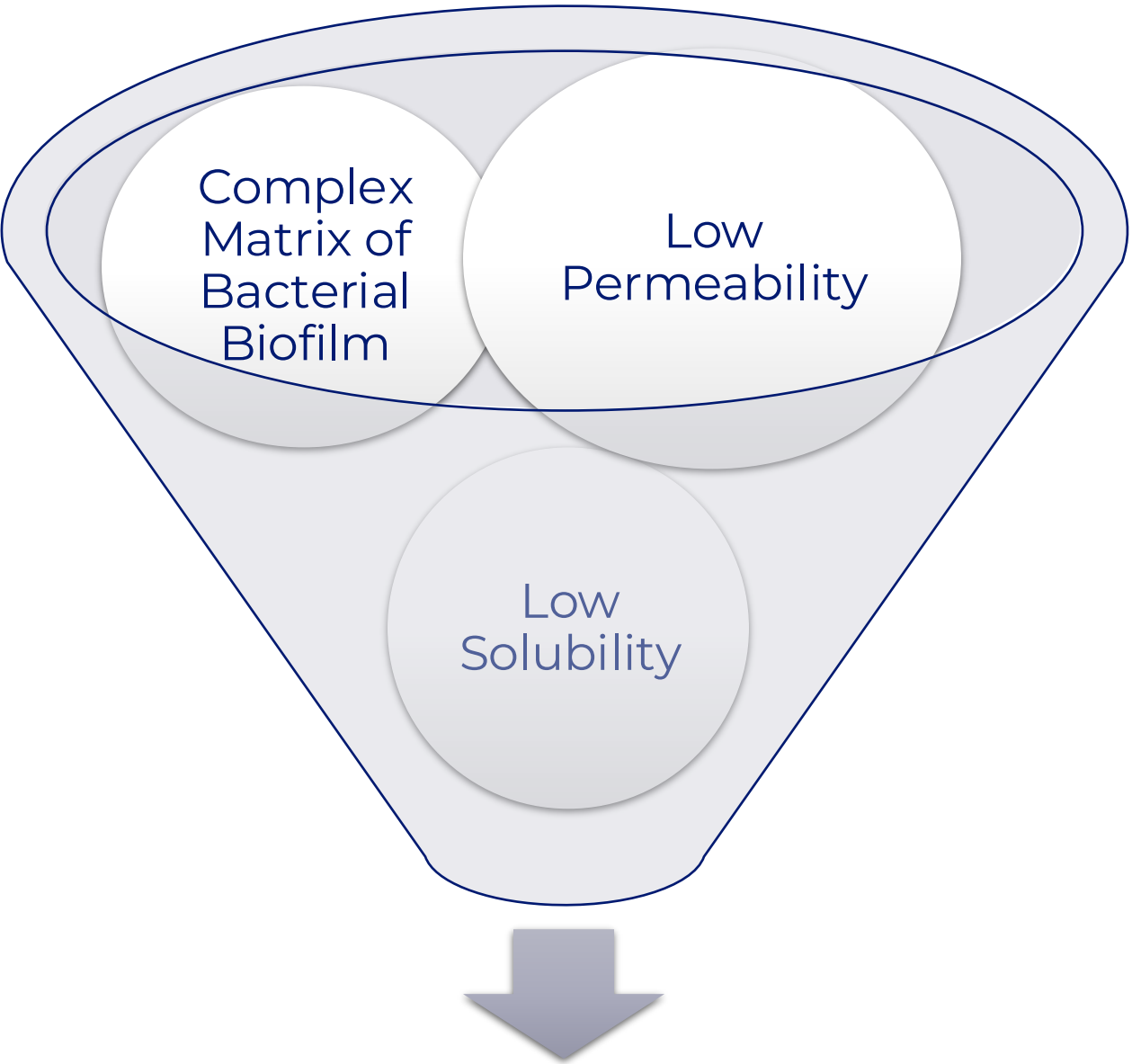


**4.3 million lives** lost to AMR in 2024.



AMR could lead to **10 million deaths per year** by 2050 (source: WHO)

