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PREMIERE ISSUE

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Dr. Douglas Freedberg

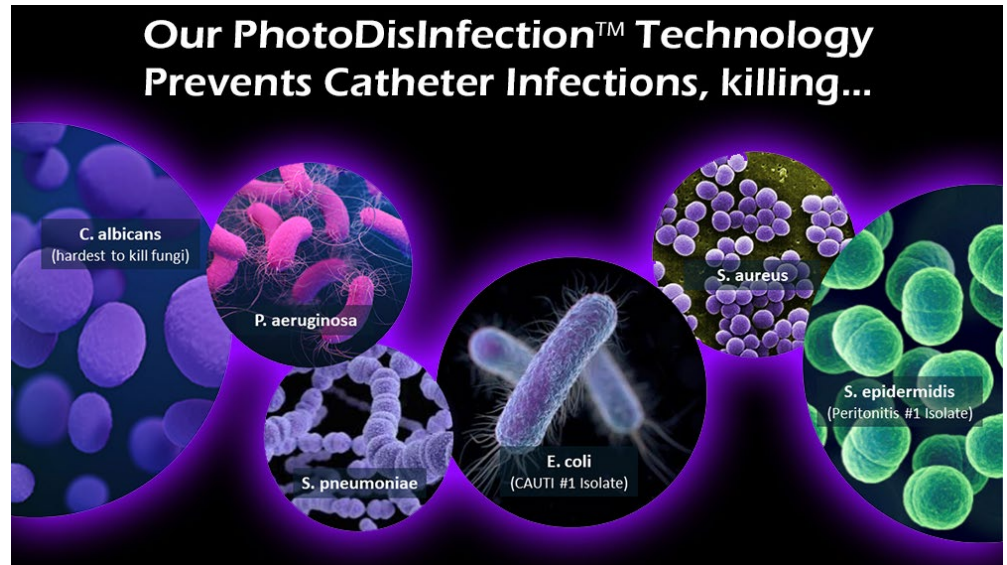


Light Line Medical

Catheter-Associated Infections (CAI) have a tremendous toll on healthcare, individuals, and their families; It is one of the greatest causes of morbidity and sources of cost in medicine today. This is one of the reasons Vicki Farrar, Light Line Medical's (LLM) CEO, joined the company. She has herself lost dear friends and colleagues to these infections. The team is committed to the financial success of the company but also to addressing this tragic healthcare crisis.

Light Line began at the Center for Medical Innovation (University of Utah). In partnership with the Lassonde Entrepreneur Institute, the Center provides undergraduate students with a small stipend to solve an unmet medical need. The student co-founders recognized CAI as a huge global health problem that is becoming difficult to treat because of the increasing prevalence of microbes resistant to antibiotics (i.e., MRSA and ERSA). The current standard of care - sterile technique and antimicrobial catheters - is simply not effective.

The student team developed the PhotoDisinfection™ System ("System") using visible light (i.e., light the human eye can see, not harmful UV light) to disinfect the catheter preventing infection. The idea garnered Immediate support and was awarded many prizes to support the development of this game changing idea {AMA, NASA, NSF, and others). Once the proof-of-concept studies (animal and in vitro) were completed and patents were filed, It was clear an experienced management team was needed to drive this technology to commercialization.



Healthcare Startups

MDNext is the magazine for healthcare innovation. But breakthroughs do not spring wholly formed from a vacuum. Successful entrepreneurs are assisted by a robust innovation ecosystem and central to that ecosystem must be expertise. AngelMD's clinical experts possess the ability to winnow those solutions most likely to overcome both development and adoption hurdles from the chaff of ideas that will never reach the finish line. The AngelMD expert network is proud to support a wide range of promising healthcare startups. We rely on our community of practicing clinicians to not only source promising ideas but to also select those companies with the greatest ability to make it to market and disrupt or improve the current standard of care. For more information on any of the companies featured here, contact us at MDNext@AngelMD.com. Some of these companies are actively seeking investment and/or clinical advisory support from practicing specialists.

To bring LLM's lifesaving technology to market, Vicki tapped Bob Hitchcock, her co-founder at Catheter Connections, to be the CTO. This powerhouse team, who successfully exited via acquisition to Merit Medical Systems, Inc., understand distribution channels, regulatory needs, and IP needed to succeed. LLM also has the support of Alligator Holdings, lead investor, with over 40+ years' experience in manufacturing and commercialization, an often underappreciated determinant of medical device success.

Sunlight is often said to be the best disinfectant, mainly crediting its ultraviolet (UV) component. While UV light is well known to work as a natural disinfectant, it is also harmful to tissue and degrades catheter material (think sunburn). Interestingly, the visible light spectrum (i.e., light that the human eye can see, which is also present in sunlight), is also a natural disinfectant that kills the microbes that cause infections but without harming tissue or catheter materials.

Light Line's patented System delivers visible light to a fiber optic inside an off-the-shelf catheter. The light uniformly irradiates the internal and external surfaces of the catheter, disinfecting it and thereby preventing microbial formation on all catheter surfaces, resulting in the safe and effective prevention of CAI.

