fqubed - Summer Internship 2009

Natalia Cardona: Biomedical Engineering, SWC, natalia-cardona@uiowa.edu
Carlos Lameda Diaz: Biology, SWC, carlos_lamedadiaz@hotmail.com
As mentored by: Dominic King-Smith, Ph.D., Nadir Buyuktimkin, Ph.D., Servet Buyuktimkin, Ph.D., John Newsam, Ph.D.

Introduction

fqubed (Fluids and Fluidized Formulations) is the research and development facility of **Nuvo Research Inc**. Nuvo is a Canadian pharmaceutical company focused on developing targeted therapeutic products designed to produce minimal side effects.

The company develops drugs based on two technology platforms: **transdermal drug delivery** and **immune system regulation**.

The transdermal drug delivery objective is to transport drugs through the skin directly to the disease site causing fewer side effects than oral medications. The immune regulation platform focuses on supporting the immune system by targeting the macrophage, a type of white blood cell that coordinates much of the immune system, to regulate normal immune function.

Aim

The purpose of this internship is to gain experience in the field of biochemistry by doing experiments similar to the ones done in laboratory courses.

Our tasks were to create different formulations and to follow procedures. The formulations contained an antifungal chemical and are being developed for treatment of nail fungus. The procedures will help determine skin retention and antifungal concentration in immiscible mixtures.

Method

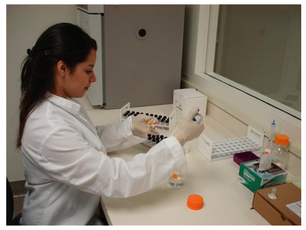
Partition Studies

A calibration curve was done with known concentrations of the antifungal in a known solvent. Then, two immiscible liquids (octanol and aqueous solvents) were stirred together with the antifungal compound for two nights to get saturated solutions using an automatic stirrer.

Samples from each phase were obtained and their concentration was measured using the spectrophotometer.

Carlos gained real hands-on experience taking samples from different concentrations of the mixture for later measurements using the spectrophotometer.

Natalia organized 1000+ pieces of scientific literature and corporate information related to new product planning.



Natalia analysed skin retention samples a second time in a High Performance Liquid Chromatography machine for more accurate results.

Skin Retention Studies

Snake skin was pre-treated with proprietary enhancers 1 and 2. The skin was then soaked in a saturated solution of an antifungal. There were two sets of solutions: pH 5.5 and pH 7.4.

After that the skin was cleaned several times, soaked in ethanol and homogenized. Finally, the samples were filtered and concentrations were measured to calculate the amount of antifungal retained by the skin.

Results

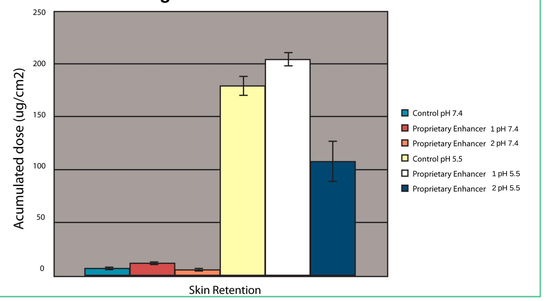
Partition Studies

The octanol phase dissolved more of the antifungal compound, therefore more dilutions were necessary for more accurate readings. This indicated that the compound was more soluble in a non-aqueous solvent than in a water-based solvent.

Skin Retention Studies

Skin soaked in saturated antifungal solution with pH 7.4 had an insignificant retention compared to the solution with pH 5.5.

Snake Skin Antifungal Retention Measured with HPLC



Skin pre-treated with proprietary permeation enhancer 1 and soaked in saturated solution pH 5.5 showed no retention. Skin pre-treated with proprietary permeation enhancer 2 and soaked in saturated solution pH 5.5 showed come retention compared to the control samples.

Conclusion

During our involvement with the company participating in the internship program, we learned useful skills in the biology and chemistry fields including a way of organizing medical information from hundreds of different sources.

This opportunity gave us experience and confidence to work in a laboratory. Particularly, this internship motivated us to continue with our studies and our majors.

Acknowledgements

fqubed staff

We want to thank for the National Science Foundation, fqubed and the NSF MESA Program for their support.

SWC: NSF Grant # DUE0653234