The Assessment of Commercially Available In-Home Drug Disposal Product

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Purpose and Introduction

This project aims to understand in-home disposal kits' instructed use and ability to resist potential misuse by providing a robust evaluation of the **Efficiency, Ease of Use, and Safety** of in-home disposal kits.

Many of us are familiar with or heard of the Opioid Epidemic. According to the CDC, death rates from Opioid overdose have increased in waves over the last 25 years. In 2022, 108,000 people died from a drug overdose, with 82,000 deaths being from opioids (76%). A major factor contributing to the risk of opioid misuse is the in-home storage of unused opioid products.

To address these issues, the FDA was given authority to regulate unused in-home Opioid products. This led to companies in the private sector to develop in-home disposal kits that would make drugs non-retrievable. There are two main mechanisms of action: physical inactivation (i.e., activated carbon or other adsorbent material) and chemical inactivation (i.e., an oxidizing agent such as calcium hypochlorite). Despite the kits' widespread availability, few studies have been performed to evaluate their effectiveness and safety, which raises concerns for regulatory agencies (EPA, DEA).

Conducted adsorption studies to assess the usability and efficacy of 3 kits: Deterra® pouch, DisposeRx sachets, and NarcX solution.

Experimental Methods

Adsorption Study:

Step1: Add x amount of Targin tablets (40/20 mg) to Deterra® pouch, DisposeRx or NarcX solution.

Step 2: If instructed add x mL of warm (~40°C) distilled water and shake for 30 seconds.

Step 3: 1 mL was withdrawn from the samples at respective timepoints.

Step 4: Filter using a 0.22-µm polyester filter and assay via UPLC.

*The amount of Oxycodone and Naloxone in solution and remaining tablets were determined by a validated UPLC method.

