Synthesis of a Unique Fluorescent Material to Print onto Medications for use in the Anti-Counterfeiting of Pharmaceuticals

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Research Objectives

- Synthesize a molecule that fluoresces (fluorescein) (Figure 1)
- Formulate an ink using fluorescein
- Print ink onto medications
- Improve covertness of the ink

Procedure

Ink Formulation

- Synthesized fluorescein according to reaction scheme (Figure 3)
- Made 1.5 mM fluorescein in 50% methanol inks
- Added blue dextran and blue food coloring dyes to solutions to improve covertness

Printing

- Printed QR code encoding for "SDSM&T" (Figure 2) using inks onto various substrates using Optomec M3D printer
- Illuminated under long wavelength (365 nm)

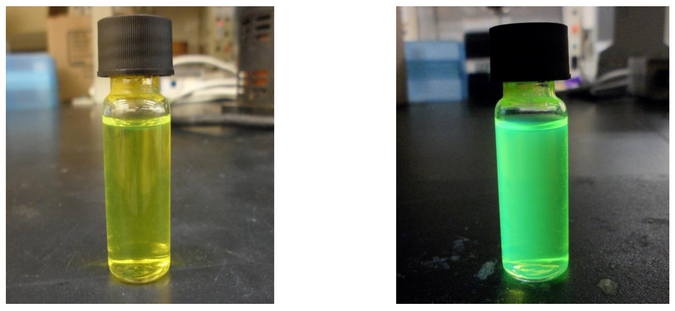

Figure 1: Fluorescein in methanol under ambient light (left) and long-wave ultraviolet light (right).

Figure 2: QR code printed onto substrates.

Introduction

Anti-counterfeiting of pharmaceuticals is a widely growing field due to the increased prevalence and sophistication of counterfeit medications. A fluorescent security label that can be printed onto medications would provide a simple and efficient means by which an authentic pill may be distinguished from a counterfeit one. In this study, fluorescein inks were used to print QR code labels onto a variety of different medications in order to combat the counterfeiting of pharmaceuticals.

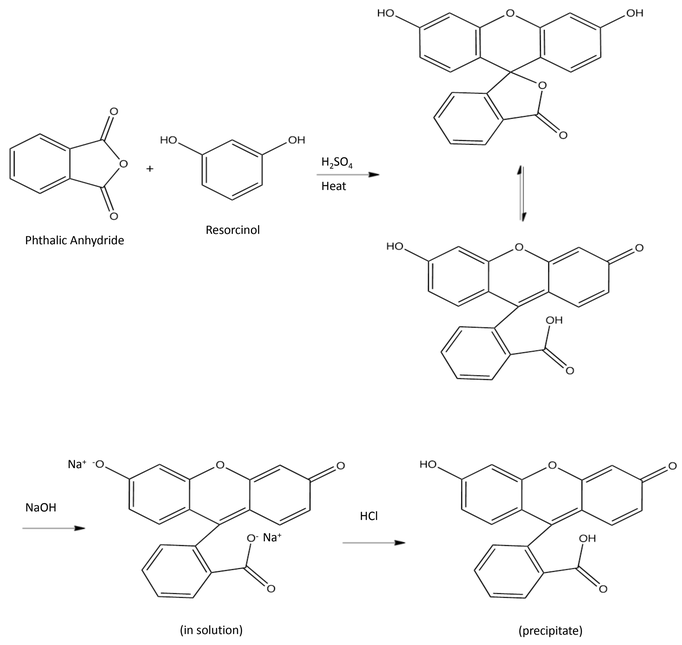

Figure 3: The synthetic scheme for the production of fluorescein.

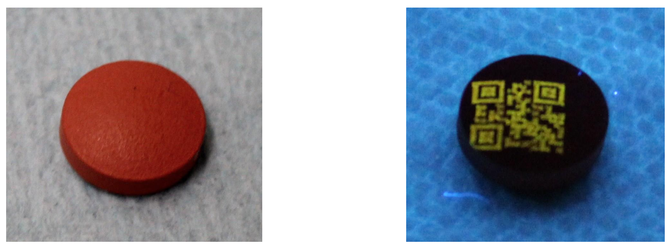

Figure 4: Fluorescein solution printed onto ibuprofen under ambient light (left) and UV light (right).

Results

- Ink was compatible with enteric coated medications (Figure 4)
- Printing onto yellow medications allows for increased covertness (Figure 5)
- Blue dyes successfully mask fluorescein color and maintain fluorescence properties (Figure 6)

Figure 5: Fluorescein ink printed onto ChlorTabs® under ambient light (right) and UV light (left).

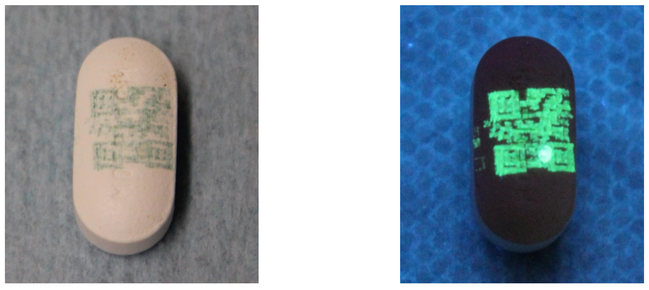

Figure 6: Blue dextran fluorescein ink printed onto Motrin® under ambient light (right) and UV light (left).

Conclusions

- Fluoresein QR code labels could provide an additional level of authenticity to medications

Future Work

- Microencapsulate fluorescein with UV degrading polymer for increased covertness
- Different types of fluorescent inks could be formulated for medications that are not enteric coated

Acknowledgments

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