Ionic gradient liposomes: Recent advances in the stable entrapment and prolonged released of local anesthetics and anticancer drugs

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Liposomes have established themselves as great pharmaceutical carriers over the past three decades. These phospholipid vesicular systems have undergone great technical advances including remote drug loading, targeted delivery, and combinatorial drug therapy. Ionic gradient liposomes (IGL) necessitates active loading of the drug in preformed vesicles exhibiting a transmembrane pH or ion gradient, with a low intra liposome pH (? 4-5), and a high outside pH (?7-8). It allows high drug encapsulation and prolonged release, particularly for amphipathic weak acids and weak bases. Most local anesthetics (Bupivacaine, Ropivacaine, Tetracaine, and others) have a pka in the range of 7-9, which makes them ideal candidates for their entrapment in IGL. The same is true for most anthracyclines which have great anti-tumor properties (Doxorubicin, Daunorubicin, Idarubicin, and others). Many FDA approved liposomal drugs utilise ion gradient for their encapsulation. Considering their immense utility, we summarize here in this review, the recent contributions made by various research groups utilizing IGL, to accentuate the development of these carriers in drug delivery. This would possibly be helpful in carrying new investigations and further contributions in the optimization and advancements of new drugs for better therapeutics.

Anthracyclines

Controlled release

Drug delivery

Entrapment

Ionic gradient liposomes

Local anesthetics

pKa

Weak base

anthracycline

antineoplastic agent

ionic gradient liposome

liposome

local anesthetic agent

unclassified drug

antineoplastic agent

ion

liposome

local anesthetic agent

concentration ratio

drug concentration

drug delivery system

drug release

drug retention

encapsulation

human

lipophilicity

micelle

nonhuman

pH

physical chemistry

priority journal

Review

temperature sensitivity

delayed release formulation

pharmacology

Anesthetics, Local

Antineoplastic Agents

Delayed-Action Preparations

Ions

Liposomes