

SCIENCE FROM LITERATURE: AN EASY WAY TO LEARN COMPLEX PHENOMENA OF THE SITE-SPECIFIC DRUG DELIVERY USING LIPOSOMES

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Abstract. The inculcation of complex phenomenon of specific drug delivery in a simplest way is suggested using the example of Trojan's War from literature. The Odysseus's idea of building a giant wooden horse to penetrate the city is compared with the development of vehicles for targeted drug delivery.

Keywords: specific drug delivery; vesicles; chemistry teaching

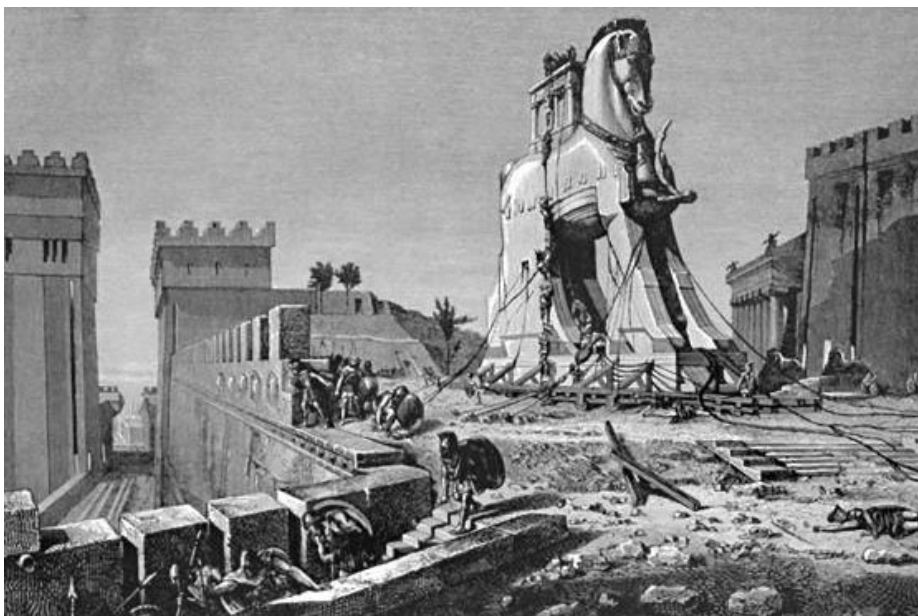
Introduction

Trojan's War^{1,2)} appears widely in literature [1-3]. The story of Trojan War is available in juvenile literature as well [4-7]. This work emphasizes utilization of the story for inculcation of the scientific phenomenon of specific drug delivery [8]. A comparative analysis shows that the penetration of Greek soldiers into the Troy using a wooden horse has a lot in common with the penetration of drugs to the site of action using different carrier systems called the vehicles for specific delivery. A common example for such vehicles is liposomes, vesicles made up of lipid or fat molecules, capable of delivering a variety of biological molecules or molecular complexes to cells.³⁾

Comparative analysis

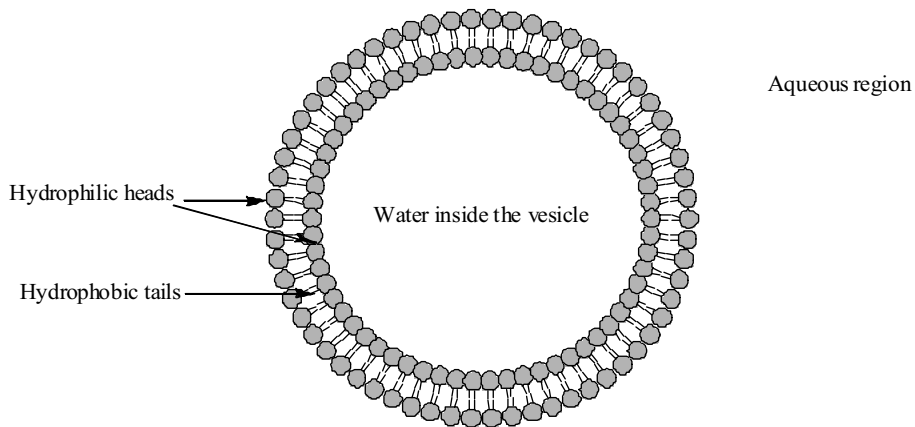
Trojan's war goes on but neither the Greeks nor the Trojans succeed in achieving their goal. Greeks try to invade the Troy but fail. A wooden horse is built on suggestion of Odysseus, King of Ithaca – an island located in the Ionian Sea, in Greece.⁴⁾ Pieces of wood are aggregated to construct a giant effigy of a horse. This resembles the way monomers (single molecules) of amphiphilic compound (one that has both water-loving called hydrophilic as well as water-hating part within the same molecule) self-assemble to form aggregates called vesicles. Vesicles comprise of a bilayer of amphiphilic molecules, and they are hollow inside, similar to the belly of wooden horse.

The soldiers along with Odysseus hide inside the belly of the horse and carrying their weapons they are prepared for an onslaught. This is how a drug that has an ability to act against the disease inside our body is loaded in the vesicles (Fig. 1), making them stealth or unreachable by the elements in the surroundings till they approach the site of action, a tumor for example [9-11].



