Problem of plastic container for storage of chemicals for nucleic acid isolation kits for PCR use

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A Brief Report

Summary: There is a lot of use of plastic products in the biotechnology field. This report of RNA isolation kit is showing that there is a reaction taking place with a chemical (guanidine thiocyanate) in storage bottle during the self-life period as this liquid changed its color from transparent to yellow along with building the precipitation at the bottom. It makes the chemical unsuitable for use. The problem was solved through replacing the storage container from other manufacturer. Therefore, there is a need to select the storage bottles carefully for long term storage of chemicals to be used in biotechnological methods.

Keywords: Nucleic acid isolation, Storage container, PCR, Guanidine thiocyanate

It is a common practice in laboratories around the world to store the chemicals for molecular analysis in plastic bottles. The biotechnological industry is using different sizes of plastic containers around the world. These containers are made of chemicals, which may interfere or react with the chemicals stored in these plastic bottles and develop new chemical complex. In the literature, there is hardly any report in the biotechnological field, which pinpoints how to select a suitable plastic bottle to be used in molecular biological laboratories because master mix contains the chemicals like $MgCl_2$ as well as isolation kit contain chemicals containing different components like guanidine thiocyanate, Tris HCL etc. These are some examples. (McGookin 1985, Bhatia 2021) The standards for storage contains are still to be defined.

In the literature, there are several studies conducted to know whether stored chemical is inert and how it interacts with plastic of the container in particularly in pharmaceutical industry? Such interaction may lead to uptake of the chemicals in plastic structure or leaching and release of components of the plastic in the stored chemicals. (Jenke et al. 2005, Murat et al. 2019). At which stage of self-life such reactions occur, it may be a complex process to determine.

In this report, Genekam Biotechnology AG is a manufacturer of products for detection of pathogens with PCR method, hence it manufactures also nucleic acid kits. In mini column-based RNA isolation kit, it uses guanidine thiocyanate, which was stored in plastic bottles (Roth Germany). After one year of storage, there was change of color of the stored chemical to yellow and there is development of precipitates at the bottom. (Picture1) The original color of the chemical is transparent and without any precipitation. The labels shows that the kit is manufactured in 2019 because there is expiry date from 2021. The supplier of bottles was changed and there is no development of yellow color and precipitation anymore even after 2 to 3 years. (Picture 2) This report is based on accidental observation as two tubes containing guanidine thiocyanate were left unused during the corona pandemic outbreak for more than one year.

Discussion: This report shows that there are reactions taking place between the containers and stored chemicals, which reduce the self-life of the product as it may make unsuitable to be used as nucleic acid isolation kit in this case, hence it is very important to select the storage containers carefully to determine the self-life of a product. There is a need of long-term studies to determine the suitability of containers for chemicals of a kit as guanidine thiocyanate is one of common used chemical during the isolation for past many years. (McGookin, 1985) The biotechnological including medical product industry is using a lot of plastic products for long-term storage of their final products and their intermediates. There are possibilities of interaction of chemicals used for medical products with their containers being discussed in one book. (Bohrer, 2012). This report is pointing out a major

problem, which needs very urgent attention and needs further research to provide good plastic products for biotech industry because many products are approved as medical devices to be used in diagnostics. We have reported also other pitfalls for corona PCR tests used during the pandemic outbreak in the past. (Bhatia 2022)

Literature:

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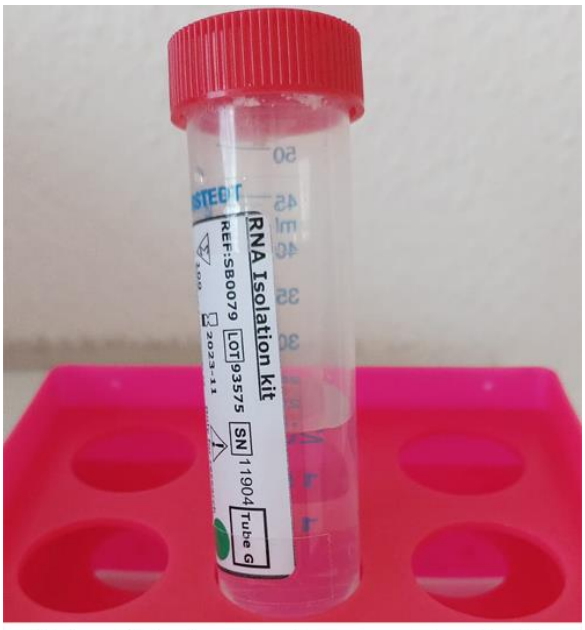
Picture 1 is showing yellow color changed fluid in both tubes.



Picture 2 is showing the same chemical in a new tube after 2 years.