HEALTH

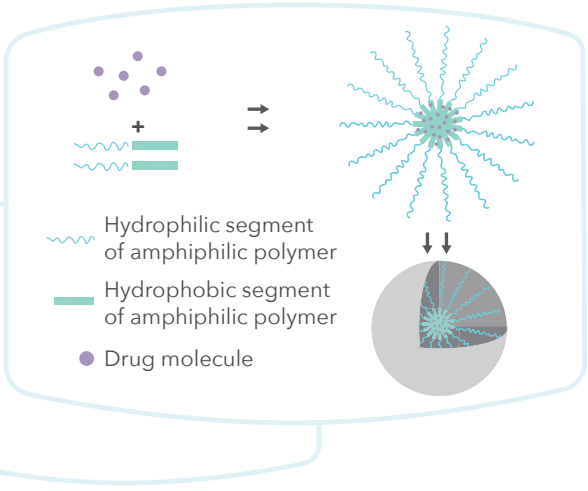
Apisolex™ Polymer

Solubility-enhancing polymer for use in bolus injections and IV infusions

Lubrizol Life Science Health's (LLS Health's) Apisolex™ GMP, injectable-grade excipient is a safe, polyamino acid-based polymer that enhances the solubility of BSC Class II and IV APIs.

Formulation Benefits

- Increases the solubility of hydrophobic APIs by up to 50,000-fold.
- Allows high drug loading (up to 40:100 API:solubilizer ratio).
- Forms stable, lyophilized drug product that reconstitutes in saline in under 30 seconds.
- Enables IP protection and 505(b)(2) formulations/lifecycle management.



Processing Benefits

- Simple formulation techniques - solution mixing or oil-in-water emulsion formation.
- Minimal API loss (recovery >90%).
- Standard, scalable formulation techniques.

Competitive Advantages

- **Higher drug loading** than other solubility-enhancing excipients.
- Substantially **increases achievable concentration of API in water**.
- Non-toxic, non-immunogenic, biocompatible, and biodegradable **alternative to PEG**.

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Putting Apisolex™ Polymer to the Test

- The solubilization properties of Apisolex polymer were evaluated in comparison with other excipients for a series of poorly water soluble active pharmaceutical ingredients.
- The experiments were conducted by non-optimized, standard dispersion techniques (mixing or homogenization), followed by dilution or lyophilization and reconstitution.
- Target API concentration in final product after dilution or reconstitution was 500 µg/ml. The criteria for solubilization were turbidity (NMT 100 NTU), particle diameter (NMT 150 nm), and drug recovery after filtration (NLT 80%).

Series A results

Compared to solubilizers that utilize a dissolution and dilution technique, only Apisolex polymer enabled successful solubilization of all APIs evaluated and at a much lower ratio of excipient to API.

API / Excipient	Polysorbate 20	Polysorbate 80	Cremophor®[1]	Apisolex™
Amphotericin B	Fail	Fail	Fail	Pass
Cyclosporin A	Pass	Pass	Pass	Pass
Etoposide	Pass	Pass	Pass	Pass
Melphalan	Fail	Fail	Fail	Pass
Paclitaxel	Pass	Pass	Pass	Pass
BI-001[2]	Pass	Pass	Pass	Pass
BI-002[2]	Pass	Pass	Pass	Pass
BI-003[2]	Pass	Pass	Pass	Pass
BI-004[2]	Pass	Fail	Fail	Pass
BI-005[2]	Pass	Pass	Pass	Pass
Excipient : API Ratio	100 : 1			100: 5 - 10

[1]Polyethoxylated castor oil (Kolliphor® ELP or Kolliphor EL, formerly known as Cremophor EL, is a registered trademark of BASF Corp)
[2]APIs for this study were provided by Boehringer Ingelheim Pharm. Inc.

Series B results

Compared to solubilizers processed using the same lyophilization and reconstitution technique, only Apisolex polymer enabled successful solubilization of all APIs evaluated.

API / Excipient	TPGS[1]	Captisol®[2]	PEG-PLGA[3]	Apisolex™
Amphotericin B	Fail	Fail	Fail	Pass
Cyclosporin A	Pass	Fail	Fail	Pass
Etoposide	Pass	Fail	Pass	Pass
Melphalan	Pass	Pass	Pass	Pass
Paclitaxel	Fail	Fail	Pass	Pass
BI-001[4]	Fail	Fail	Fail	Pass
BI-002[4]	Fail	Fail	Fail	Pass
BI-003[4]	Pass	Fail	Fail	Pass
BI-004[4]	Fail	Fail	Fail	Pass
BI-005[4]	Fail	Fail	Fail	Pass

[1]D-α-tocopheryl polyethylene glycol succinate
[2]Cyclodextrin (Captisol® SBE-AE-Beta-CD is a registered trademark of Ligand Pharmaceuticals Incorporated)
[3]Polyethylene glycol-poly lactic acid-co-glycolic acid
[4]APIs for this study were provided by Boehringer Ingelheim Pharm. Inc.

Series C results

In additional experiments conducted for APIs, BI-001 – BI-005, **Apisolex polymer increased the drug solubility up to 50,000-fold**.

API	Solubility in Water (µg/ml)	Solubility in Formulation with Apisolex Polymer (µg/ml)	Solubility Increase with Apisolex Polymer (Fold)
BI-001[1]	20	2,000	100
BI-002[1]	8	2,000	250
BI-003[1]	0.4	20,000	50,000
BI-004[1]	1.2	10,000	8,333
BI-005[1]	4	5,000	1,250

[1]APIs for this study were provided by Boehringer Ingelheim Pharm. Inc.

Safe for Parenteral Use

Polymeric excipient is constituted of biocompatible, biodegradable amino acid building blocks and has been tested for safety for parenteral use:

	Test	Results
System toxicity	Tolerability (rats and mice)	Well tolerated at doses as high as 1,500 mg/kg
	32-day IV injection 28-day recovery (rats)	No treatment-related side effects detected
Pharmacokinetics	[14C] labelled Apisolex IV dose in male and female rats	- Can be distributed to distant organs without accumulation - Tissue: plasma AUC0-t ratios <1.0

Request your sample today

Contact our Team directly or visit **apisolex.com** to learn more.

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