

Difference Between DNA and RNA Extraction

www.differencebetween.com

Key Difference – DNA vs RNA Extraction

The study of [DNA and RNA](#) are vital aspects in order to understand the basic concepts of [molecular biology](#), [biotechnology](#), and [genetics](#). Extraction of pure DNA and RNA samples are necessary in order to carry out experimental procedures during these studies. The key difference between DNA and RNA extraction is that **DNA extraction process purifies DNA while RNA extraction purifies RNA**. DNA extraction process has three different steps: cell lysis and [catabolism](#) of membrane lipids and proteins, clumping of catabolites by concentrated salt solution and the precipitation of DNA with [ethanol](#). The three step procedure may consist of two optional steps. RNA purification process consists of four different steps: addition of guanidium thiocyanate for cell lysis, protein denaturation including ribonucleases, separation of RNA by the addition of chloroform and [phenol](#) and the washing of the precipitate using ethanol. The difference between DNA and RNA extraction is their steps.

What is DNA Extraction?

DNA extraction is a physical and chemical process of that is used to purify DNA from a sample. DNA extraction is an important aspect in the context of molecular biology and forensic sciences. The process is of three basic steps. Initially, the cells of interest should be obtained. Next, cell lysis is facilitated in order to break the cell membrane, which opens up the cell and exposes the [cytoplasm](#) along with DNA. Surfactants or other detergents can be utilized to lyse the lipids from the cell membrane while the proteins present are catabolized by proteases. This is an optional step. Once the cell is lysed, clumping of the catabolized molecules is facilitated by concentrated salt solutions. It is followed by centrifugation of the solution which separates the debris clumps from DNA. In this stage, the differentiated DNA is mixed with the reagents and salts used during the cell cycle.



Figure 01: DNA extraction

In order to purify it further, the following steps could be used. One method is ethanol precipitation, which involves mixing ice cold ethanol with the separated DNA sample. DNA is insoluble in alcohol and thereby produce a pellet due to the aggregation of DNA molecules together. Sodium acetate is added in this process in order to enhance the degree of precipitation by increasing the ionic strength. In addition to ethanol precipitation process, phenol-chloroform extraction process could also be induced for this. In this method, phenol denatures the proteins present in the sample. Once centrifuged, denatured proteins will remain in the organic phase while the DNA molecules that are mixed with chloroform will be present in the aqueous phase. Chloroform will remove the phenol residues. Once extraction is completed, DNA is kept dissolved in TE buffer or ultra pure water.

What is RNA Extraction?

RNA purification is a process by which RNA is purified from a biological sample. Due to the presence of ribonuclease in the cells and tissues, this process is complicated. Ribonuclease enzyme has the ability to degrade RNA rapidly. The chemical nature of ribonucleases is extremely stable, and it is hard to inactivate them. Neutralizing the ribonucleases is an option. Since this enzyme is ubiquitous in the cells and tissues, special techniques are developed for RNA

extraction. Out of the many methods, the common method is Guanidinium thiocyanate-phenol-chloroform extraction. This extraction method depends on [centrifugation](#) and phase separation. The mixture to be centrifuged consists of the aqueous sample and a water saturated solution that consist of phenol and chloroform. Once centrifuged, the solution consists of an upper aqueous phase and a lower organic phase under neutral pH conditions (pH 7-8). RNA is present in the aqueous phase. The organic phase typically consists of proteins dissolved in phenol and lipids dissolved in chloroform. A chaotropic agent (a molecule that has the ability to break the hydrogen bonds between water molecules) is added; this is known as, guanidinium thiocyanate. This agent has the ability to denature proteins which include ribonucleases that can degrade RNA and is involved in cell lysis. It also separates rRNA from ribosomal proteins. The final step of RNA purification is washing the precipitation of the aqueous phase with ethanol. RNA could also be purified using liquid nitrogen.

