Organic and Medicinal Chemistry
International Journal
ISSN 2474-7610

Juniper Publishers
key to the Researchers

Research Article
Volume 13 Issue 3 - October 2023
DOI: 10.19080/OMCIJ.2023.13.5558561

Organic & Medicinal Chem IJ

The Lipid Solubility of Most Drugs Play Important Role of Its Pharmacological Action and Duration of Action

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Submission: September 04, 2023; **Published:** October 02, 2023

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Abstract

The fact of human body and animal body formed of organs which formed of tissue which its constituents is the cells. The cell enveloped by cell membrane which contain more its content of lipid compounds to protect the cell. Hence when the chemical compounds (drugs) across to the cytoplasm of the cell must has a lipophilic character. Also, there is a fact the oily substances do not mix with the watery substance, so must be take a cream form (water in oil or oil in water emulsion),so the drugs must be soluble in lipid to across the cell to obtain the desirable effect. The partition co-efficient is a significant expression of lipid solubility.

Many of drugs convert to prodrug this prodrug has highly lipid solubility and has long duration of action e.g. testosterone cybionate, rolitetracyclline, penicillin procaine, benzylpenicillin, nandrolone decanoate….etc., on the other hand the water soluble compounds (hydrophilic drugs) e.g. vitamin B complexes which exert its effects and excreted from the kidney quickly this indicate to no long duration of vitamin B complex except the cyanocobalamin (vit.B12) which incorporated to sesame oil to depote in the body to treatment the inflammation of nerves of diabetic patients which suffering from neuropathy.

Keywords: Lipid Solubility; Hydrophilic Drugs; Partition Co-Efficient; Prodrugs; Duration of Action; Pharmacological Action; Blood Brain Barrier (BBB)

Introduction

In the first when the chemist design new drug, or the physician want to describe some drugs in some diseases must be taken in his mind the lipid solubility of the drug to sure reach the drug to target site and may be prolonged its action. The partition co-efficient is significant for lipid solubility in vitro where represented by the solubility of the drug in n-octane (represent the lipid phase), the water which represent the aqueous phase, if the chemical compound (drug) soluble in octane phase will be soluble in lipid and if soluble in water will be water soluble. The partition co-efficient is the ratio of drug soluble in n-octane to water. Many of drugs may be react with organic acids (acetic, propionic, buteric, pentanoic, hexanoic, heptanoic, octanoic, nonanoic, decanoic, undecanoic, dodecanoic) or fatty acids (saturated non-essential, non-saturated essential), to make esters, these esters don't water soluble (many of esters mainly water insoluble), so these esters lipid soluble not only this fat but the drugs become prodrugs [1-10]. The lipid solubility of drug esters make the drugs reach to the target sites due to lipid solubility across the cell membrane of (cell, tissue, or organ), furthermore the drug esters easly hydrolyzed by esterase enzyme in the body. Hence the pharmacists, physicians, and the pharmaceutical companies must take in consideration the lipid solubility in your works to reach the maximum activity of the drugs [11-15].

Chemistry and Discussion

The drugs which are water soluble not stay in the body for long time e.g., water soluble vitamins where it excreted from the kidney [16]. Vit.B1 (Thiamine) [Figure 1]. Thiamine is important to growth and vital functions and present in many foods as (dicots) and is important for metabolism of carbohydrates, lipids, and protein, decrease of the thiamine in the body will cause

dysfunction on the body and lead to Beri Beri disease, so we must take in consideration the solubility of thiamine and its excretion quickly from the kidney [17-20].

The Riboflavin is vit.B2 which is essential for the functions of the body [Figure 2] Riboflavin plays many important roles in vital processes in the body, the very important role is in carbohydrates (glucose) metabolism which enter the structure of FAD, which is Co-enzyme to enzymes which act on glucose, also water soluble and excreted from the kidney [21-23].

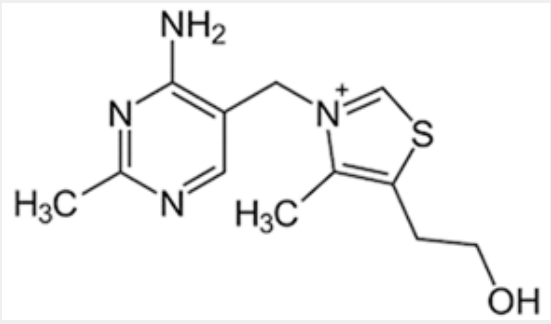

Figure 1.

