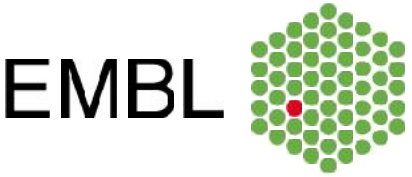
A photoablation approach for the treatment of chronic pain and itch

Paul A. Heppenstall



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Chronic pain and itch

Pain

- Chronic pain affects one in five adults and can last a lifetime
- One in three pain sufferers is not treated
- Current therapies are ineffective, addictive and unsafe

Itch

- Chronic skin diseases such as eczema affect one in ten adults
- Chronic itch sufferers report a very poor quality of life
- Current therapies target inflammation rather than itch

Treating pain and itch with light

- Apply cream to painful or itchy skin
- Illuminate with red light
- Pain or itch relief for weeks to months

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Pain: tail clip test in mice

Control (no light) Treated (cream and light)

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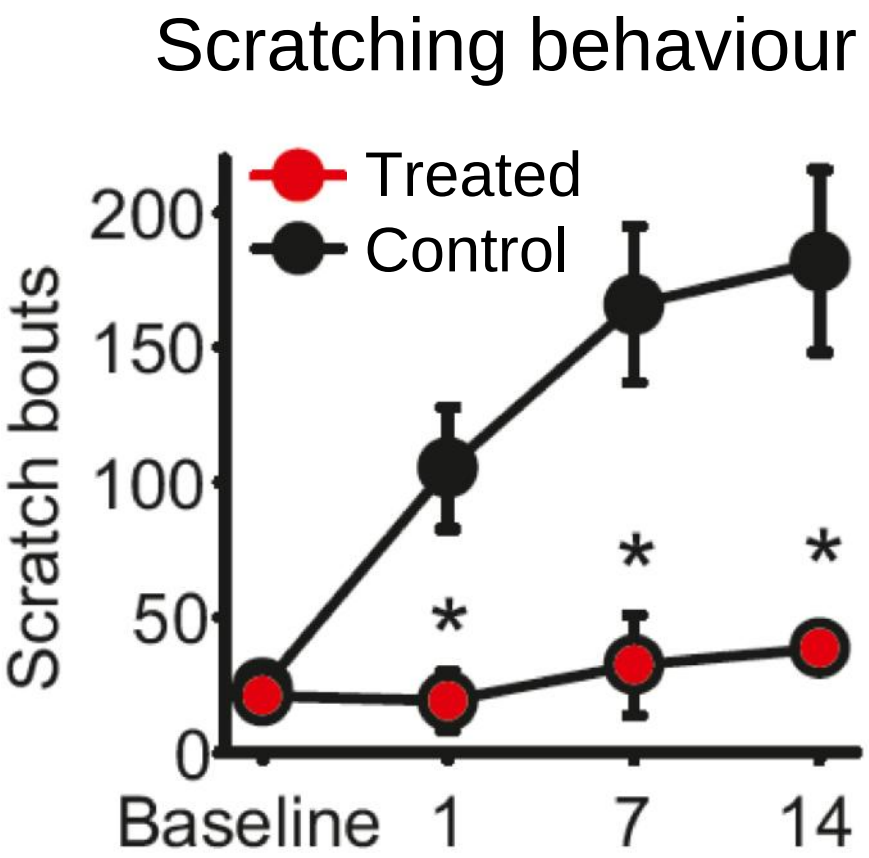
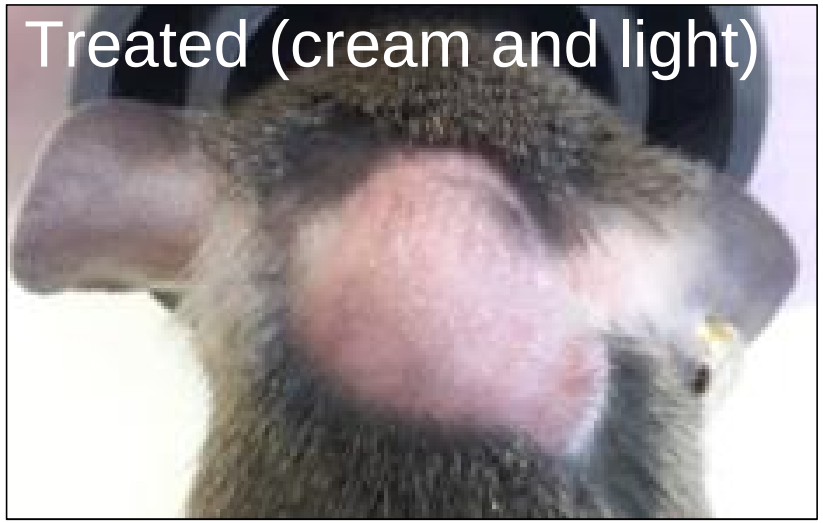
Itch: mouse model of eczema