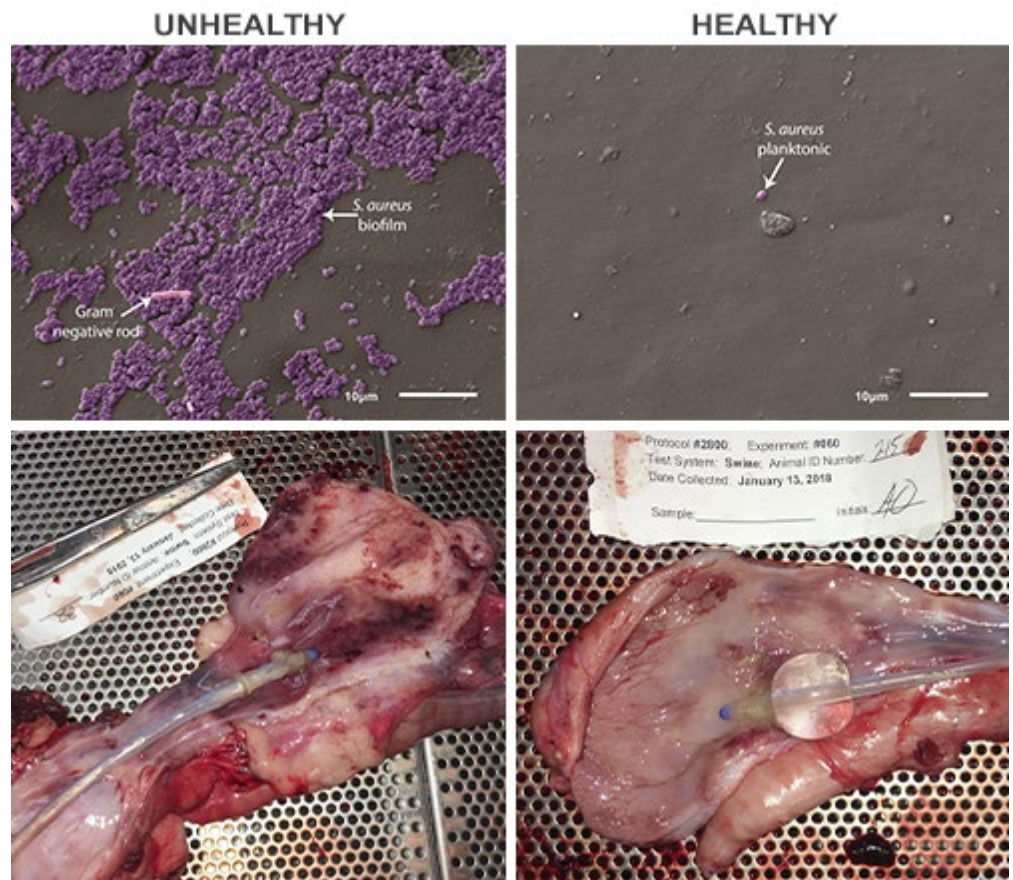
The System has successfully killed fungus, as well as drug-resistant gram-positive and gram-negative bacteria (e.g., *E. coli*, *S. epidermidis*, *S. aureus*, *S. pneumoniae*, *P. aeruginosa* and *C. albicans*). It can be delivered either as a prophylactic measure (for uninfected catheters) or therapeutic treatment (for already-colonized catheters). The kill rate exceeds the 99.99% rate required by FDA for an antimicrobial claim.

A laser is used to generate 405 nm visible light which is delivered down the length (uniform 360°) of an indwelling catheter through specially treated fiber optics. The light excites endogenous porphyrins in the microbe cells, creating activated reactive oxygen species (ROS) which damages the lipids, proteins and cell membrane of the microbe resulting in cell death. (Photos at right)

The method of delivery of the visible light is unique and innovative; protected by 23 issued patents and 16 pending applications, the technology provides some important competitive advantages:

- The System delivers the visible light so that it promotes healthy cell growth and treating infections, not just preventing them.
- It Irradiates the both the Internal and external surfaces of a (standard of care Is to use aseptic technique only outside the catheter)

Most recently, LLM's engineering team experienced a breakthrough-eliminating the hardest to kill microbe, *Candida albicans*, in 35 minutes-this meets stringent performance targets of infection control with no added time to treatment. The next challenge is to finalize the design of their light engine, the component delivering visible light to the catheter. They hope to be commercially active soon after by maintaining and growing strategic deals and collaborations across the healthcare ecosystem.



Results comparison from large animal trial. Bacterial films and photos (left) show massive infection / damage. Light Line's device noticeably reduces the bacterial infection and resulting symptoms (right).

Light Line will leverage this success to deploy their technology across four major use cases (peritoneal dialysis, followed by urinary, respiratory, and vascular).

To learn more about the company and investment opportunities sponsored by Angel MD Capital, contact us at MDNext@angelmd.com

Light Line Medical, Inc. CEO - Vicki Farrar is a serial entrepreneur who has built and led companies to successful exits. She has over 40 years of experience as an Intellectual Property attorney representing companies in the medical device and pharmaceutical fields, and over 25 years' experience as a Senior Executive in startup companies. In 2008, Ms. Farrar founded Catheter Connections, Inc., an infection control company which changed the standard of care for infusion therapy and was successfully sold to Merit Medical in 2017.



Catheter Connection's products are now being sold in more than 30 countries and are part of a \$100M annual revenue market. Prior to Catheter Connections, she served as VP Regulatory and Intellectual Property at Q Therapeutics, Inc.; and previously as acting CEO and VP of Legal, Intellectual Property and Regulatory Affairs at Cognetix, Inc., developing CNS products that required delivery through an intrathecal medical device. Currently, Ms. Farrar is the CEO of Light Line Medical, Inc. developing a visible light-based infection prevention system for catheter associated infections. Light Line has the potential to change the way the world prevents infections, with no antibiotic resistance issue which is the third leading cause of death worldwide.