

# Cholesterol

[Science](#), [Chemistry](#)



Affiliation Cholesterol Bromination Bromination is an example of halogenation reaction that involves addition of the bromine to an organic compound to produce organobromide compounds. During the bromination of the cholesterol, bromine atoms are added to cholesterol to get rid of the double bond by forming cholesterol dibromide. In this case, bromine, which acts as an electrophilic compound, is attacked by nucleophile cholesterol to form insoluble dibromocholesterol that precipitates. However, to reestablish the double bonds, zinc dusts are used, which removes the bromine atoms from the cholesterol molecule. Cholesterol bromination can be used to purify cholesterol (Barton, Miller & Young 98).

#### Oxidation

In most cases, oxidation refers to the addition of the oxygen atom to a substance. However, in organic chemistry, oxidation refers to the loss of bond by carbon atom to hydrogen forming new bonds with other atoms. The overall reaction is characterized by loss of electron density hence loss of the electron. Cholesterol is capable of undergoing both autoxidation and photo-oxidation to produce oxysterols in each case. The common oxidants used for cholesterol oxidation are zinc and sodium dichromate. The first step involves the formation of the ketone, where the O double bond replaces the OH functional group. Then zinc is used to remove the bromine atoms (Stewart, Lee & Can 439).

#### Debromination

Debromination is the opposite of the bromination because it involves the removal of the bromine atoms from the organic molecule. It is one of the dehydrogenation reactions where cholesterol dibromide is boiled in the

presence of alcoholic halide to produce the corresponding alkene molecule. The chemistry behind this reaction is that the bromine attached to the carbon in the alkyl bromide undergoes a reaction with hydrogen that is attached to the  $\beta$ -carbon that releases the hydrogen bromide. The product of the reaction is the formation of a double bond between  $\alpha$  and  $\beta$  carbon resulting into an alkene (House & Row 182).

### Isomerization

Isomerization is a process involving the transformation of a molecule into another with the same atoms but different arrangement. The new molecule is called an isomer. In the case of cholesterol, oxalic acid assists in shifting 5-Cholesten-3-one to a 4-Cholesten-3-one by shuffling of the position of the carbon-carbon double bonds. Oxalic acid provides the acidic medium that favors shifting and formation of a double bond to a new location leading to the formation of the conjugated system with the ketone group (Seager, Spencer & Slabaugh 123).

### Crystallization

Crystallization is the formation of the solid crystals from a saturated solution, melts, or even a gas. It is a technique used to separate solid-liquid mixture. Crystallization depends on the variation of solubility conditions of the solutes inside the solvent. The solid crystallized is first precipitated. The first step of crystallization is formation of nuclei by a process called nucleation. Crystal growth then follows this. Crystal growth involves coagulation of the nuclei to attain a certain shape and size. Apart from the solubility, other factors that crystallization depends on are supersaturation and melting point (Leonard 13).

### Infrared Spectroscopy

This is an important tool in organic chemistry, which uses an instrument called IR spectrometer. This technique is helpful in visualization of structures of compound together with determining the purity of compounds. The IR spectroscopy relies on the principle that the IR radiation absorbed must induce rotation or vibration motions that in turns changes the dipole moments of the molecule. In this regard, the radiation interacts with the alterations of the molecule's dipole moment. In case the frequencies of both the radiation and the molecule match, then the radiation is absorbed. Consequently, causes a change in amplitude of the molecular vibration (Leonard 18).

### Liquid-liquid extraction

This technique involves transferring of solutes from an extract solution to a raffinate solution while in contact with one another. This technique depends on the aspect of favorable distribution of solutes between the two solutions. The distribution of solutes in turn depends on distribution coefficient and selectivity factor. It is worth noting that the distribution coefficient is independent of solute concentration and extract to raffinate phase ration. On the other hand, selectivity factor is independent to the separability of the solutes (Garner 213).

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