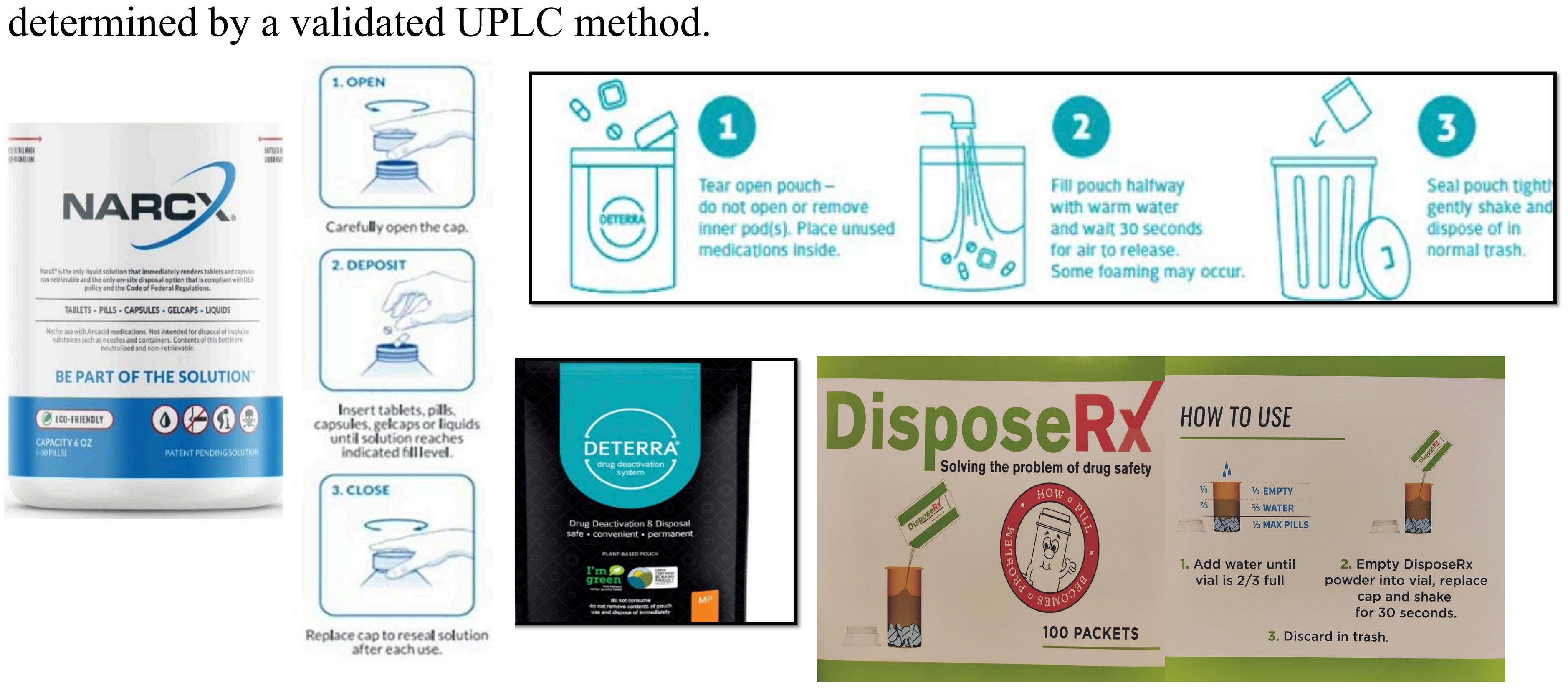
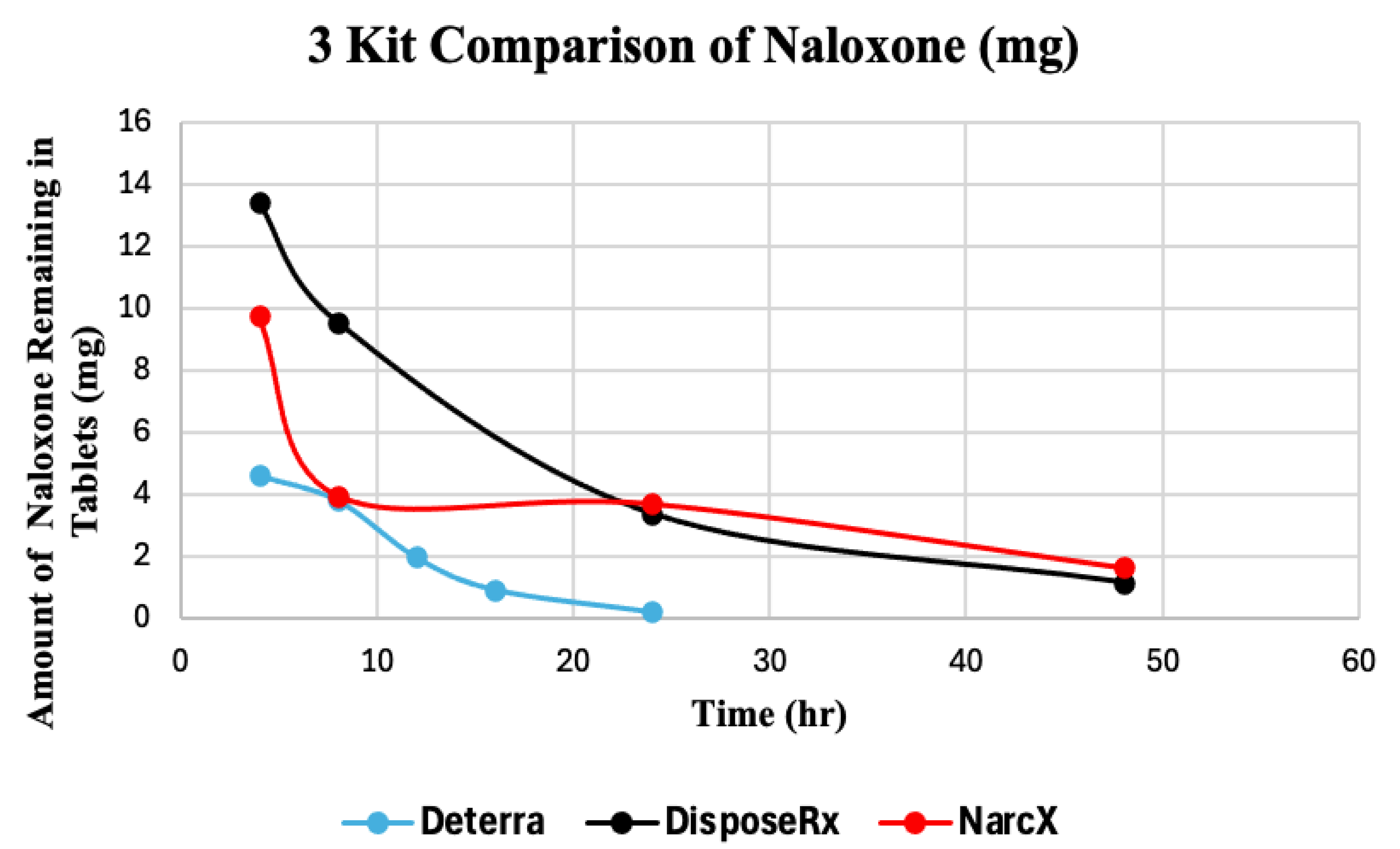