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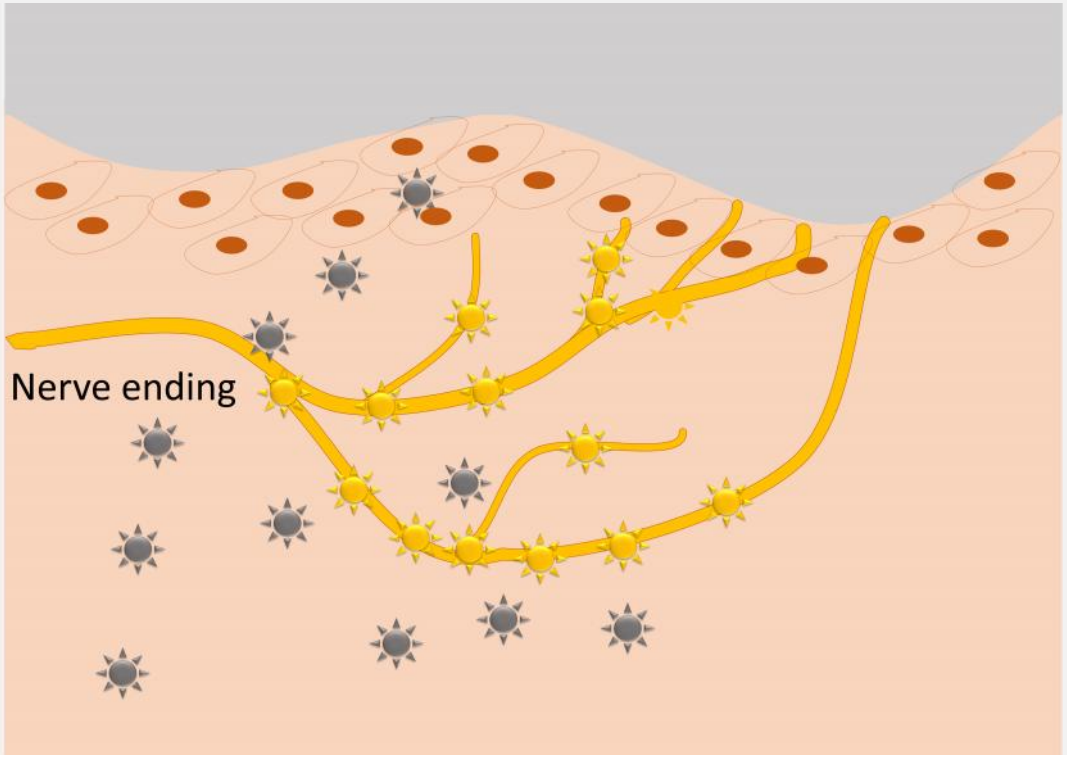
How does it work?