### Challenges

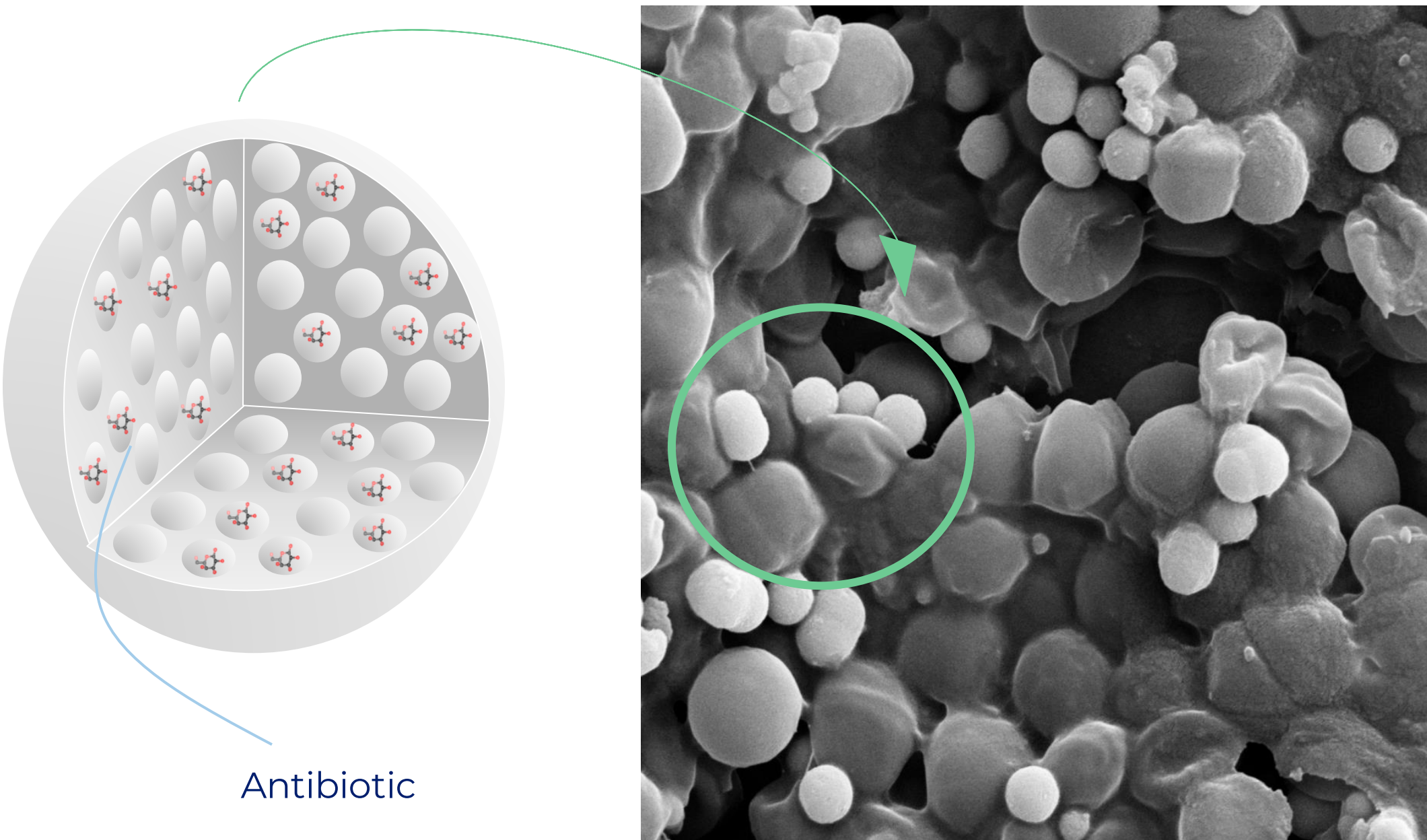


**Higher Dosages & Frequent Administrations**

# 1 Brenta Platform + Nitrofurantoin + NAC

## Synergetic enhancement of Biofilm Eradication

Brenta Platform as  
Versatile Trojan Horse



**Goal** is an  
**optimized** and **effective**  
**antibiotic use** by



Biofilm disintegration



Effective antibiotic release

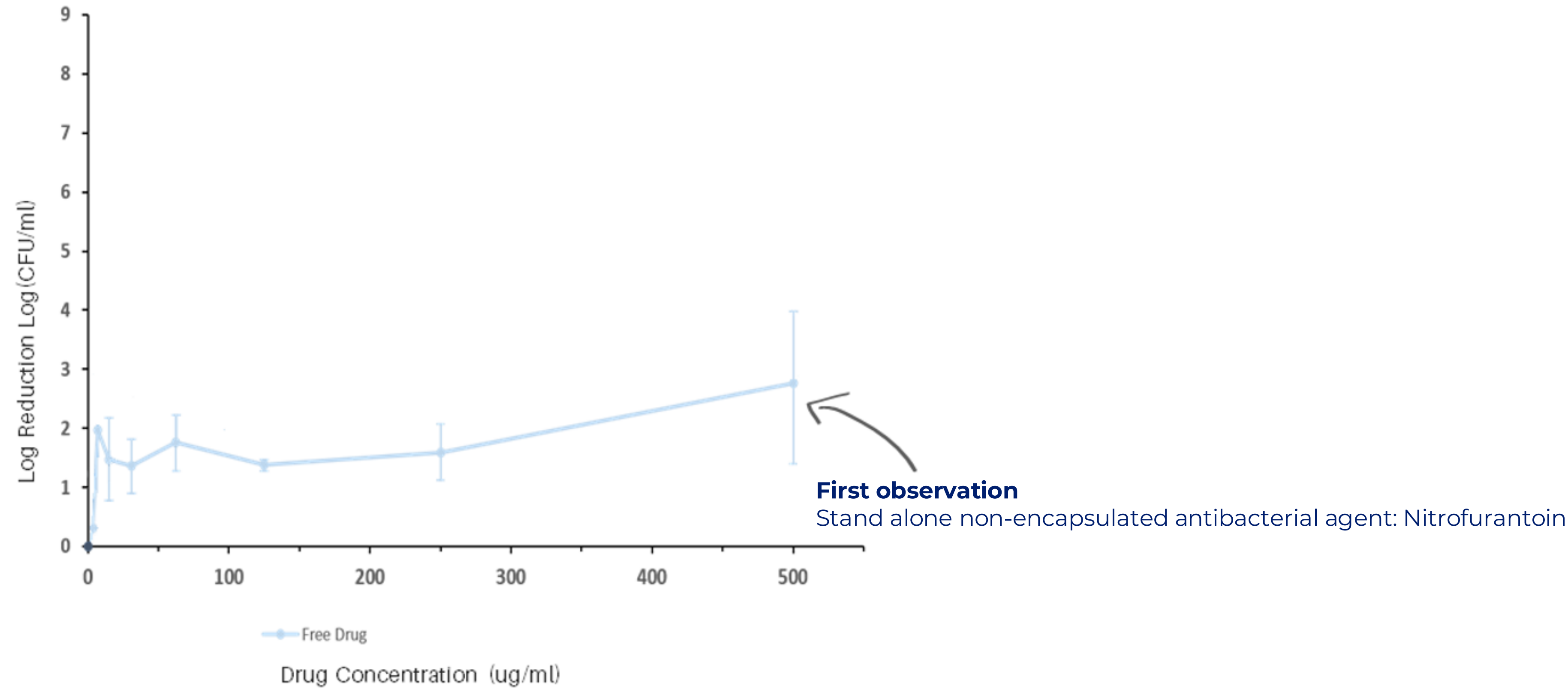


Lower dosages  
Fewer administrations

# 1 Brenta Platform + Nitrofurantoin + NAC

Combination vs *K. pneumoniae* Biofilm eradication

Synergy as result of chemical compatibility

