**SmartBottle™ ~ Biometric Tamperproof Drinkable Drug Dispenser**

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**Introduction ~ Unmet Needs**

According to the World Health Organization (WHO), morphine is one of the very few drugs that can effectively relieve severe pain, such as that experienced by most cancer patients in palliative care. It is very cheap, but being an opioid, its distribution in developing countries is strongly impeded by governmental regulations, due to fear of misuse and abuse (high street value for trafficking). Even though the number of cancers is increasing rapidly in those countries, patients in rural areas have very limited access to hospitalization, and virtually no access to morphine.

**Proposed Solution**

Originally imagined by Prof. Eric Buchser, MD, head of the Pain Management Center at Morges Hospital, Switzerland, and Ing. René Patthey, former CIO at CHUV (University Hospital of Lausanne, Switzerland) and now CTO of Ethimedix, the SmartBottle™ is a cost-efficient yet sophisticated oral (liquid) drug delivery device. It is designed to facilitate the prescription of morphine by providing biometric patient authentication and protections against abuse and tampering.

**Project Background**

The development of the device started off as a CTI project between ESPLAB and Valtronic with the goal of manufacturing a few dozen prototypes for clinical studies to be carried out in the field. Following change of ownership at Valtronic, the project could not be completed, and was taken over by Ethimedix, an emerging Swiss company which was awarded the CTI Start-up Label in 2012. That same year, private investors entered the capital of Ethimedix, making it possible to finish the development of the device, obtain its certification, and invest in production tools.

**Key Device Features**

- Delivers morphine sulfate, or any other drug in liquid form, in any dilution
- Container capacity is 1 liter, corresponding to 2 to 6 weeks of treatment
- Programmable prescription (number of doses per day, doses from 5 to 25 mL)
- Over two years of operation on a single, non-rechargeable battery
- Journal of patient usage (time when a dose is requested, amount delivered)
- Robust, designed to withstand severe environmental conditions
- Biometric patient and caregiver authentication (fingerprint swipe sensor)
- Container is under pressure and its integrity is constantly being monitored
- Drug gets inactivated (release of active charcoal) in case break in is detected
- Ensures high prescription adherence and legal compliance
- Java-based application for management running on a Windows PC
- IrDA communication @ 115 kbps with cryptographic host authentication
- Intuitive and very simple user interface (one button + fingerprint reader)
- Four green / red LEDs for feedback, no display (suitable for illiterate users)

**ESPLAB Contributions**

ESPLAB was responsible for developing the electronic board (PCB) and most of the embedded software running on the TI MSP430 micro-controller, including IrDA communication and interface with the fingerprint subsystem. Ethimedix has now taken over software development, with support being provided by ESPLAB.

**Project Status and Perspectives**

The container itself was designed by Domteknika. A first series of 100 devices were produced in 2014 and are now being tested in a clinical environment in Europe and in Africa. Since the SmartBottle™ is a ground-breaking drug delivery solution, introducing new ways to address pain treatment, Ethimedix is conducting market analysis and prospecting before the commercial launch of the product.