Polymun Scientific Immunbiologische Forschung GmbH

Liposome Technology

POLYMUN SCIENTIFIC

SERVICES

- Formulation Development
- Analytical Method Development
- Process Development
- GMP Production
- Filling
- Clinical & Regulatory Support

CLINICAL & REGULATORY SUPPORT

- IMPD / IND, IRB Submission
- Pre-/Clinical Development Concepts
- Organisation of Clinical Studies
- Legal Representative
- Requests for Scientific Advice

Polymun Scientific Immunbiologische Forschung GmbH

TECHNOLOGY

- Full Scalability
- Single Step Process
- Aseptic Process
- Homogeneous, Uniform Vesicles
- Excellent Batch to Batch Consistency
- Mild Procedure – Stability

Liposome Technology

Liposomal Formulation of Drugs

Liposomes protect, transport and release your drug at the right place and time. By this, a reduced dose achieves better efficacy and avoids side effects with a non-invasive application. A liposomal formulation can clearly improve the therapeutic index of your drug.

Polymun offers the development of liposomal formulations for all kinds of pharmaceutically active ingredients such as oligonucleotides, small molecules and proteins as well as vaccine antigens. A broad spectrum of analytical methods has been established for this purpose. Polymun produces GMP material including all necessary documentation for IMPD/IND. We assist in planning and implementation of clinical trials. Finally, license agreements are offered for the respective substance on an exclusive basis. Contracts can be arranged step by step - proof of concept, in-depth analysis, GMP production, product license - or all in one.

Different encapsulation techniques are employed, depending on the nature of the drug. Hydrophilic substances are passively entrapped. Amphiphilic substances are actively loaded and hydrophobic drugs or membrane proteins are incorporated into the membrane of the liposomes. Our patented liposome production technology is the key to a high quality solution for a broad range of active ingredients and vaccine antigens.

Alternative to Polymuns own technologies, non-proprietary technologies and existing customer processes can be implemented.

ADVANTAGES OF LIPOSOMAL FORMULATION

PROTECTION. Liposomes shield the drug from degradation. In the body, liposomes prolong the biological half-life.

SOLUBILIZATION. Liposomes can enhance solubility within the aqueous core and the lipid membrane.

TARGETED DRUG DELIVERY. Depending on their lipid composition, liposomes are able to localize, to target and to interact specifically with the affected tissue.

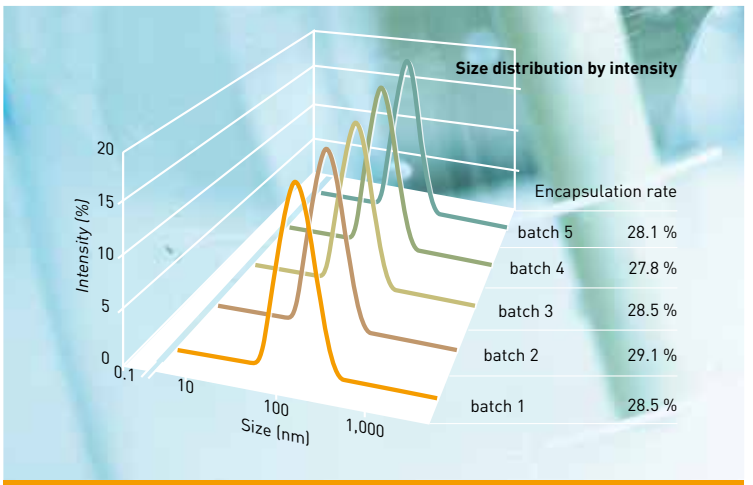
NON-INVASIVE APPLICATION. Liposomes can target the skin and the tissue below. The mucosa is an excellent target for quick uptake of liposomal drug formulations. Alternatively, liposomes can be inhaled in order to target the lung.

SUSTAINED RELEASE / LOW APPLICATION DOSE. Liposomes constitute a depot of the drug resulting in sustained release. Thereby, undesired peak concentrations are avoided and availability is prolonged. This results in a lower frequency of application and the reduction of side effects.

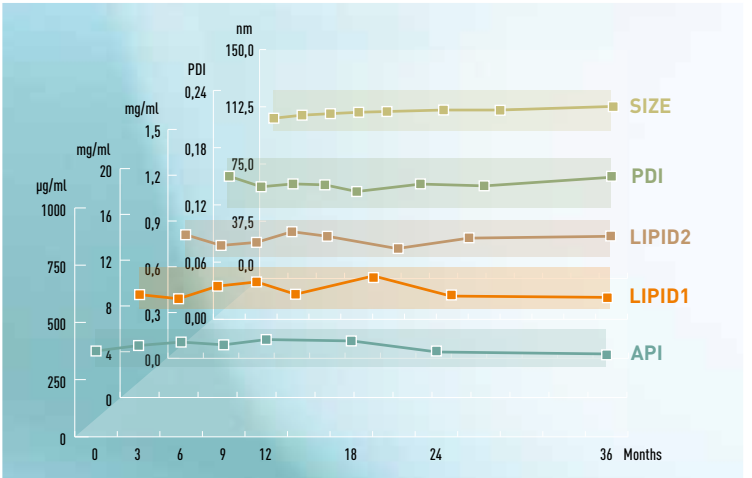
TOXICITY MINIMIZATION. Liposomal formulations are used in cancer treatment for reducing the toxic side effects of the drug.

MILD PROCEDURE ENSURES STABILITY

The crossflow injection technique is a very mild procedure that allows processing of sensitive drugs. High quality raw materials and precisely controllable process parameters guarantee high batch to batch consistency – essential for pharmaceutical products. Consequently, we achieve long term stability of liposomes even at room temperature.