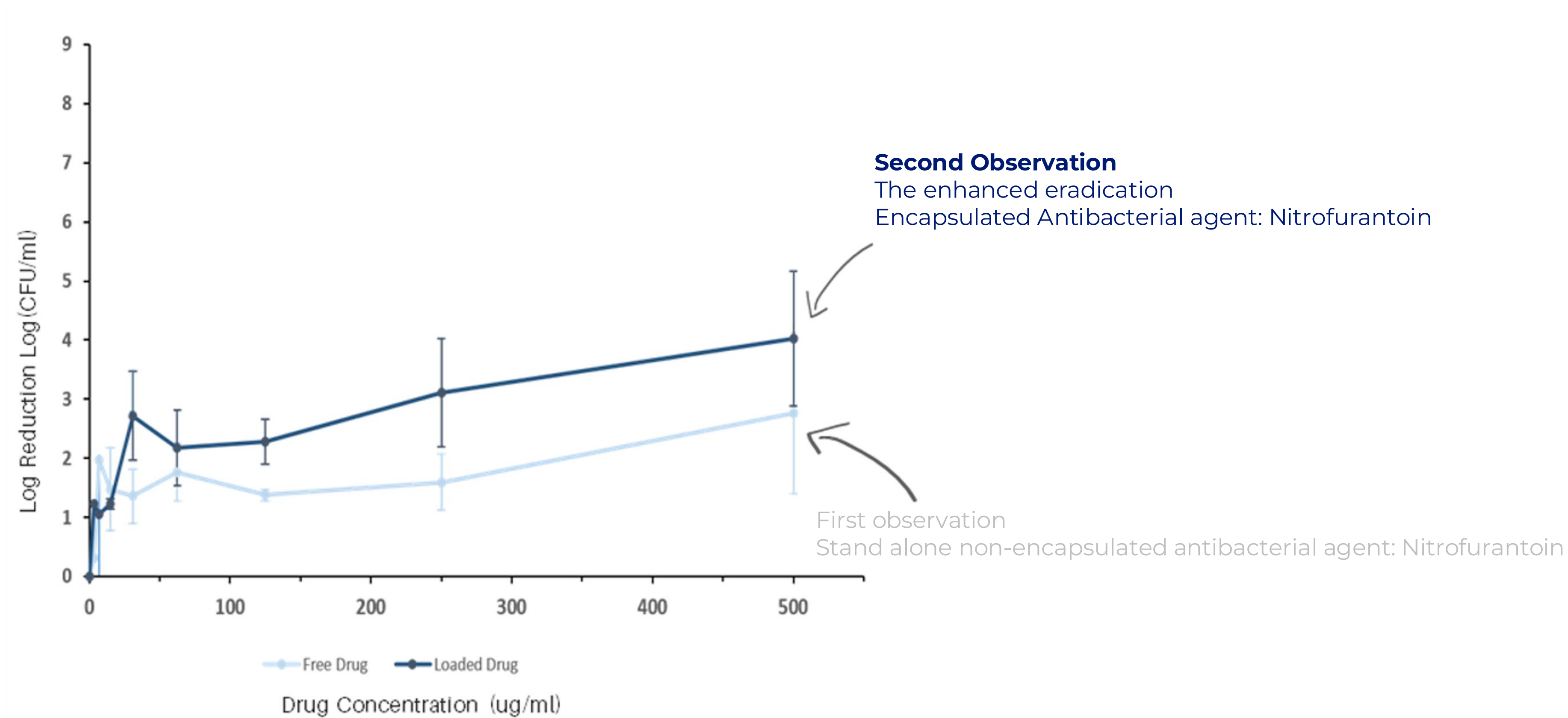


1

# Brenta Platform + Nitrofurantoin + NAC

## Combination vs K. pneumoniae Biofilm eradication

### Synergy as result of chemical compatibility

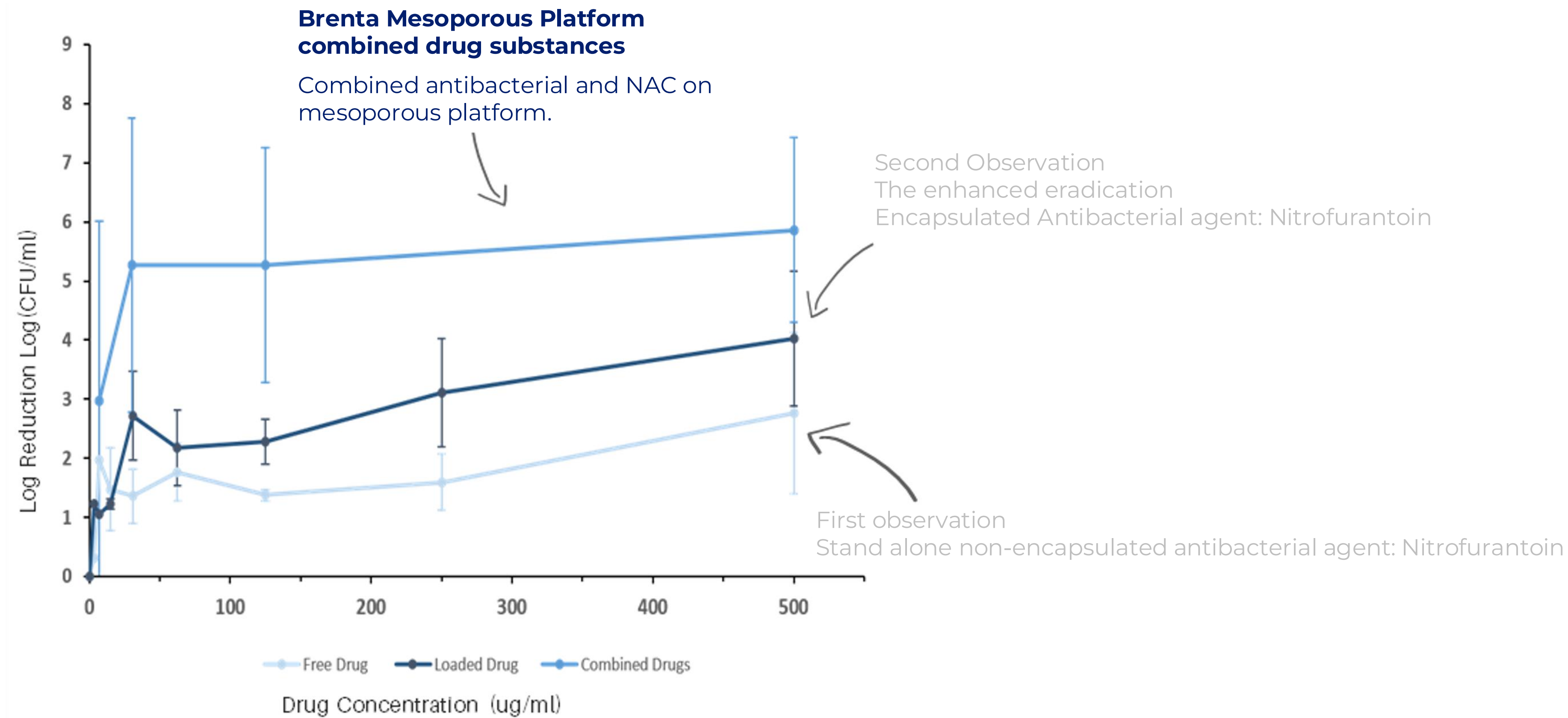


1

# Brenta Platform + Nitrofurantoin + NAC

## Combination vs K. pneumoniae Biofilm eradication

### Synergy as result of chemical compatibility

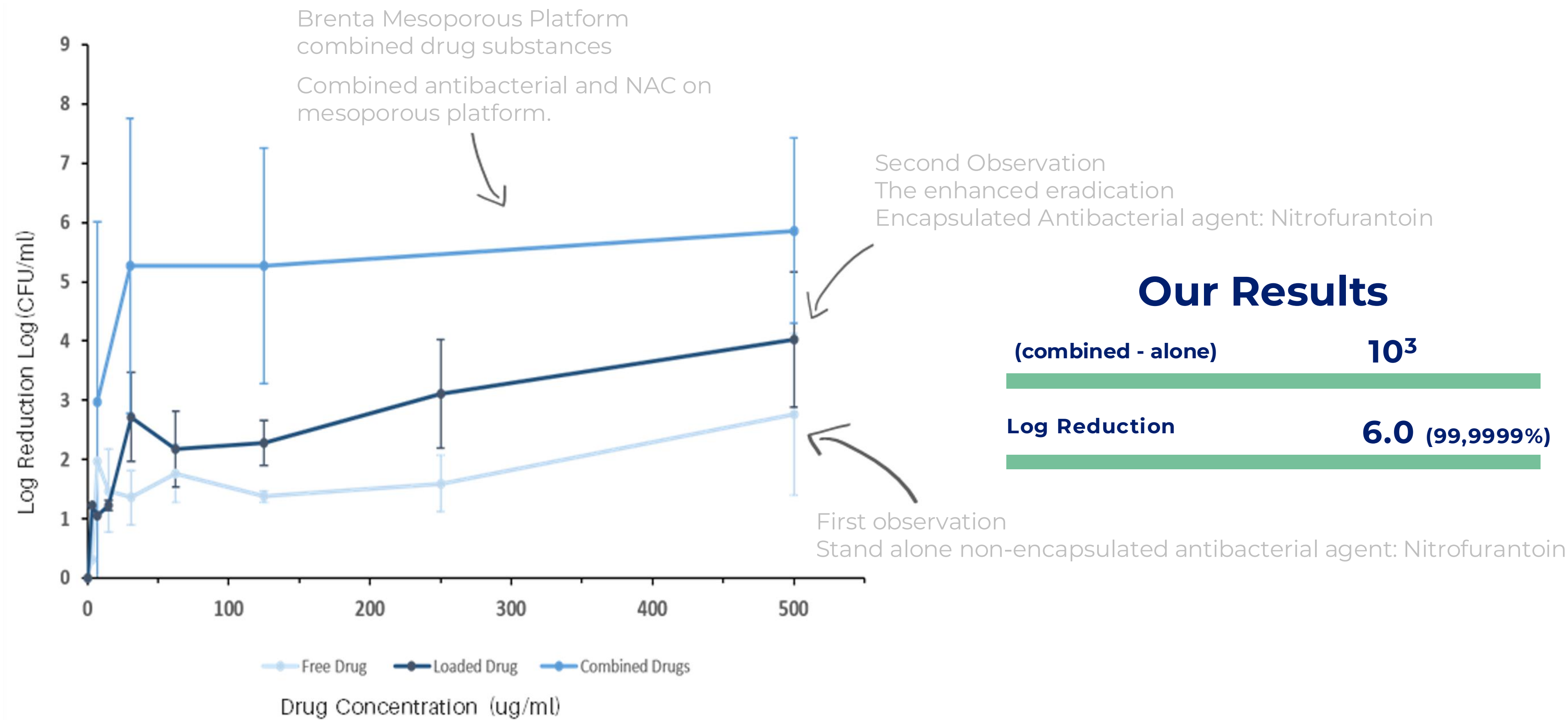




# 1 Brenta Platform + Nitrofurantoin + NAC

## Combination vs K. pneumoniae Biofilm eradication

### Synergy as result of chemical compatibility



# 1 Brenta Platform + Nitrofurantoin + NAC

## Nitrofurantoin Repositioning & Repurposing



### Key Strategic Improvements of Nitrofurantoin

- 1 Community-acquired pneumonia >>> From oral to inhaled administration
- 2 Topical infections >>> From oral (i.e.) to topical applications with increased substantivity on mucosa
- 3 Infections in immunocompromised patients >>> Improved bioavailability in different administration routes

# Showcase of Brenta Mesoporous Platform

1

Antibiotic



2

Diuretic

Furosemide



Our Results

- **Up to 70% loading** efficiency
- Stable amorphous API
- **4X increase** of **solubility**
- **+50% of permeability** of loaded API

