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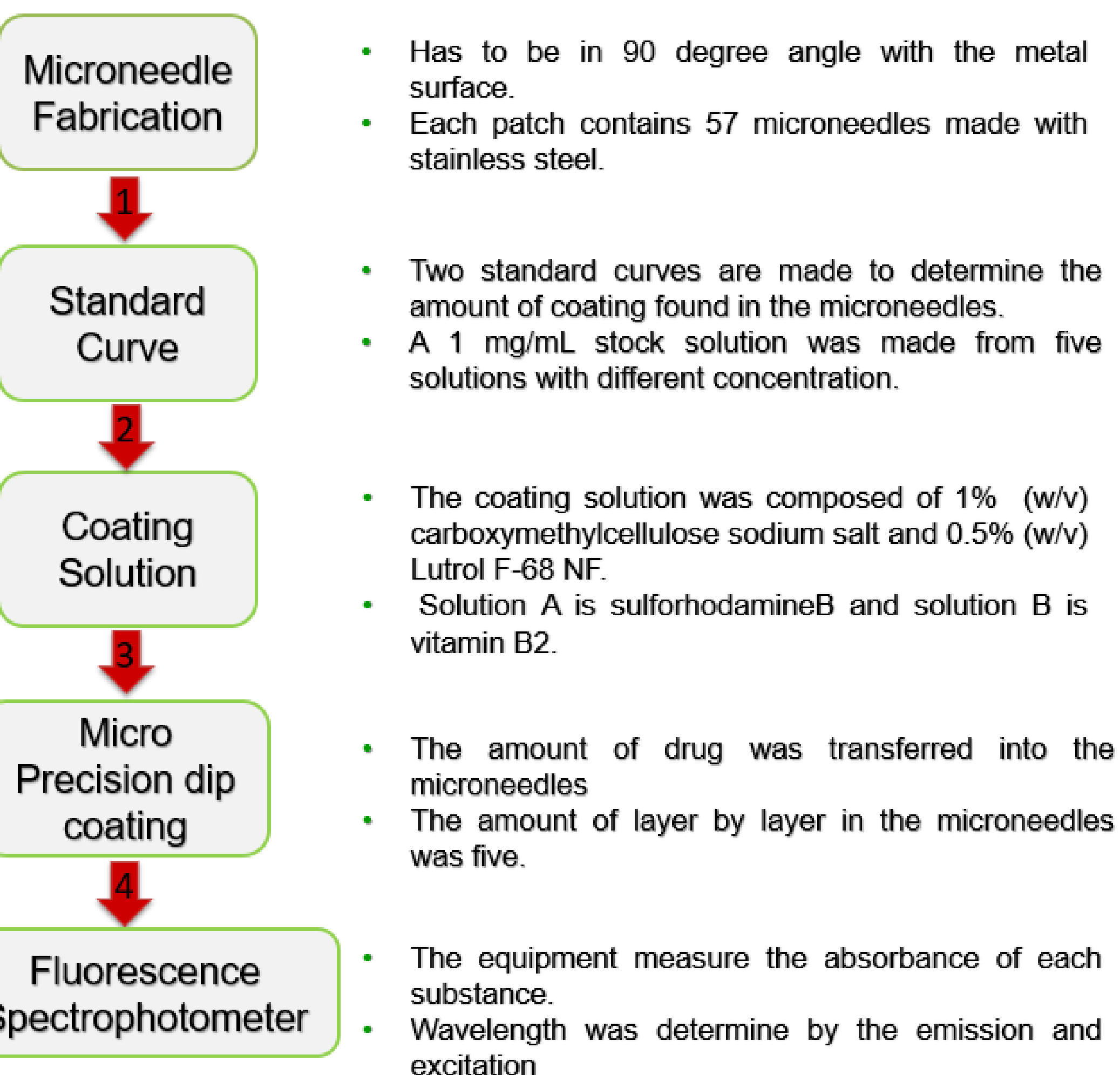
Abstract

The world is being affected by several diseases that are treated with injected medicine using hypodermic needles. Needles have become the most widely used medical device, with an estimated 16 million injections administered worldwide [1]. Hypodermic injections cause different side effects like pain, irritation, swelling, and redness of the skin. To increase patients' acceptance, it has been investigated that a smaller needle diameter and insertion force reduces the pain considerably. Using this criterion, the coated microneedles have been developed to minimize pain and achieve greater patient confidence. One of the most important parts is to know how much concentration or drug is in the microneedles to supply these into the skin. This research will demonstrate the law of conservation of matter with the coating solution made from two different drugs in the microneedles. Where the micro-precision method will be used to coat the drug on the microneedles. In addition, with the fluorescence spectrophotometer instrument, the amount of sulforhodamine B (A) and vitamin B2 (B) in the coating solution will be measured.

