



# THE SLEEP OF LIFE



Trivia

***“...if often he was wrong and, at times, absurd, to us he is no more a person now, but a whole climate of opinion”***

W.H.Auden 1939

Sigmund Freud is regarded as one of the most influential minds of the 20<sup>th</sup> century. A little known fact is his contribution to the field of anaesthesia. Freud was an early user and proponent of cocaine as a stimulant as well as an analgesic. He believed that cocaine was a cure for many mental and physical problems. He published ‘**UBER COCA**’ a monograph about this “magical” drug and started recommending its use to his colleagues. He narrowly missed out on obtaining scientific priority for discovering its anesthetic properties of which he was aware but had mentioned only in passing to Karl Koller, a colleague of Freud's in Vienna. Koller went on to use cocaine for ophthalmic anaesthesia in 1884. Freud also recommended cocaine to one of his friends, Ernest Fleischl-Marxow as a treatment for the morphine addiction he developed while trying to control the pain from neuroma on his thumb. Unfortunately, he developed “double addiction” of morphine as well as cocaine and died in 1891. The rising fascination of Freud for cocaine and his willingness to prescribe it for multiple disorders quickly made him a public danger. Sigmund Freud had a final encounter with pain medicine and palliative care when he was diagnosed with cancer of the jaw in 1923 and died on 23 September 1939 after receiving a deliberate overdose of morphine from his friend Max Schur.

## The development of “Raksha Kawach”

***We spoke to Lt Col Shamik Paul who designed ‘RakshaKawach’-*** An aerosol isolation retractable canopy to manage patients suffering from infectious respiratory disease for protection of healthcare workers and other patients. This is a collaborative project with Dr. Ajay Suryavanshi.

***What is the specific problem that you are attempting to solve?***

The Center for Disease Control and the World Health Organization has confirmed that COVID-19 disease is primarily airborne, and spreads by aerosols less than 5µm, which tend to remain suspended in the closed room environment for prolonged periods (hours). Aerosols containing the viral nuclei, which are between 5-10µm, settle down after a while (mins) but is highly infectious. Healthcare workers (HCW) involved in the management of the airborne disease patients have been donning appropriate PPE, however, in closed spaces like the ICU and the ward, the viral load can be very high. Oxygen delivery devices used for managing these patients generate large amounts of viral laden aerosols. Even when the patients are talking, coughing or sneezing; a huge amount of viral load is released to the surrounding environment. Thus, there has been an urgent need to develop a device to reduce the aerosol footprint in hospitals, which have admitted COVID-19 patients.

***What was your proposed solution?***

There was an acute need to manufacture a device that not only scavenges the viral laden aerosols, but also traps them inside a filter, thereby preventing their dispersion to the surrounding environment. With this vision in mind ‘RakshaKawach’ was conceptualized: as an aerosol containment system which had 2 modules: a retractable canopy and a fan-filter unit. The canopy also acts as a physical barrier when deployed thereby preventing the physical dispersion of the viral-laden aerosols. The fan filter

unit is an efficient negative pressure system to scavenge aerosols from the canopy using 3 sequential filters: pre-filter, fine filter and HEPA filter. This device would not only keep the ICU and the wards relatively safe for the HCWs but also reduce the viral load inhaled by the COVID negative patients who are admitted in the wards. Its application is not restricted to improving safety of HCW while treating patients with COVID 19, but to other contagious airborne diseases as well.

### ***How did you develop a working solution?***

The RakshaKawach aerosol isolation retractable canopy device, is a miniaturized version of a negative pressure room (N class) or airborne infection isolation room (AIIR) recommended for housing patients suffering from airborne contagious diseases: it is a cost-effective alternative to high-maintenance, infrastructure-heavy expensive AIIRs. It is retractable, portable, lightweight, versatile and user-friendly. Proof-of-concept has been established by design and development of the device through the following steps

- (i) Several iterations of the prototype design by CAD modeling were carried out which looked at: canopy and frame design modifications changes in access points positioning and dimensions, fan-filter unit inlet positioning changes, etc.
- (ii) We tested different material options for the canopy frame, the zipper and elastic bands for fastening, fan-filter unit casing, etc.
- (iii) Prototype testing: we demonstrated the efficacy of the prototype with extensive and rigorous pragmatic experiments



**Vigorous testing**

### ***How does the validation process go?***

The device has been subjected to rigorous tests with the help of particle counter and also through Computer Flow Dynamic (CFD) studies. NABL accredited third party labs carried out the tests. Provisional patent has been filed on 02/10/2020 for “an aerosol isolation retractable canopy to manage patients suffering from infectious respiratory disease” in the name Armed Forces Medical College, Pune.