- Molecules bind to pain or itch sensing nerves in the skin

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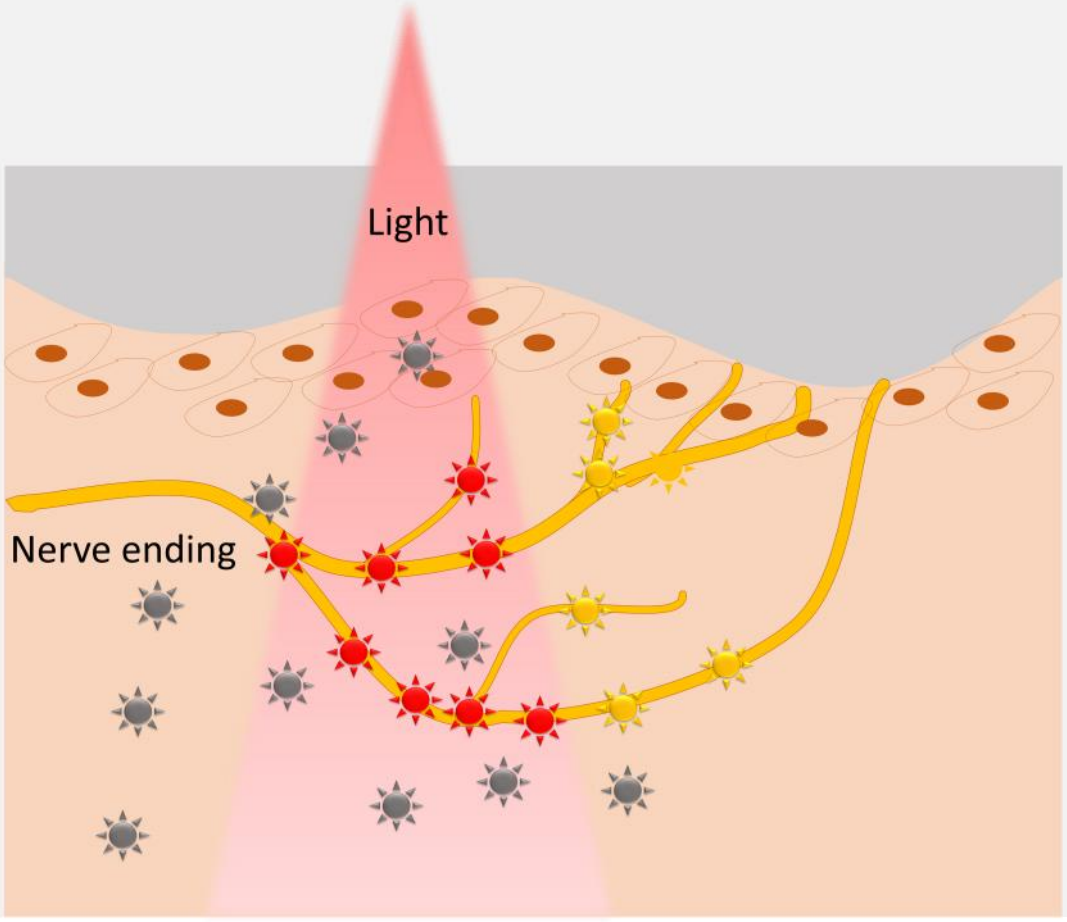