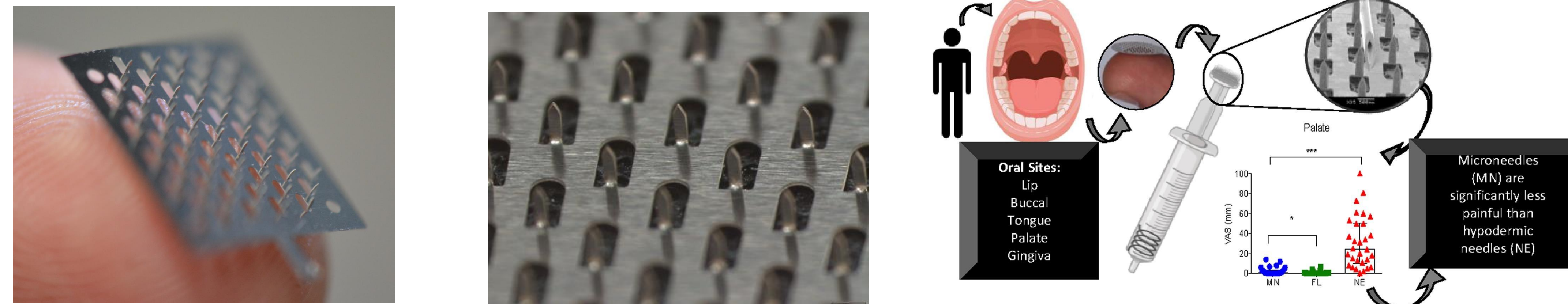
Objectives

- Another alternative for the administration of drugs that we produce, using microneedles and maintaining the law of conservation of mass, efficiency, efficacy, and quality without altering the standards of stability and concentration of the product.
- Helps the company's goals to contribute to the patients to have administration options to reduce different side effects like pain, irritation, swelling, and redness of the skin while maintaining the quality and efficiency of the product.