### ***What about commercialization of the product?***

This device will have a wide-ranging clientele. Hospitals housing patients with contagious airborne diseases (spread via viruses and bacteria) would be the primary users. It is very difficult to isolate the COVID patients due to the widespread presence of the virus. ‘RakshaKawach’ is a device that when placed over a patient will scavenge the viral laden aerosols from patient’s vicinity, thereby making the surrounding environment safer. This innovation would have a great impact in reducing the lethality of the disease by decreasing the dose of viral laden particles entering HCW and adjacent patients. ‘RakshaKawach’ could also be used in patients undergoing home isolation and also individuals in quarantine facilities.

### ***Are there any other such products?***

Currently, there is no such device with retractable canopy available in the Indian market. The variants available globally are as follows i) Melbourne model, ii) Israeli Model, iii) NIOSH model, iv) Envelope model: similar to DIAT, Pune and IIT Ropar design. However, our product is superior to these products in the following ways:

- i) The mechanism of canopy retraction allows single step ready access to the patient for HCW
- ii) Aerosol isolation canopy has a simplified design retractable frame and collapsible transparent enclosure reaching up to the mid femoral region
- iii) During the retraction mode, no blockage of inlet of fan-filter unit by collapsible canopy

takes place therefore there is aerosol clearance even during retraction

iv) Multiple access ports

v) It can accommodate beds of various sizes

vi) Collapsible transparent enclosure can be disposed after use whereas support frame can be reused after sanitation: It is therefore a cost-effective, safe solution

vii) When uninstalled, it can be dismantled completely as all components are detachable occupying minimal storage space.



**Final Product**

### **What steps have you taken for Commercialization?**

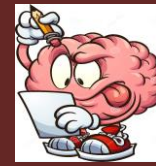
The steps we have taken towards commercialization and taking the product to market includes the following.

We are now planning to assess our device for testing requirement for air cleaners/ air purifiers/ air scrubbers for hospitals according to ISO and FDA standards, after consultation with regulatory experts E.g. ISO 16890-1:2016 Air filters for general ventilation- Part 1: Technical specifications, requirements and classification system based upon particulate matter efficiency (ePM). We are being approached by interested collaborators/ partners like plastic canopy makers, air purifier/ air scrubber manufacturers to license the technology. We plan to engage in technology transfer to interested 3<sup>rd</sup> party manufacturers via non-exclusive licensing. The potential licensees would help us in taking this technology to the masses by producing market-ready product, doing required amendments to suit market

needs and utilize their marketing and distribution channels for better outreach.

***Congratulations on your venture and best wishes for the future. Hopefully this will pave the way for many such inventions by other AFMC faculty and students.***

Thank you very much



**Twister**

1. I was a famous Anesthesiologist, a notorious examiner. I had exceedingly high standards and I refused to pass any candidate who sat before me. In my defense, I had helped create the exam. My peers gradually convinced me to quit examining. I also created oral and nasal connectors, the first catheter mount and many more innovations. At my 90<sup>th</sup> Birthday, the Section of Anaesthetics of the Royal Society of Medicine said I was a doyen of British Anaesthesia, only second to John Snow. Who am I?

2. X, whose chemical structure is given below, was originally designed to treat Porcine Stress Syndrome, which was known to occur in Pigs that were inbred in order to maximize muscle mass. It was only much later that it was realised that porcine stress syndrome is the equivalent of a similar syndrome, Y in humans and this drug has proven effective for the same. An example of veterinary research benefiting humans. X and Y please?