EXCELLENT BATCH TO BATCH CONSISTENCY



POLYMUN LIPOSOMAL PRODUCTS ARE STABLE OVER YEARS

Polymun Technology

Polymun has transformed liposomes from a promising scientific idea into a sound industrial solution. The production technology is suitable for a broad range of substances formulated by passive entrapment, active loading or membrane incorporation.

cGMP PRODUCTION

HOMOGENEOUS, UNIFORM VESICLES

MAIN CHARACTERISTICS OF OUR TECHNOLOGY

FULL SCALABILITY

The injection module is the heart of the liposome production. The process parameters determine the size of the liposomes regardless of the scale. Production of 250 liters of liposome preparation takes only 1.5 hour. Large scale also can be achieved by using several injection modules in parallel.

ASEPTIC PROCESS

A closed system is used for production.
All components can be added via sterile filtration.
Subsequent concentration by crossflow filtration is possible as well.

HOMOGENEOUS, UNIFORM VESICLES

All process parameters are controlled precisely.
This results in a very narrow size distribution, necessary for reliable targeting and transport characteristics.

SINGLE STEP PROCESS

Liposome size is adjusted by modulating the process parameters during vesicle formation. No additional downsizing is required.

EXCELLENT BATCH TO BATCH CONSISTENCY

High quality of raw materials and precisely controlled process parameters guarantee excellent reproducibility – essential for pharmaceutical products.

MILD PROCEDURE – STABILITY

The crossflow injection technique is a very mild procedure that allows the processing of sensitive drugs. Together with the high quality of raw materials and narrow size distribution, we achieve long term stability of liposomes even at room temperature.

PATENTS

Method and device for producing lipid vesicles
granted by: AU 2002215987; CA 2,427,640; EP 1337322; US 6,843,942

Application of superoxide dismutase in liposomes
granted by: AU 690377; CA 2,204,493; EP 0789584; MX 206295; NZ 296098; US 5,942,245; US 6,312,720

Superloaded liposomes for drug delivery
granted by: EA 200602172; CN 1960706A;
pending in: AU, CA, EP, IN, JP, KR, US,
international stage WO2005115337

Liposomal composition comprising an active ingredient for relaxing smooth muscle production and therapeutically use of said composition
granted by: AU 04024753.8; EA 011391; EP 1802277; NZ 554183; pending in: CA, CN, IN, JP, KR, US,
international stage WO2006042701

SELECTED PUBLICATIONS

Wagner A, Vorauer-Uhl K (2011) Liposome Technology for Industrial Purposes.
Journal of Drug Delivery 2011, 9 pages

Wagner A, Stiegler G, Vorauer-Uhl K, Katinger H, Quendler H, Hinz A, Weissenhorn W (2007) One Step Membrane Incorporation of Viral Antigens as a Vaccine Candidate Against HIV. J Liposome Res 17(3):139-54

Wagner A, Platzgummer M, Kreismayr G, Quendler H, Stiegler G, Ferko B, Vecera G, Vorauer-Uhl K, Katinger H (2006) GMP Production of Liposomes-A New Industrial Approach. J Liposome Res 16(3):311-9

Vorauer-Uhl K, Wagner A, Borth N, Katinger H (2002) Long term stability of rh-Cu/Zn-SOD-liposomes prepared by the crossflow injection technique following ICH-guidelines. European Journal of Pharmaceutics and Biopharmaceutics 54:77-81

Wagner A, Vorauer-Uhl K, Kreismayr G, Katinger H (2002) Enhanced protein loading into liposomes by the multiple injection technique. Journal of Liposome Research 12(3):271-83

Wagner A, Vorauer-Uhl K, Kreismayr G, Katinger H (2002) The crossflow injection technique - an improvement of the ethanol injection method. Journal of Liposome Research 12(3):259-70

Wagner A, Vorauer-Uhl K, Katinger H (2002) Liposome produced in a pilot scale: production, purification an defficiency aspects. European Journal of Pharmaceutics and Biopharmaceutics 54:213-9

Polymun's technology enables the industrial realization of liposomal formulations for pharmaceuticals and medical devices in GMP quality for volumes of 0.5 liters up to cubic meter scale. Product development is performed within the same system at a minimum scale of 20 mL.

LIPOSOMAL FORMULATION IN THE LAB SCALE: 20 mL IN 2 SECONDS

LIPOSOMAL FORMULATION IN THE cGMP PRODUCTION SCALE: 250 L IN 1.5 HOUR

Reference Projects

CUSTOMER/PARTNER	PRODUCT	SCOPE AT POLYMUN
Mirna Therapeutics Inc., USA	Liposomal miRNA MRX34 with Smarticle technology for cancer treatment	Process development, GMP production
Wittycell SAS, France	Liposomal adjuvant WTCc	Formulation and process development, GMP production
AC Immune SA, Switerland	ACI-24, liposomal Alzheimer's disease vaccine with MPLA adjuvant	Process development, GMP production
EuroNeut-41, EU FP7 project coordinated by Sanofi-Pasteur, France	Liposomal formulation of HIV membrane protein gp41 and MPLA as HIV vaccine	Formulation and process development, GMP production
Signpath Pharma, USA	Liposomal formulation of curcumin for the treatment of cancer	Formulation and process development, GMP production
ProNAi Inc., USA	Liposomal of DNAi PNT100 with Smarticle technology for cancer treatment	Process development, GMP production
Dafra Pharma Research and Development bvba, Belgium	OlPC liposomes for the treatment of leishmaniasis	Formulation and process development, GMP production
Merck Serono, Germany	Survivac, liposomal cancer vaccine	Formulation and process development

www.polymun.com

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