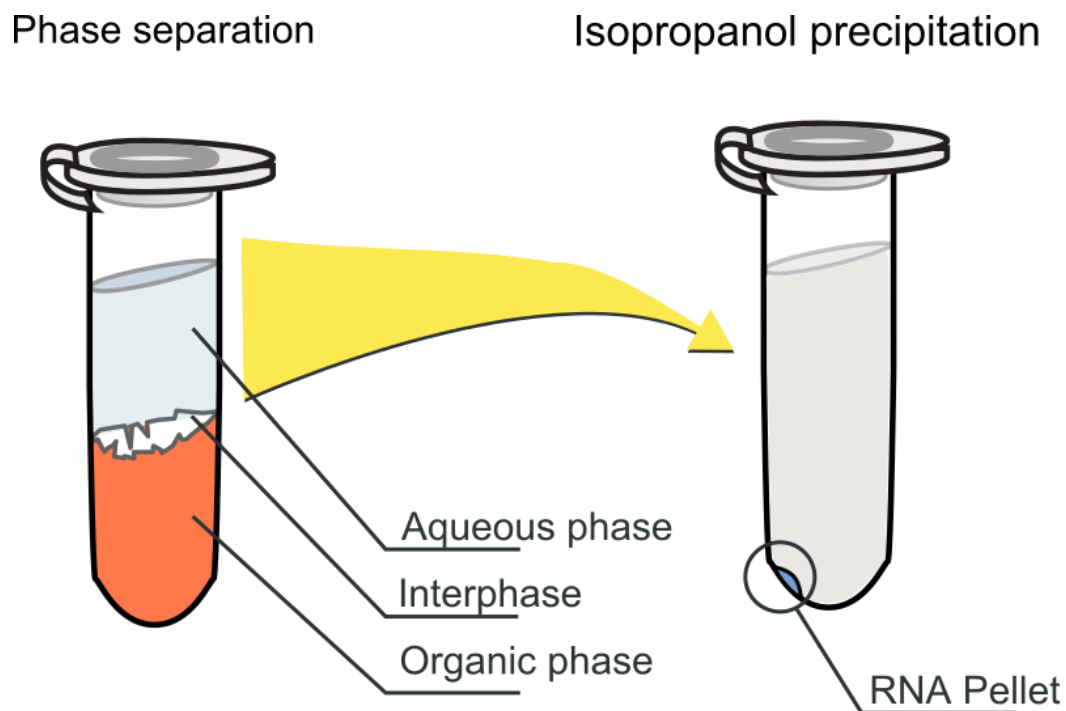


Figure 02: RNA Extraction

What are the similarities between DNA and RNA Extraction?

- Both extraction processes utilize harmful chemicals such as phenol and chloroform.
- Centrifugation is an essential technique for both processes.
- Ethanol is used to wash the precipitate and to obtain purified DNA or RNA.

What is the difference between DNA and RNA Extraction?

DNA vs RNA Extraction

DNA extraction is a process which extracts DNA from an organism or sample.

RNA extraction is a process which extracts RNA from a sample.

Steps

The DNA extraction process is composed of three different steps with two optional steps.

The RNA extraction process is composed of four different steps.

Reagents

Surfactants, proteases (optional), alcohol, chloroform, phenol, sodium acetate are used for DNA extraction.

Guanidium thiocyanate, chloroform, phenol, ethanol are used for RNA extraction.

Summary – DNA vs RNA Extraction

DNA and RNA extraction are vital aspects of the experimental procedures for the study of molecular biology, genetics, and biotechnology. Both processes involve similar reagents, but RNA extraction utilizes a special reagent known as Guanidium thiocyanate which diminishes the activity of ribonucleases. This is the main difference between DNA and RNA extraction.

Reference:

1. Chomeczynski, P, and N Sacchi. "Single-Step method of RNA isolation by acid guanidinium thiocyanate-Phenol-Chloroform extraction." Analytical biochemistry., U.S. National Library of Medicine, Apr. 1987, [Available here](#). Accessed 31 Aug. 2017
2. Hindawi. "DNA, RNA, and Protein Extraction: The Past and The Present." BioMed Research International, Hindawi, 30 Nov. 2009, [Available here](#). Accessed 31 Aug. 2017.

Image Courtesy:

1. "DNA extracted from avocado" By Mike Seyfang – originally posted to Flickr as success ([CC BY 2.0](#)) via [Commons Wikimedia](#)
2. "PhOH-CHCl3 extraction" By Squidonius (talk) – Own work (Original text: self-made) (Public Domain) via [Commons Wikimedia](#)

How to Cite this Article?

APA: Difference Between DNA and RNA Extraction. (2017, September 08). Retrieved (date), from <http://differencebetween.com/difference-between-dna-and-vs-rna-extraction/>

MLA: "Difference Between DNA and RNA Extraction" *Difference Between.Com*. 08 September 2017. Web.

Chicago: "Difference Between DNA and RNA Extraction." *Difference Between.Com*. <http://differencebetween.com/difference-between-dna-and-vs-rna-extraction/> accessed (accessed [date]).



Copyright © 2010-2017 Difference Between. All rights reserved