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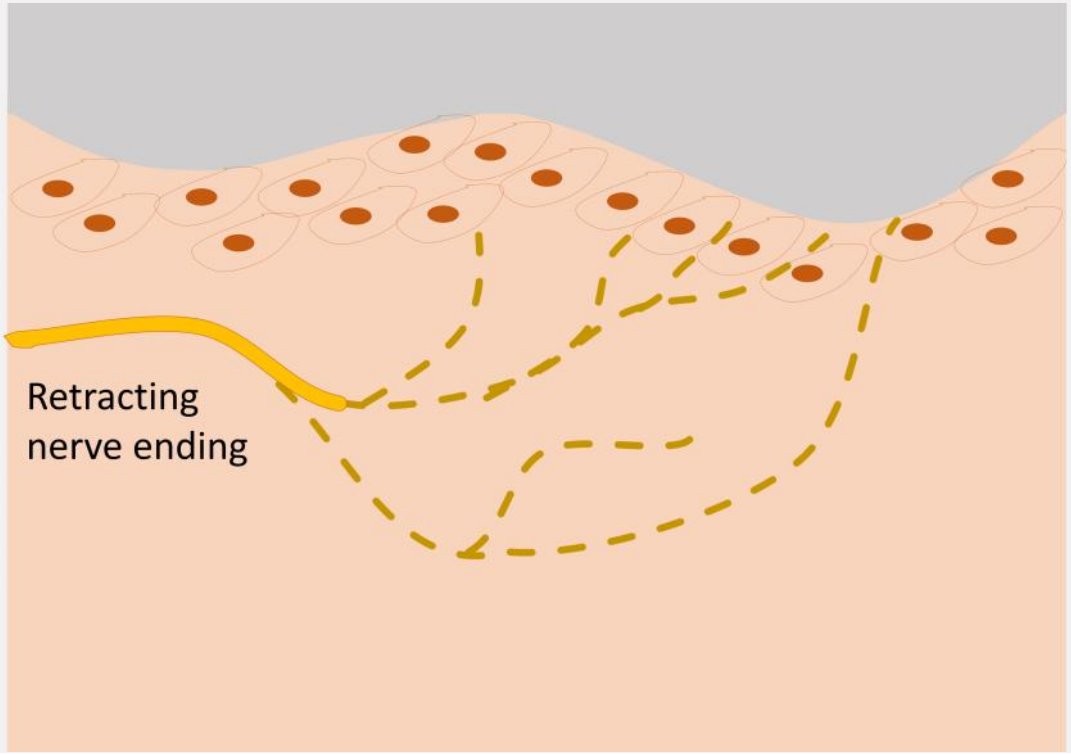
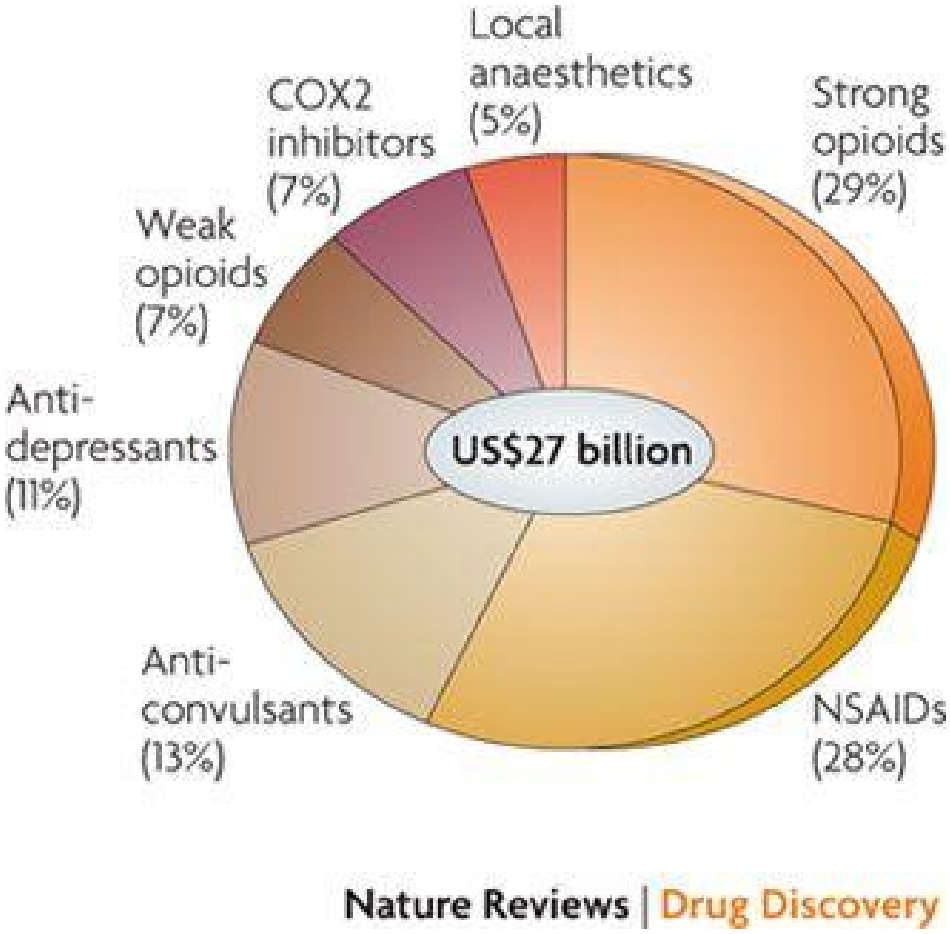