Methodology



Microneedle Fabrication



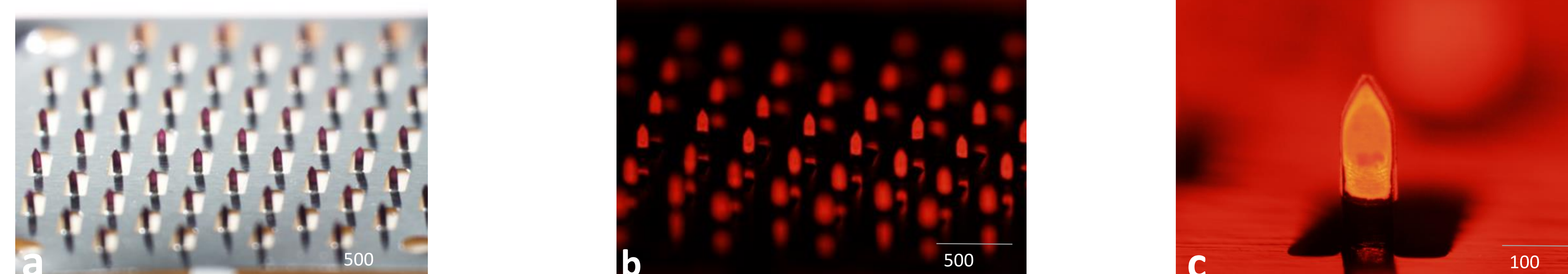
Experimental Setup and Method

Sulforhodamine B (ng/mL)	Vitamin B2 (ng/mL)
90	50
70	150
60	200
30	350



Results and Discussion

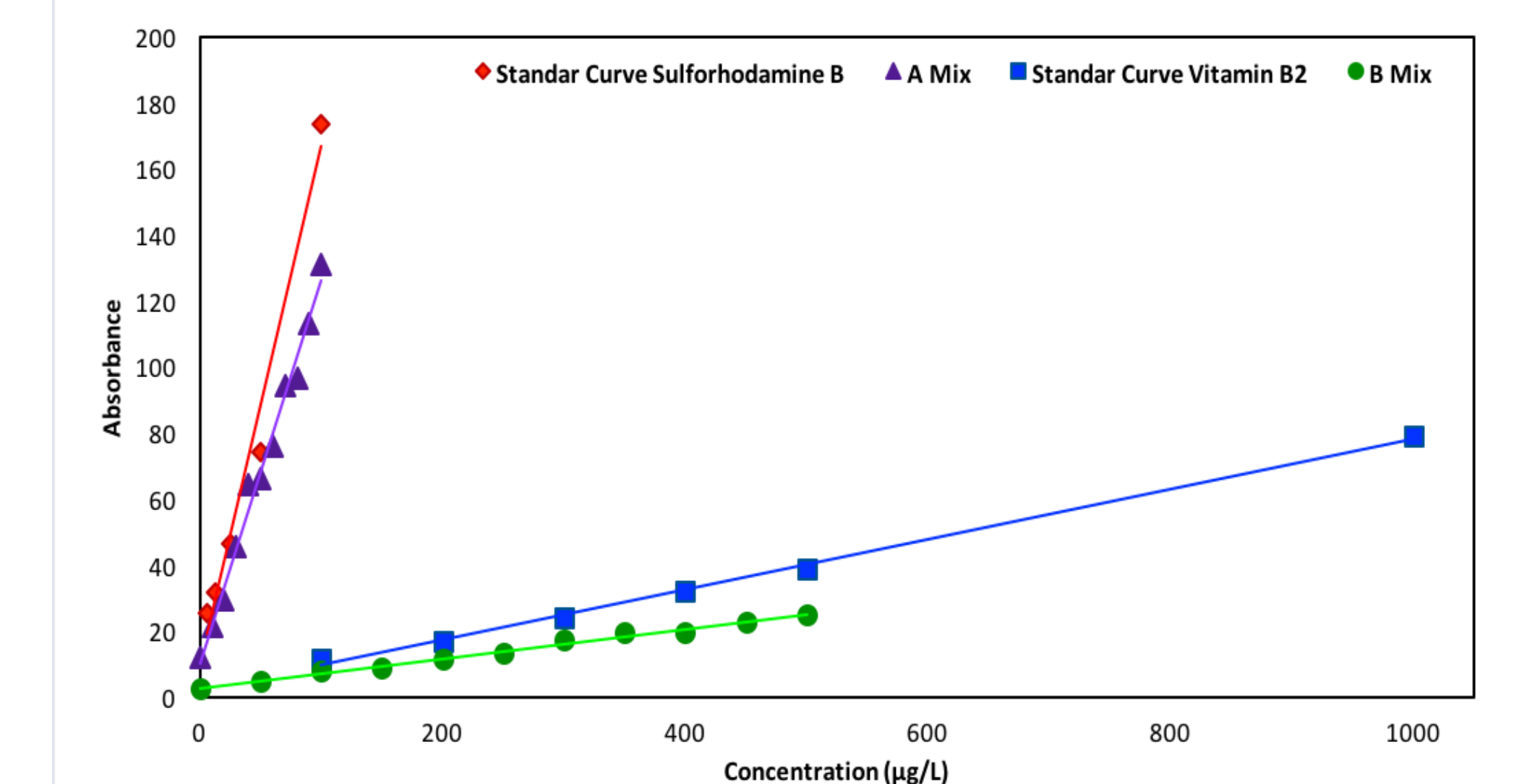
(i) SulforhodamineB coating on 2-dimensionless microneedles patched



(ii) Vitamin B2 coating on 2- dimensionless microneedles patched



(iii) SulforhodamineB and Vitamin B2 coating on 2- dimensionless microneedles patched



Theoretical Ratio (A/B)	Experimental Ratio (A/B)
1.8	1.856
0.466	0.578
0.3	0.336
0.085	0.0868

The following results were obtained from methodology execution:

- It is observed that the drugs of sulforhodamine B and vitamin B2 when they are in their pure state and with high concentration, the absorbance tends to become greater.
- When mixing A and B the absorbance decreases proportionally with the concentration of each substance.
- As the coating solution was used in different concentrations, it was identified that the absorbance varied but the mass ratio remained the same.

Conclusions

- In a world with high incidence of diseases, where patients require regularly medication it is important to ensure the effectiveness of the drug.
- Being the concentration a determinant factor for the microneedle treatment effectiveness, the value were maintained for the coating solution and pure substances subjects of study.
- The investigation results demonstrated the law of conservation of matter using absorbance as the main indicator through experimentation.

Future Works

For future work, larger molecules will be investigated to observe the mass conservation behavior. Experiments will be performed with sulforhodamine DNA and proteins to administer the drugs to different animals in the mucosal area and to calculate the mass transfer.

References

[1] Hauri A, Armstrong G, Hutin Y. The global burden of disease attributable to contaminated injections given in health care settings. *Int J STD AIDS*. 2004Jan;15(1):7-16
 [2] McAllister DV, Wang PM, Davis SP, Park JH, Canatella PJ, Allen MG, Prausnitz MR. Microfabricated needles for transdermal delivery of macromolecules and nanoparticles fabrication methods and transport studies. *Proc NatlAcadSci USA* 2003;100(24):13755-13760
 [3] Harvinder S. Gill, Mark R. Prausnitz. Coated microneedles for transdermal delivery. *National Institute of Health USA* 2007 February 12; 117(2): 227-237