3

Anti-inflammatory



## 2 Brenta Platform + Furosemide

Innovative way to enhance performance of Diuretic products

### Key Figures



**15-20% of patients with congestive heart failure** are affected by acute pulmonary edema.



**Mortality** rate of up to **40% within the first year**



**Furosemide** is the primary agent used to treat these cases.

### Challenges

1

**Poor Biopharmaceutical** profile

BCS Class IV with low solubility and permeability

2

Traditionally, improvement of BCS is done by **Micronization** of API

**Several limitations:** slow, highly complex and often fail to achieve uniform particle size

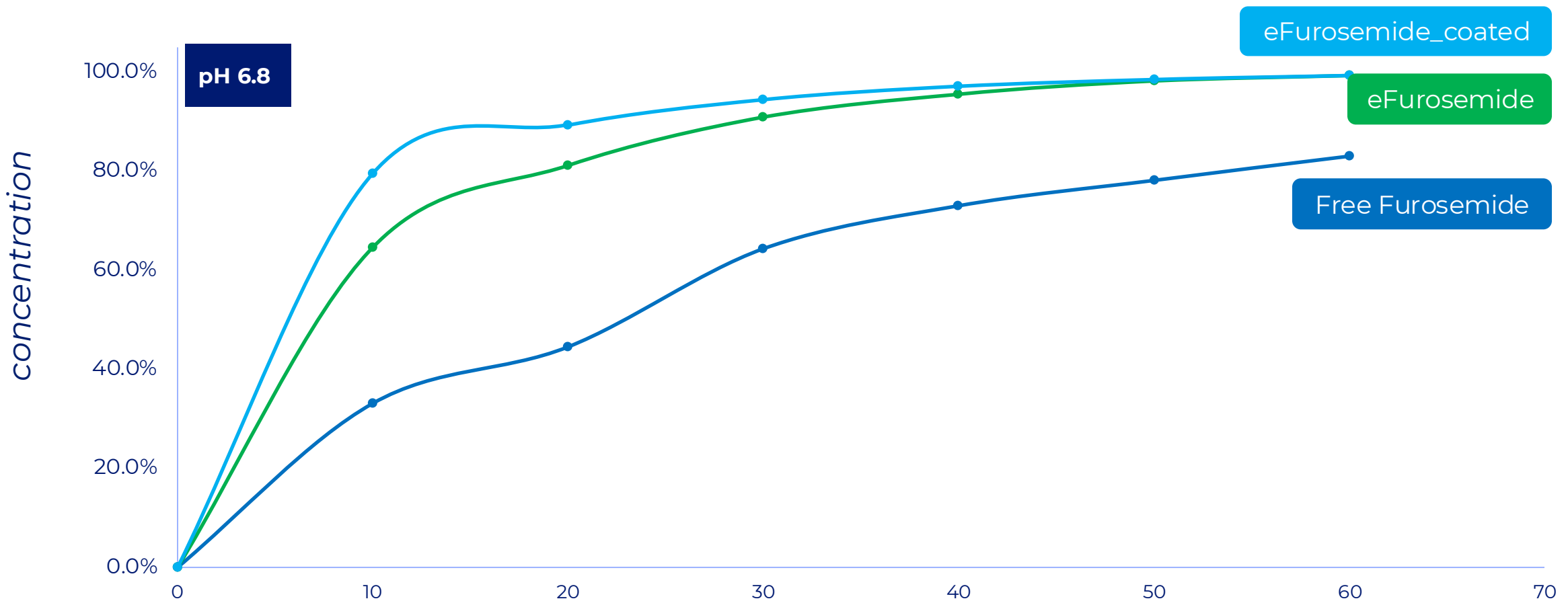
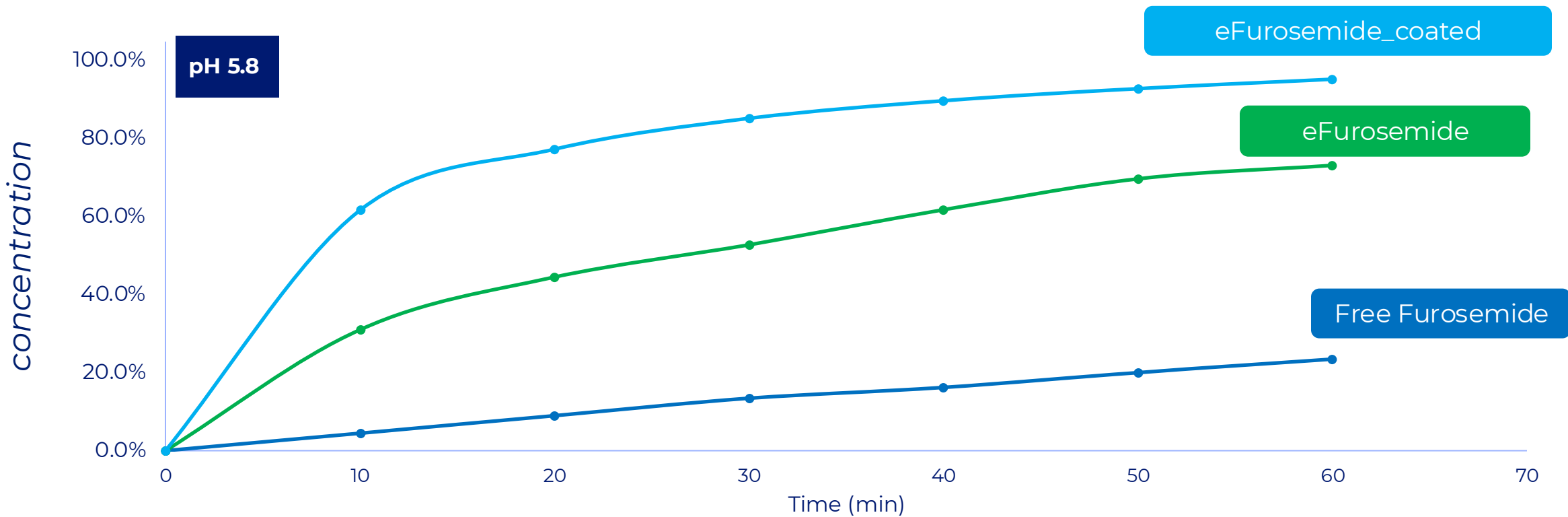