- Molecules bind to pain or itch sensing nerves in the skin
- Red light activates the bound molecules
- Nerves retract from the skin

Commercial potential



- Global pain and itch markets predicted to have a combined value of more than USD 115 billion by 2024
- Rapid market penetration expected in patients with no alternative treatment option (NSAIDs intolerant, addiction potential)
- Opportunities in light of restriction policy on opioid prescriptions
- Recognized need for new treatment options in ageing populations
- Further markets for chronic itch in veterinary medicine, e.g. canine atopic dermatitis

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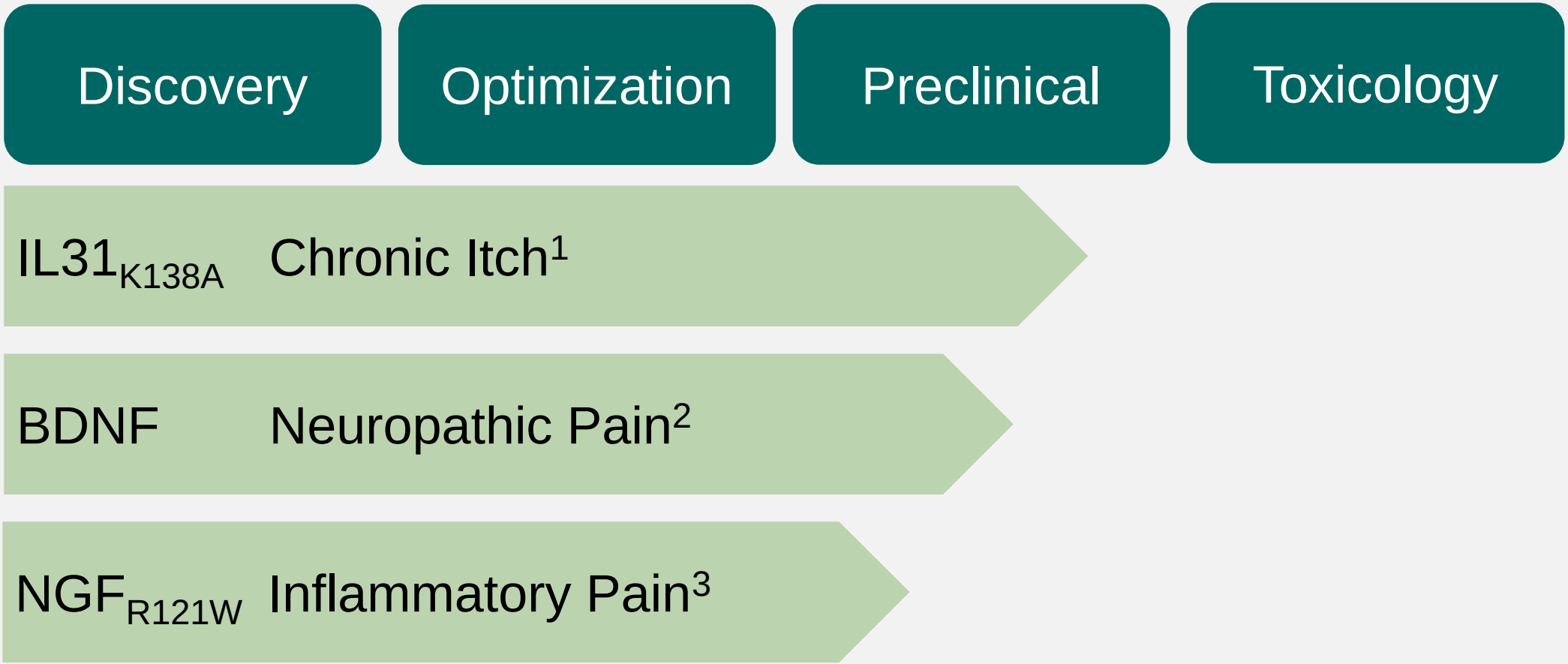
Comparison with existing solutions

- Photoablation targets nerves rather than molecules thus avoiding redundancy
- Photoablation is local and on demand thus minimizing off target effects (eg misuse, addiction, GI complications)
- Photoablation is effective for at least 3 weeks after a single treatment thus reducing costs

