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Esterification of Many Drugs Causes Its Prolonged Action Due to Increase Lipid Solubility and Store in Fatty Tissues

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Abstract

The esterification process is a reaction between alcohol and acid which increases the resistance to metabolism, increases lipid solubility, and takes time to liberate the active constituent either alcohol or acid. Fluphenazine is an antipsychotic drug that is in the form of decanoate which is prolonged in its action making it take 1 month. Nandrolone decanoate, progesterone acetate, propionate and cypionate, also benzathine and penicillin procaine.

Keywords: esterification, acid, alcohol, phenothiazine, progesterone, testosterone, lipid solubility, hydrolysis

1. Introduction

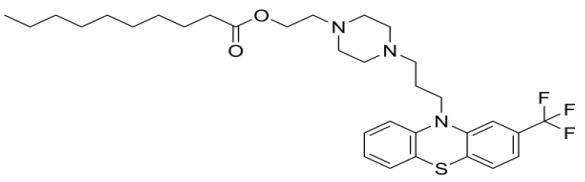
The drugs in ester forms are depot in fatty tissue and take time to hydrolysis and liberate the original drugs, for example, fluphenazine decanoate is a prolonged drug used in the treatment of schizophrenia which requires many doses each month, hence, the esterification of fluphenazine solves the problem of repeated doses.

Benzathine penicillin is a benzylpenicillin with benzathine that forms salt, and no ester but forms a complex compound which is depot in fatty tissues and released gradually to the blood.

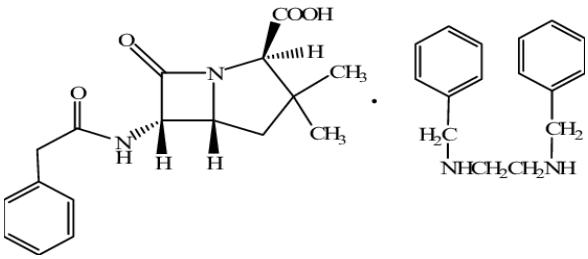
Progesterone is a female sex hormone which in ester forms acetate, propionate, and cypionate which make the progesterone prolonged in action due to storage in fatty tissues and takes a long time to hydrolysis and release the

progesterone, also testosterone is the male sex hormone in form acetate which prolonged its action. Nandrolone decanoate is a male sex hormone which has mainly anabolic activity, this ester form makes it a prolonged action and depot in fatty tissues.

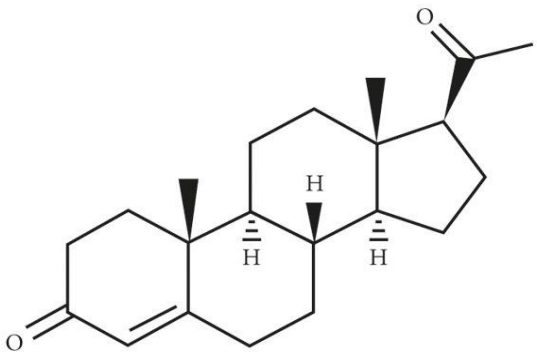
2. Chemistry and Pharmacology



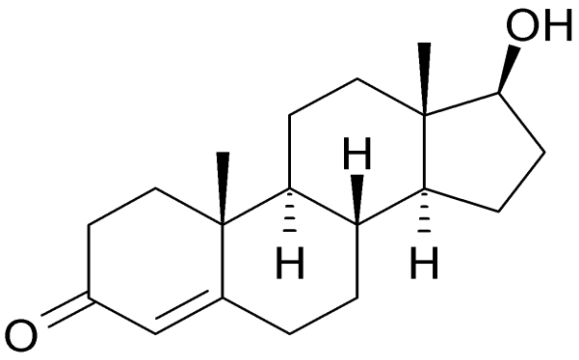
Fluphenazine is a drug used for the treatment of schizophrenia. It has a phenothiazine ring and is an ester formed from fluphenazine and decanoic acid to form fluphenazine decanoate. It is used to relieve the need for repeated injections in patients, as it is taken once per month. This esterification prolongs the action of fluphenazine.



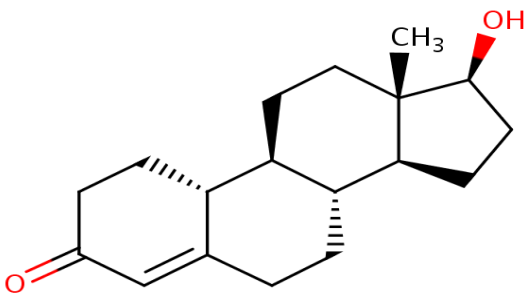
Benzathine penicillin is a salt formed from 2 mol of penicillin G and 1 mol of benzathine (N, N-dibenzyl ethylene diamine). It is not an ester, but a salt that forms a depot in the fatty tissue and is slowly hydrolyzed. It is used in the prevention of rheumatic heart fever, which arises from a streptococcal infection. Benzathine penicillin is a beta-lactam antibiotic with long-acting properties.



The esterification of progesterone with acetic acid and propionic acid form esters of progesterone which is depot in the body in the treatment of early abortion in the first months of pregnant women, hence these esters make the progesterone prolonged action in this case and in deficiency of progesterone.



Testosterone is a male sex hormone which is in ester form, where the ester is more lipid soluble than the parent testosterone, testosterone has anabolic and androgenic effects i.e., builds the muscles and increases the spermatogenic effect in males, so testosterone is used in depot form due its steroidal nucleus and its ester form.



Nandrolone is a male sex hormone, which is nor-testosterone, an endogenous hormone resulting from the metabolism of testosterone via oxidative dealkylation. Nandrolone decanoate is an ester form, which forms a depot in adipose tissue that is hydrolyzed at a slow rate and gives a prolonged action. Nandrolone is an anabolic compound more than an androgenic compound, i.e., used in muscle building.

3. Conclusion

The esterification of pharmaceutical compounds significantly enhances their therapeutic profiles by increasing lipid solubility and facilitating depot formation in fatty tissues. This process effectively prolongs the action of various drugs, such as fluphenazine decanoate, benzathine

penicillin, progesterone esters, testosterone esters, and nandrolone decanoate. By slowing the hydrolysis of these compounds, esterification reduces the frequency of administration required, thereby improving patient compliance and therapeutic outcomes.

The strategic use of esterified drugs offers distinct advantages, particularly in managing chronic conditions where long-lasting effects are essential. As demonstrated, the modified pharmacokinetics resulting from esterification not only alleviate the burden of regular dosing but also optimize the therapeutic efficacy of these agents. Future research should continue to explore the potential of esterification in developing new formulations that deliver improved pharmacological benefits while minimizing side effects.

In summary, the application of esterification in drug design represents a valuable tool in enhancing the functionality of various pharmacological agents, ultimately leading to better patient care and treatment effectiveness.

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