A REVIEW ON VACCINE STORAGE: KEEPING VACCINES SAFE WHEN THEY ARE IN HIGHEST DEMAND

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ABSTRACT

Vaccines are important for the development of global population. For vaccines to be effective it is essential that they are stored and preserved under refrigeration. Pharmaceutical products require controlled storage conditions in order to ensure that their quality is not compromised. Proper environmental control (i.e.; proper temperature, light, and humidity, conditions of sanitation, ventilation and segregation) must be maintained wherever drugs and supplies are stored in the premises. One of the biggest problems faced by laboratories and clinics is improper and mismanaged vaccine refrigeration. Vaccines save three million lives per year. According to the report of U.S. federal vaccines for children program, over $20 million worth of vaccines are wasted annually due to improper vaccine refrigeration. This article focuses on vaccine storage with minimal disposal of vaccines.

KEYWORDS: Vaccine storage, Vaccine refrigeration, Cold chain, Transport

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INTRODUCTION

Drug storage is among the pharmacist’s most important responsibilities. Therefore, adequate methods to assure that these responsibilities are met must be developed and implemented. The pharmaceutical are to be stored under conditions that prevent contamination and, as far as possible, deterioration. The stability of product retain within the specified limit, throughout the period of storage and use. Precautions that should be taken in relation to the effects of the atmosphere, moisture, heat and light are indicated. During storage of the pharmaceutical products is one of the fundamental concerns in patient care. The conditions under which pharmaceutical products are manufactured and stored can have a major impact on their quality. High temperature and relative humidity (RH) are the most important factors involved in drug degradation. Factors such as temperature, humidity, air quality, time and production process characteristics can all have a significant impact on the final quality of products. For many products requiring storage in cool conditions, refrigeration plant is widely used, which needs to be carefully monitored to ensure that the correct temperatures are maintained. Stock must be stored in appropriate and auditable environmental conditions.

A number of factors influence whether vaccines stored in a refrigerator remain within the prescribed temperature range. Vaccine storage trays can obstruct refrigerator air flow, creating areas pockets of colder or warmer air. Vaccines stored in certain locations, such as near the refrigerator cooling unit, may be kept significantly colder than if placed in the main body of the refrigerator. Some factors may vary drastically between different refrigerators (e.g. dorm style, freezer less or pharmaceutical grade). Parameters such as temperature control stability, air circulation, defrost cycles, and long-term drift of the temperature set point can play a major role in determining whether a refrigerator maintains suitable vaccine storage conditions. Because of this, simply setting a refrigerator to a temperature between 2 °C to 8 °C may not actually result in stored vaccines being kept within that temperature range.

Temperatures for refrigerated and frozen vaccines need to be maintained within a strict range, with refrigerated vaccines requiring between 2 and 8 °C and frozen vaccines between -50 and -15 °C. Vaccines such as H1N1 influenza rely on a tight temperature range (2–8 °C), with a desired average temperature of 40 °F (5 °C) and must have temperatures measured twice daily. It is recommended to also use a secondary source of temperature monitoring for maximum product security and peace of mind, such as the Thermo Scientific Smart-Vue™ wireless monitoring system (Thermo Fisher Scientific, Milford, MA). Smart-Vue provides independent, secondary monitoring, and comes with the ability to text, e-mail, or call a staff member if the
温度上升或下降超出期望的范围。 [6]

**Smart-Vue无线监控系统**

**适当疫苗存储和管理**

疫苗应储存在足够大的冰箱中，以应对最高的需求，避免冰箱过载。疫苗不应堆叠或放置在可能导致开启门时其掉落的位置。应允许适当的空气流通，将疫苗存储在冰箱或冰柜的墙壁之外。

在流感季节，恶劣天气可能导致电力中断。在这些情况下，应有一个紧急计划。该计划应包括疫苗存储的替代地点，必要包装材料的清单以及疫苗运输的适当方法。每个包装容器内应有一个校准的温度计，用于监控疫苗在运输过程中的温度。 [8]

适当的疫苗管理始于了解如何正确使用存储和处理疫苗的设备的熟练人员。疫苗应存储在正确温度的冰箱或冷冻箱内，标识为“疫苗专用”。这意味着食品或饮料不应与存储疫苗的同一单元中存储。所有工作人员需要了解制造商提供的指南。处理疫苗的工作人员应维护详细的库存日志，包括疫苗名称、疫苗创建日期、分发时的疫苗状况以及疫苗的过期日期。 [9]

国内冰箱无法维持均匀的温度。
needed to avoid freezing or thawing of vaccines, given that the airflow in these units is neither consistent nor constant. The temperature of a commercial unit can fluctuate as much as $10^\circ$ during normal use. Purpose-built laboratory refrigerators and freezers have forced air circulation that maintains an even temperature throughout the unit, ensuring that products will see little to no temperature fluctuation during use.\(^{(10)}\)

**SAFE VACCINE TRANSPORT**

The cold chain must be maintained during transport. Vaccines should be kept in an insulated cooler. Frozen ice packs or refrigerated packs should be used as needed to maintain the temperature between 2 and 8 °C. The temperature in the cooler should be monitored and logged immediately before and after transport. A layer of insulation should be tucked between the vaccine box and the ice packs to prevent direct contact, which could result in freezing temperatures in vaccine vials. The cooler should be kept in the passenger cabin of the vehicle; temperatures in a trunk or truck bed could get too hot in summer or too cold in winter.
CONCLUSION

Maintaining proper storage conditions at pharmacies is essential to reduce the problems caused by environmental factors. The pharmaceutical products were found to retain their potency when stored in pharmacies having good storage facilities. Hence it is important to highlight the importance of maintaining proper storage conditions in pharmacies by the authorities. All vaccines are sensitive biological substances which are susceptible to heat, light and/or freezing. They will lose their potency with time but this becomes more rapid if vaccines are not continuously stored at the temperature appropriate for them from the time they are manufactured till the time of use.

REFERENCE