Fig 1: Disposal Kit Packaging and Instructions; Deterra®, DisposeRx, NarcX

Results and Discussion



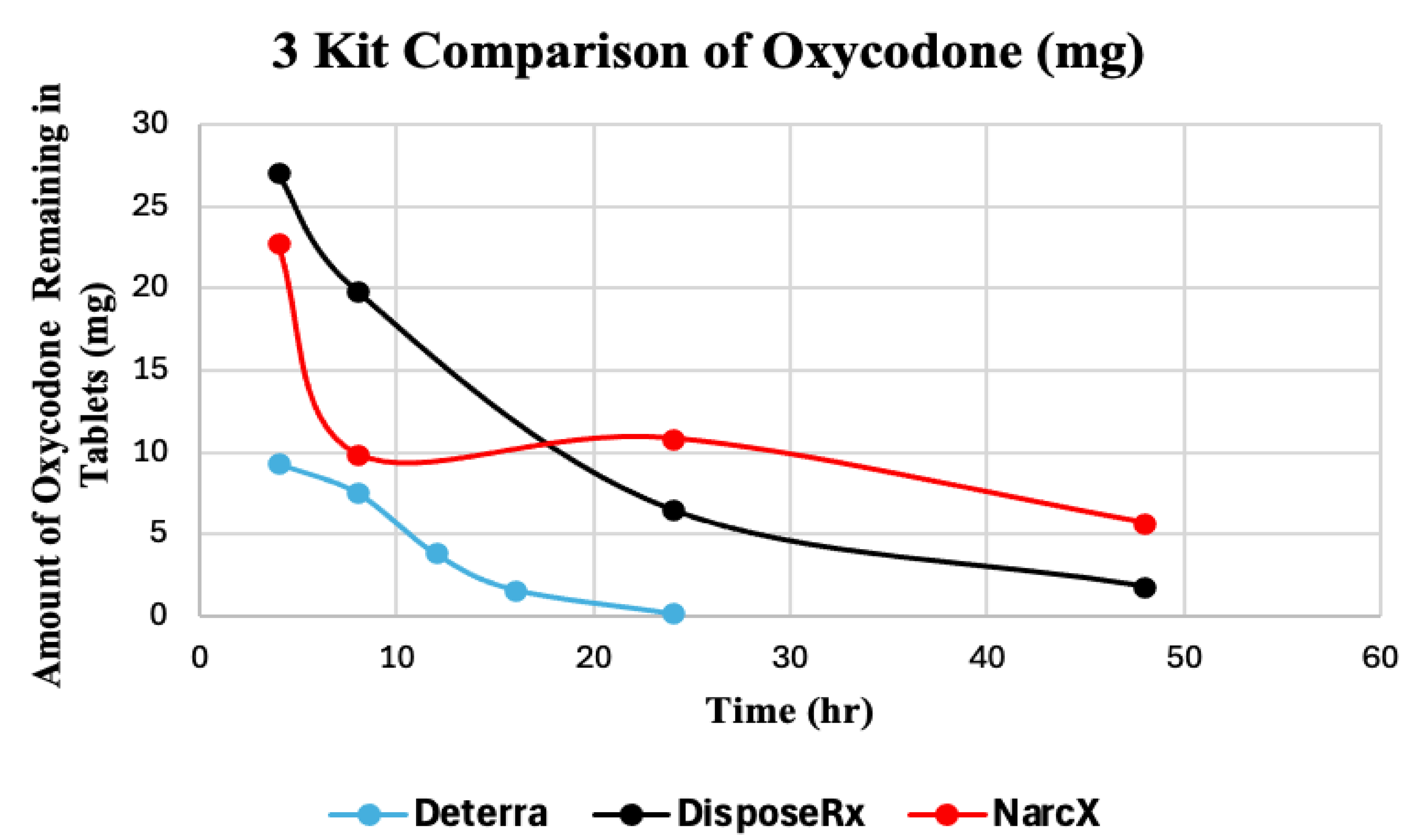


Fig. 2: Comparison of Disposal Kits; Naloxone (top graph), Oxycodone (bottom graph)

Fig 3: Physical Form of Disposal Kits Left to Right; Deterra® (before water), DisposeRx (after water), NarcX (after opening)