**Impacting formulation performance and scalability**



## 2 Brenta Platform + Furosemide

Furosemide improved BCS profile by Mesoporous encapsulation



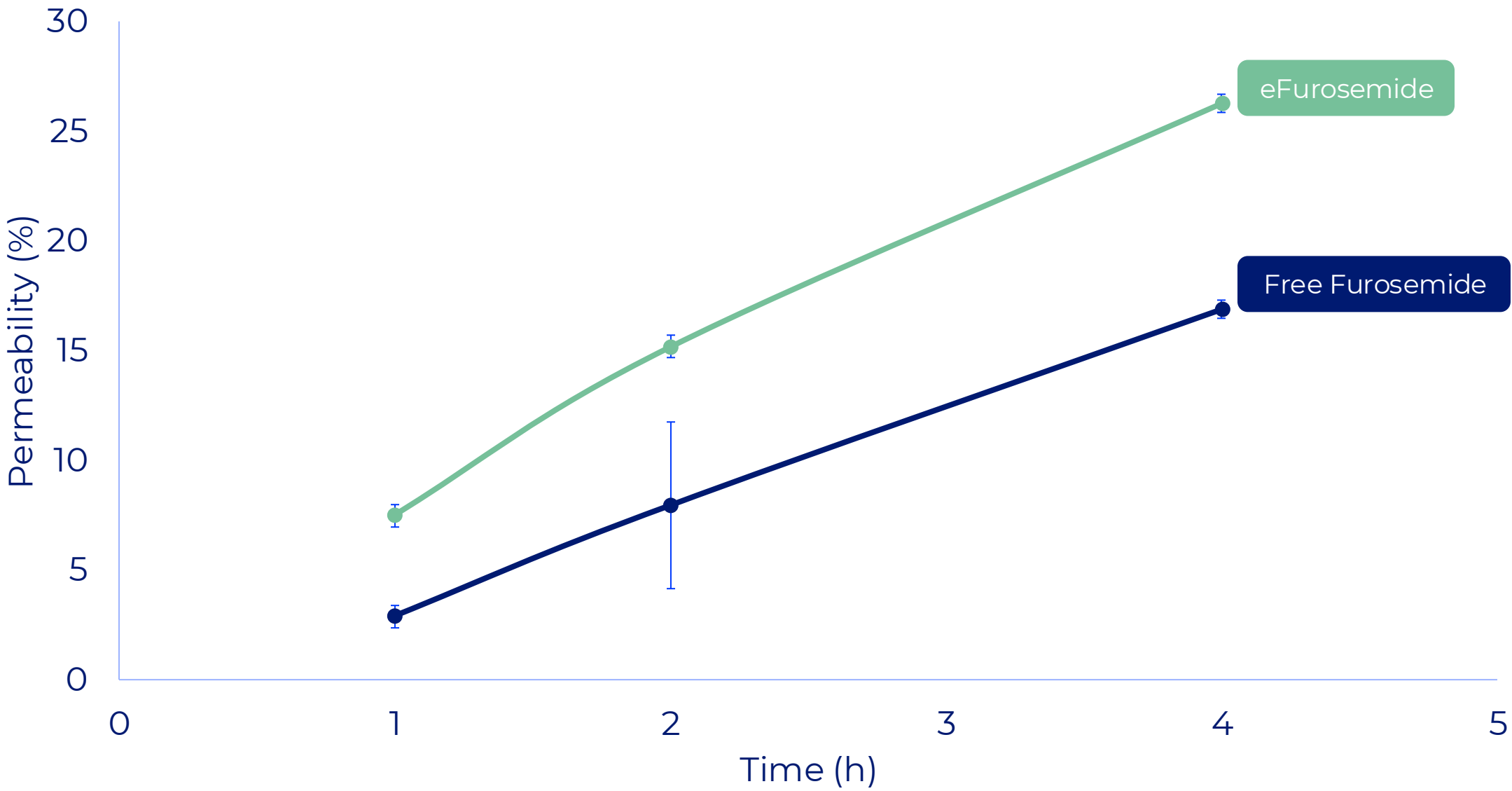
### Our results

- ✓ Loading efficiency 50 – 70 %w/w
  - ✓ 4x increase of solubility of loaded API
  - ✓ Successful coating with hyaluronic acid
- for its mechanical properties

## 2 Brenta Platform + Furosemide

Furosemide increased permeability by Mesoporous encapsulation

Time (h)	Free Furosemide permeability (%)	eFurosemide permeability (%)	Increased permeability (%)
1	2,9%±0,5%	7,5%±0,5%	+154,0%±0,3%
2	8,0%±3,8%	15,2%±0,5%	+81,7%±0,3%
4	16,9%±0,4%	26,3%±0,4%	+52,1%±0,3%



## Our Results

✓ Steady and linear permeability improvement

## 2 Brenta Platform + Furosemide

### Furosemide Repositioning


#### Key strategic improvements of Furosemide

- |   |   |  |
|---|---|--|
| <b>1</b> Pharmaceutical Homogeneity and Enhanced efficacy |    | Consistency with low strengths and less intakes              |
| <b>2</b> Keep Oral administration                         |  | Opportunities for rapid-onset formulations (i.e. ODT or OFS) |

# Showcase of Brenta Mesoporous Platform


1

Antibiotic



2

Diuretic



3

Anti-inflammatory  
**Indomethacin**



## Our Results

- **Up to 85% loading** efficiency
- Stable amorphous API
- **x11 increase** of **solubility**
- **+44% of permeability** of loaded API