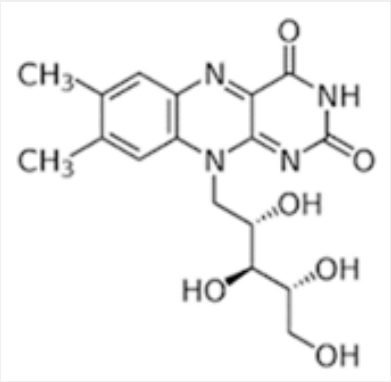

Figure 2.

Nicotinamide is vit.B3 one of the vit.B complex group which make vital role in skin health and its Important role enter the structure NAD and NADP which are important as co-enzymes to the enzyme which act on glucose, so when decreased in the body due to its water solubility and excreted from kidney may be increase the glucose level in the body [Figure 3] [24-25].

Pyridoxine is a vit.B6 and is also member of vit.B complex which is important for keep on the health nerves especially in diabetic patients which after time of chronicity wine neuropathy, also used in pregnant woman emesis (also has water solubility and excreted from the body via excretion routes) [Figure 4] [26-30].

Vit.B12 (cyanocobalamine) also one of the vit.B complex which soluble in water and decrease in the body, so it must be taken more times for diabetic and pre diabetic patients because it keep and treat the inflammation of nerves caused by high level of glucose in the blood. As we mentioned above, the cyanocobalamine in sesame oil prolonged in the body [Figure 5] [31-35].

Vit.C (Ascorbic acid) is a water soluble vitamin plays an essential role in the body to maintain a healthy life as it act as powerful antioxidant, raised the immune level so enhance immunity against infection and help in relief the symptoms of common cold and other viral infections, also it enhance absorption of Ca so maintain a healthy bone, also ascorbic acid (Vit.C) water soluble and excreted from the body and the body need take repeated administration to keep its function in body [Figure 7], all the mentioned vitamins are essential for human, but its water solubility make them make them around disadvantage [36-40].

Also, Pantothenic acid (vit.B5), Biotin (vit.B7), Folic acid (vit. B9) and Amygdaline (vit.B17 which is used as anticancer) these compounds are water soluble and has low concentration in the body [Figure 8-10]. N.B. The vitamins which are soluble in water must be alarmed to physicians of diabetes and must calculate the actual need of vitamin B complexes, which are very important in diabetic treatment [41-45].

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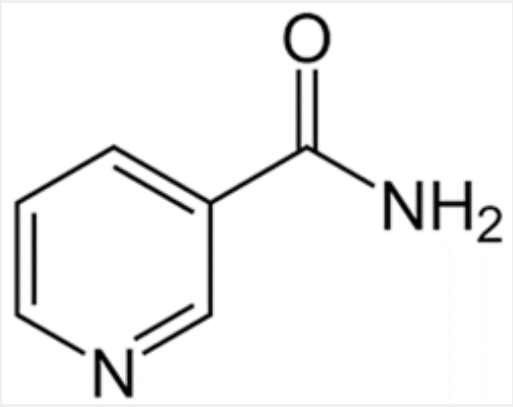

Figure 3.

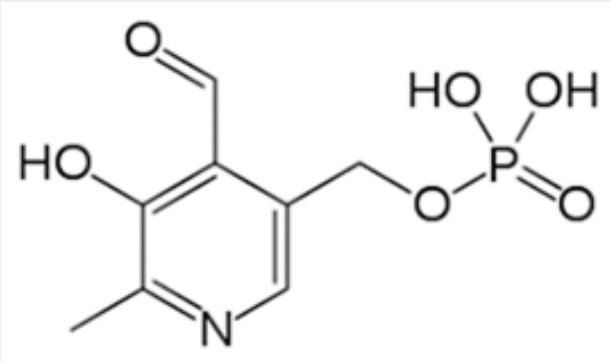

Figure 4.

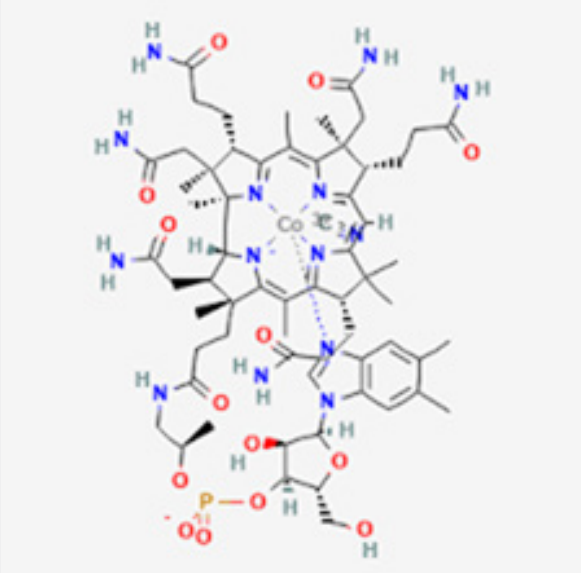

Figure 5.