Development status



1. *Nature BME* 2019, 2. *Nature Comms* 2018, 2. *Pain* 2019

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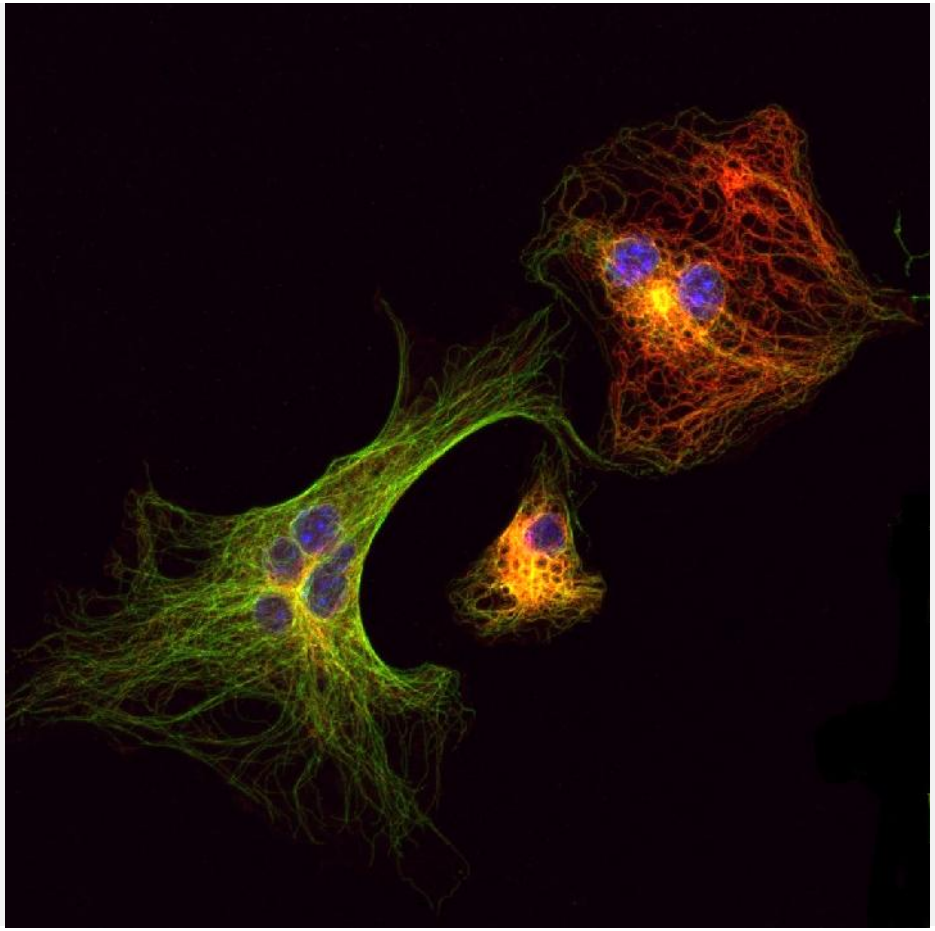
IP status

- Priority patent application filed in Sep 2016, currently in national phase in EP, US
- PCT patent application published under WO 2018/042018

> *… A conjugate compound, preferably a protein conjugate compound, comprising (i) a binding domain which specifically binds to the target cell, and (ii) a photosensitive inhibition/cytotoxin group, and wherein the therapy comprises the steps of:*
>
> *(a) Administering said conjugate compound to the subject, and*
>
> *(b) Irradiating said target body surface area of the subject with an appropriate excitation light …*

Commercial opportunities



- Technology Evaluation Program: access to and transfer of materials, protocols and know-how, testing of technology in-house at partner.
- Collaboration Opportunities: proof of concept studies, further development of technology with a partner.
- Licensing Opportunities: assistance and support with transfer of technology, consultancy.

Risks and bottlenecks

- Safety and efficacy of repeated treatment
- Immunogenicity of treatment
- Scaling up of protein production
- Permeation of human skin by large molecular weight complexes
- Production and regulation of a device for light application

Publications and contact

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