### 3 Brenta Platform + Indomethacin

Enhancing the performance of Anti-inflammatory products

#### Key Figures



**20-33% of world's population** experiences chronic musculoskeletal pain



The **management** of chronic musculoskeletal pain is done **with NSAIDs**, among them **Indomethacin** (BCS Class II)

#### Challenges

**Lack of proportionality between dosage and therapeutic effect.**



Gastrointestinal irritation  
Cardiovascular complications  
Kidney problems

=

**Black box warning**



Need for innovative **delivery systems**



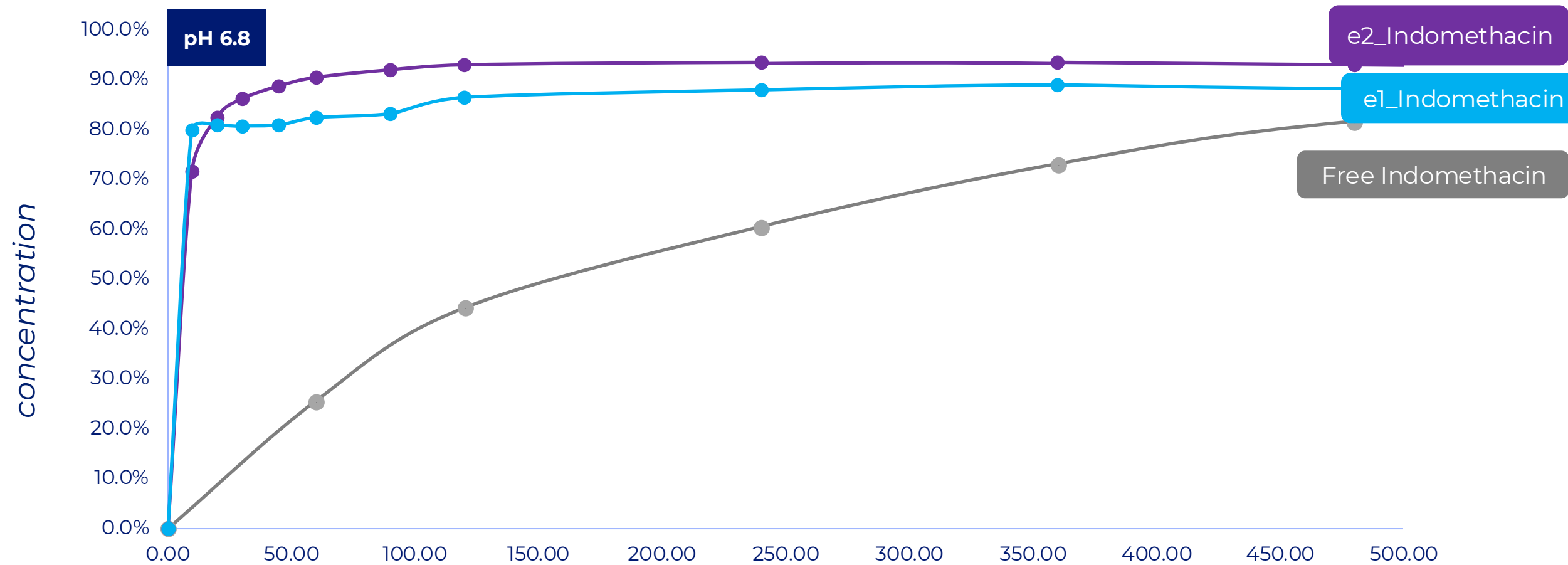
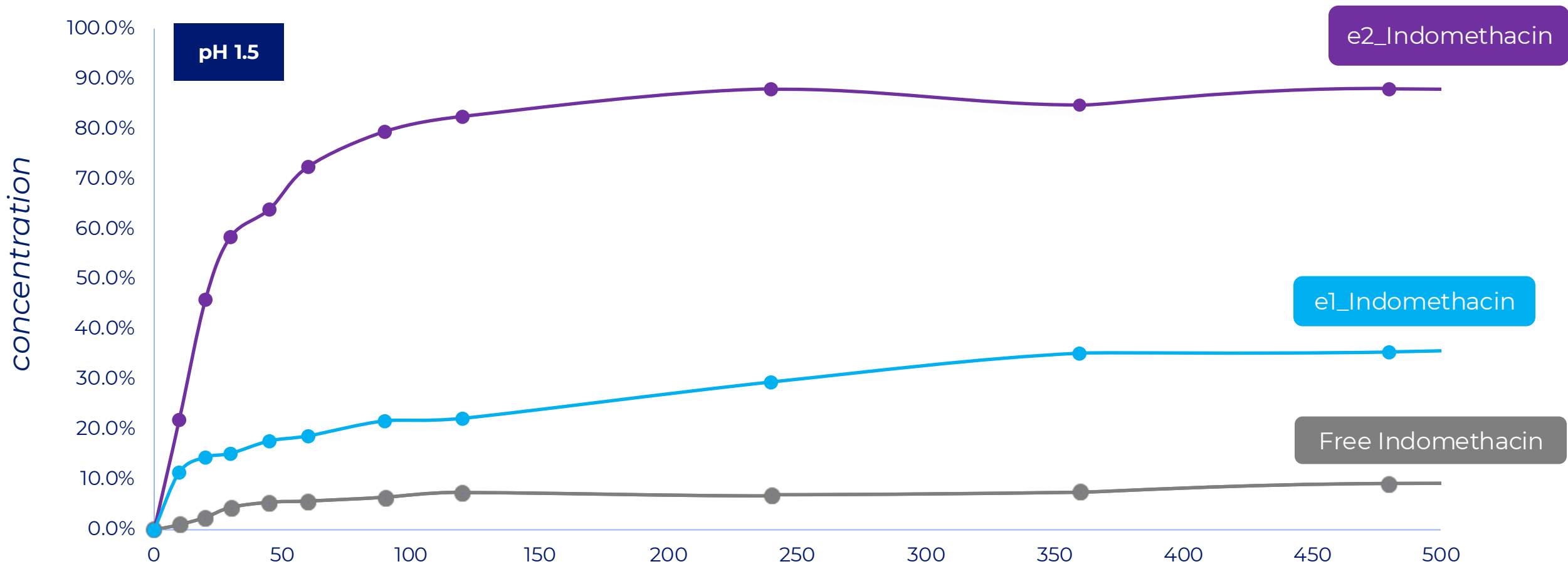
Optimized **pharmacokinetics**