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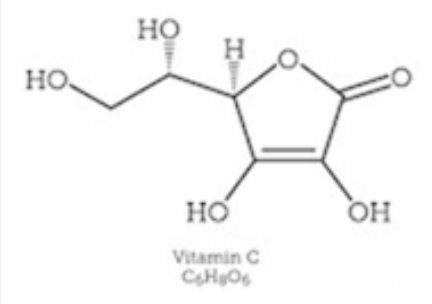

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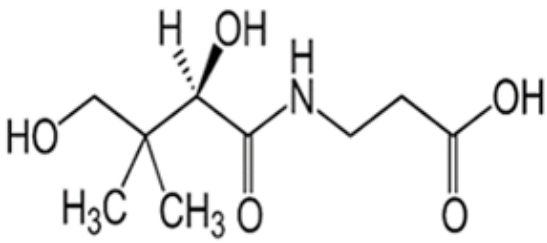

Figure 7.

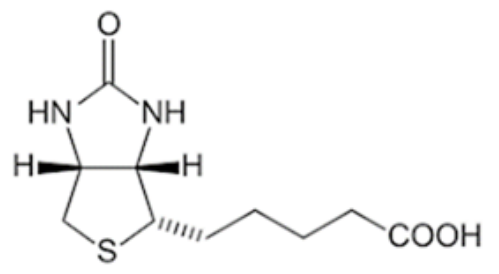

Figure 8.

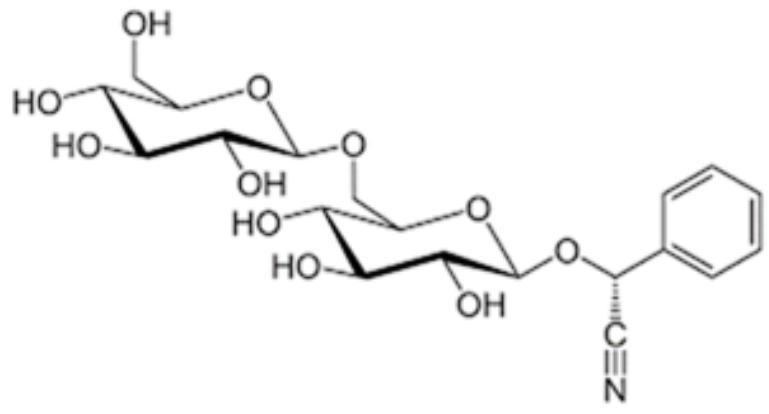

Figure 9.

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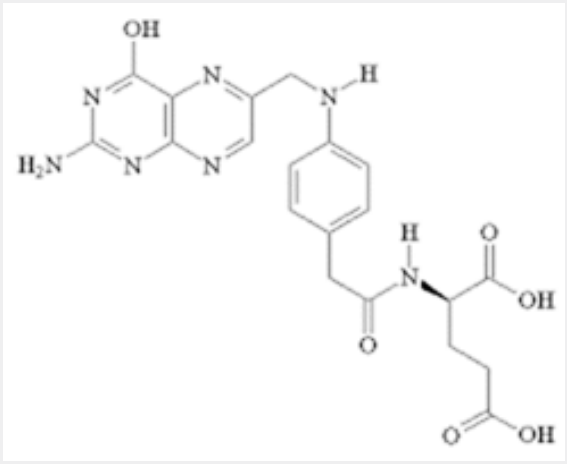

Figure 10.

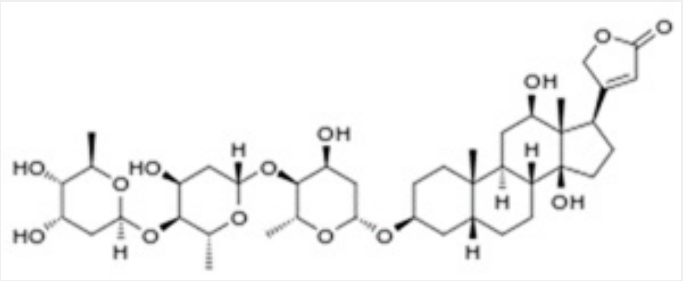

Figure 11.

Conclusion

The lipid solubility must be taken in consideration in many drugs when we want design a new drug or the physician want to describe a drug to patient. Absolutely not all drugs are highly lipid solubility due to the accumulation property e.g., [Figure 11] Digoxin not merely, some compounds if stored in the body may be harm to it (toxicity of digoxin) or cause disease (edema of mineralocorticorticoids hormone), in spite we attention to the importance of lipid solubility of the drugs to sure reach it to the target sites or to give prolonged action.

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