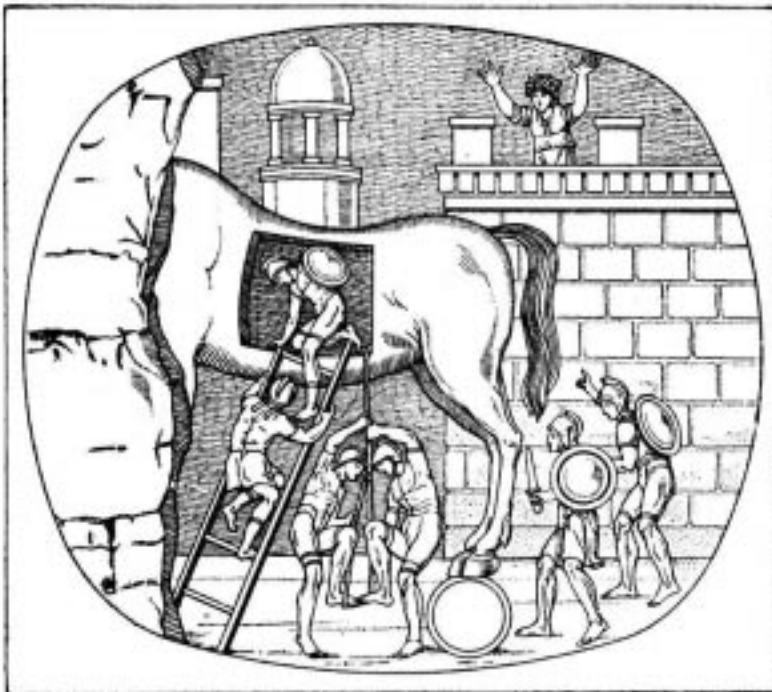
Once the horse is loaded with soldiers or vesicles with drugs, the second stage is the penetration into the Troy by horse or into the blood plasma by the vesicles. Greeks pretend to sail away, leaving the horse behind allowing the people of Troy to think that they have given up. One of the Greek soldiers who is left behind tells them that the horse is offering to Athena, the goddess of wisdom. Trojans take the horse inside fearing not to upset Athena, and start to celebrate the end of war.⁵⁾ This represents a clever strategy on the part of Greeks and in case of drug delivery the vesicles are injected into the blood plasma.

The final phase is that of action, where Odysseus along with his men comes out and attack the sleeping or intoxicated people of Troy and start killing them. They also allow others to enter and enforce their attack by opening the gates. The vesicles after reaching the site of action, for instance cancerous cells, release the drug (Fig. 2),



A vesicle composed of lipid molecules

termed as controlled release and allow for the biological action against the diseases, killing the cells ultimately.



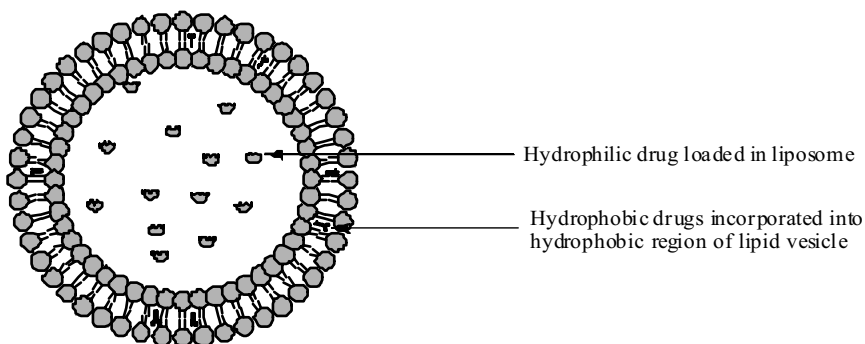


Fig. 1. Drug loaded vesicles (liposomes)

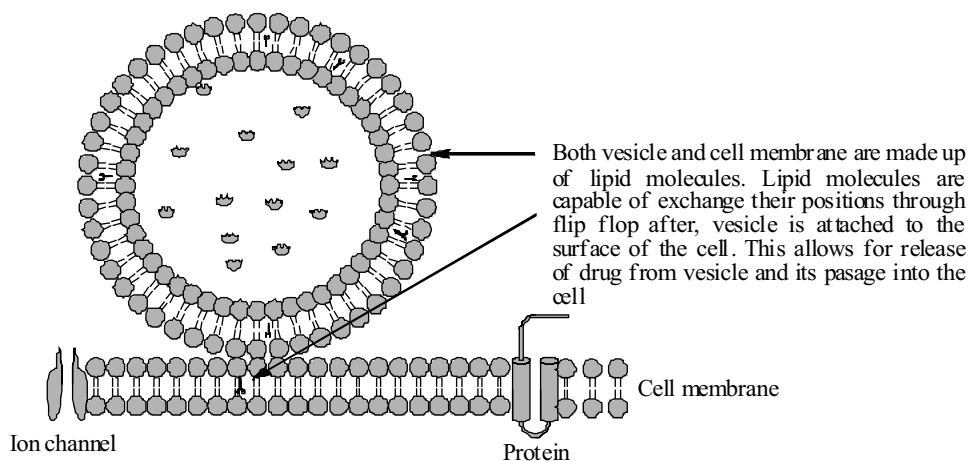


Fig. 2. Delivery of drug to the target by a liposome vesicle

NOTES

1. Euripides. *Helen*.
2. Sophocles. *Philocretes*.
3. <http://www.websters-online-dictionary.org/Li/Liposomes.htm>
4. <http://en.wikipedia.org/wiki/Odysseus>
5. <http://www.historyforkids.org/learn/greeks/religion/myths/trojanhouse.htm>

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