=

Potentially remove the **Black Box Warning**

### 3 Brenta Platform + Indomethacin

Indomethacin increased solubility by Mesoporous encapsulation



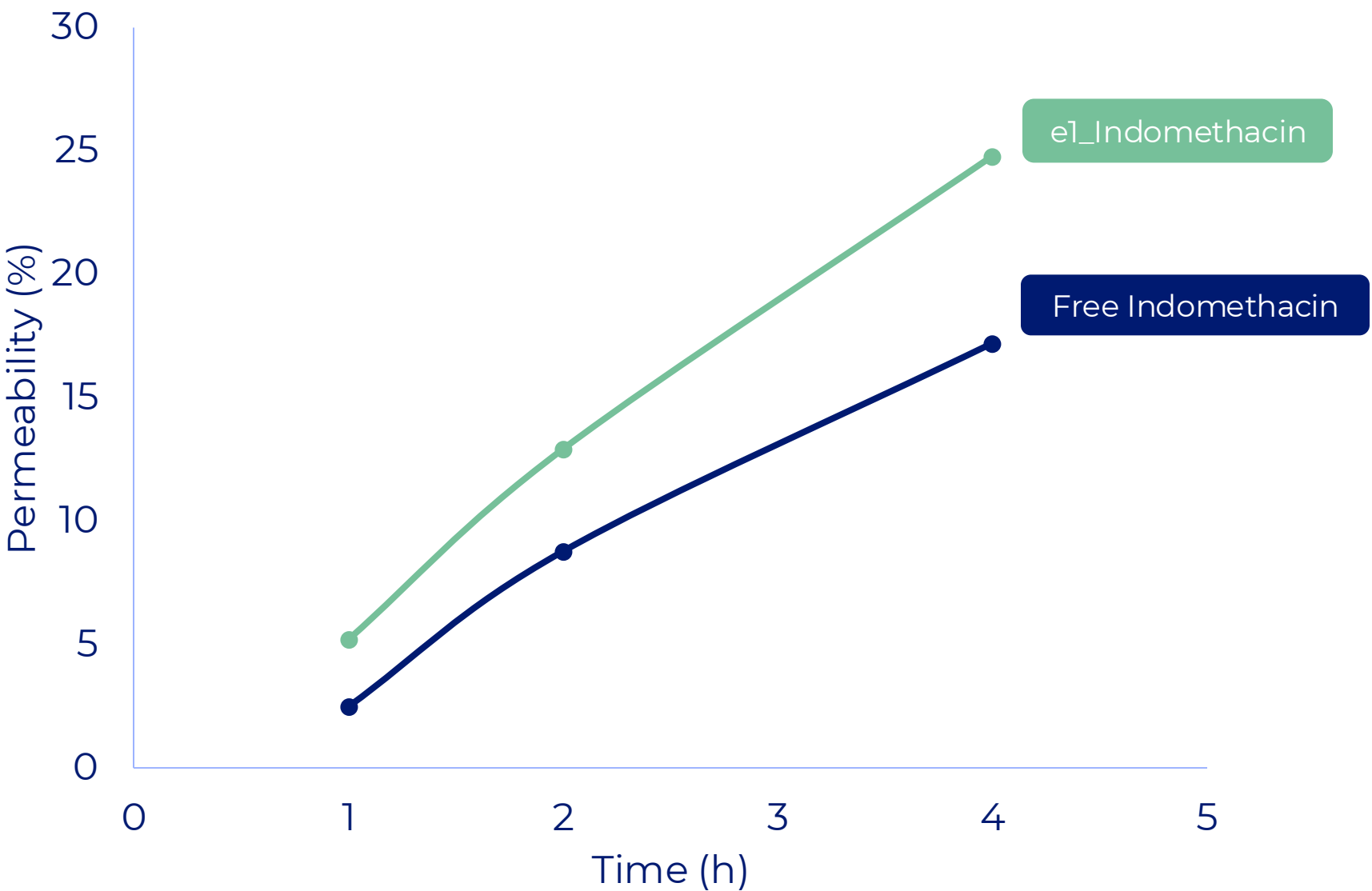
### Our results

- ✓ Loading efficiency up to 85 %w/w
- ✓ 11x increase of solubility of loaded API
- ✓ Expected inherent improve availability for passive transport

### 3 Brenta Platform + Indomethacin

Indomethacin increased permeability by Mesoporous encapsulation

Time (hours)	Indomethacin Permeability(%)	eI_Indomethacin Permeability (%)	Increased Permeability(%)
1	2,5%±0,01%	5,2%±0,01%	108,6%±0,4%
2	8,8%±0,01%	12,9%±0,01%	46,9%±0,2%
4	17,2%±0,01%	24,8%±0,01%	44,2%±0,1%



### Our Results

✓ **Steady and linear permeability improvement**

### 3 Brenta Platform + Indomethacin

#### Indomethacin Repositioning



## Key strategic improvements of Indomethacin

- 1 Expanded therapeutic options**  **From Rx to OTC** by lowering the dosage
- 2 By lowering the dosage**  **Black box warning removal**
- 3 Technology expansion line-up**  Market expansion and pharmaceutical innovation (cannabinoids, other NSAID, corticosteroids...)



## Take Aways



**Brenta Mesoporous  
Platform  
for  
Value added medicines  
and  
Generics Rx**

- 1 Improve drug substance **solubility** and **permeability**
- 2 Increase efficiency, possibly **reducing** dosage and multiple **intakes**
- 3 Increase **homogeneity** in drug product formulation and **patient compliance**
- 4 Improve lack of proportional **relation** between **dose** and **performance**
- 5 **Non-irritability** and **Biocompatibility**  
**Safety profile**