Workflow

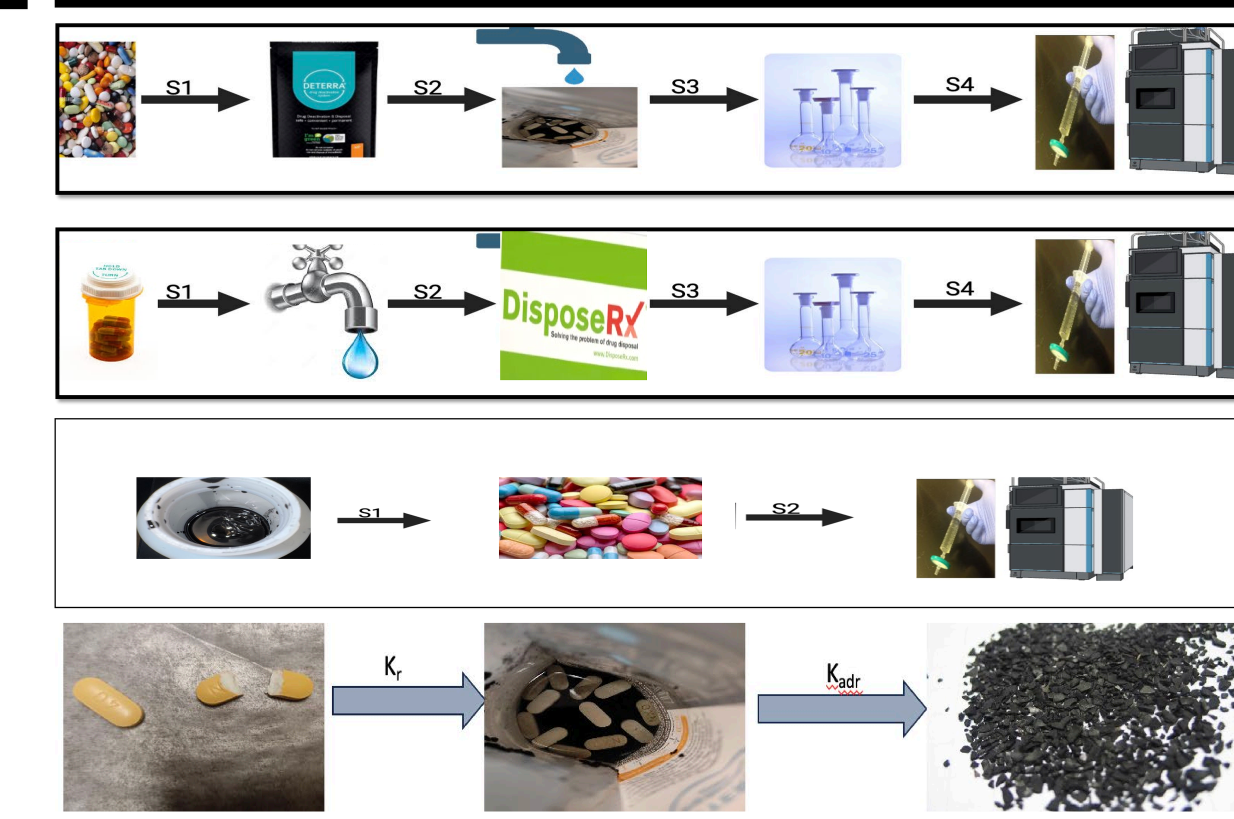


Fig. 4: Adsorption Study Procedure; Deterra® (top), DisposeRx (middle), NarcX (bottom)

The drug exists in 3 phases at any time: in the tablet, in the solution, or adsorbed by activated carbon or polymer

Conclusions and Future Directions

Among the tested in-home disposal kits, all have shown a downward trend for available API (active pharmaceutical ingredient), potentially indicating the effectiveness of in-home drug disposal. However, the kits tested show varying degrees of efficacy in rendering the API's non-retrievable.

Future directions:

- Saturation studies will be conducted on all kits.
- Testing a range of other commercially available disposal kits.
- Testing other APIs and formulations to assess the ability of the kits to render the drugs non-retrievable.
- Assessing the robustness of the kits if improperly used or tampered with.
- For those that utilize chemical inactivation, identify the resulting product produced.

Acknowledgements

Funded by FDA Grant No: 3U01FD005946-08S6

Dr. Ahmed Ibrahim, Dr. Stephen Hoag, Dr. Chad Johnson, and Salonee Tawde

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