

Summer of 1995 -Mailbox Temperature Excursions in St. Louis¹

J.C. Black and T. Layloff,* *US. FDA Division of Drug Analysis*

Introduction

Resolution No. 10 adopted by the 1995 United States Pharmacopeial Convention instructed the Committee of Revision to investigate the impact of shipment, distribution, and storage conditions on the quality of pharmaceutical products. Since many pharmaceutical products are distributed through the United States Postal Service, an experiment was conducted to measure, over the course of a summer in St. Louis, Missouri, the interior temperature of a mail box placed in full sun exposure to determine the approximate maximum temperature excursion. The interior temperature of a black mail box with full sun exposure was monitored for a 4-month period. The maximum temperature of 136°F (58°C) was recorded in an ambient temperature of approximately 101°F (38°C). The maximum interior versus exterior temperature difference was approximately +31°F (+17°C).

Equipment and Location

For this experiment, the measuring devices, type of mailbox, and testing location are described as follows:

Recording thermometer: OMEGA Chart-Temp 7-day recording thermometer, Model CT-220F-7, temperature range of 20°F to 220°F, OMEGA Engineering, Inc. P.O. Box 4047, Stamford, CT 06907-0047.

Mercury thermometer: ERTCO maximum registering mercury thermometer, Model H-93902-41, temperature range of 0°F to 220°F, Cole-Palmer Instrument Co., 7425 North Oak Park Ave., Niles, IL 60714.

Mailbox: Black rural mailbox, standard size, 19" x 6.25" x 7.5", galvanized steel, ribbed design, approved by the Postmaster General.

Location- The testing location was St. Louis County, Missouri, with an approximate latitude of 38.5 degrees north and an elevation of 550 feet above mean sea level. The mailbox was placed on a wooden deck railing facing south with full sun exposure.

Procedure

The mercury thermometer was calibrated against two NIST thermometers at 32°F and 212°F. The chart-recording thermometer is an aneroid design with a mechanical spring driven clock-drive. Both the mercury thermometer and the chart-recording thermometer were placed in the mailbox. The calibrated mercury thermometer served as a reliability reference check for the performance of the chart-recording thermometer. The mercury thermometer was placed in a foam-padded shipping envelope to protect it from breakage. Temperature readings were taken from the mercury thermometer on Tuesdays and Fridays. Readings from both thermometers were logged in a laboratory notebook. Maximum ambient temperatures were obtained from the National Weather Service data log recorded at St. Louis-Lambert International Airport located five miles from the testing location.

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Results and Discussion

The experiment was conducted between June 9 and October 28, 1995. The ambient temperatures ranged from 53°F to 101°F. The differences between ambient and mailbox temperatures ranged from -6°F to 41°F (-3°C to +25°C), and most of the differences fell between +20°F and +35°F (+11°C and +26°C). Mailbox temperature differences from ambient temperatures are inconsistent due to cloud cover, wind, and precipitation. The maximum mailbox temperature observed was 136°F (58°C) at an ambient temperature of 101°F (38°C).

Conclusion

These results show that pharmaceutical products distributed through the United States Postal Service may be exposed to temperatures that significantly exceed those normally specified in stability testing procedures. Pharmacists, therefore, should exert care in sending thermally labile pharmaceutical products through the mail system in the summer months.

* U.S. FDA Division of Drug Analysis, St. Louis, MO 63101 (Dr. Thomas Layloff).