ANTI-MICROBIAL CONDUCTING POLYMERS: SUMMARY & COMMERCIALIZATION STRATEGY

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ABSTRACT

The global market for anti-microbial agents is receptive to novel technologies free from the health concerns and limitations of existing agents. The current global market for industrial anti-microbial agents encompasses many diverse types of materials. This new technology that is attracting commercial interest is based on a family of patented functionalized polyaniline-related polymers and co-polymers.

The interdisciplinary Hybrid Polymers team (Polymer Chemistry and Microbiology) have developed a series of potent conducting polymers that exhibit anti-oxidant and anti-microbial properties. A range of applications has been identified which are being developed across a range of sectors including construction, packaging, coatings etc. A 1% w/v suspension of key polymeric biocides will reduce S. aureus populations by 99.9% within 2 hours. We have applied the active polymers as solutions, blends, films, powders, electro-spun fibres, colloids, zeolite surface layers and others.

The polymer substrates include thermoplastics, elastomers, metals, paper and oxides including zeolites. We have demonstrated that the potent polymers are non-cytotoxic and so are applicable in medical and health applications. The advantages of the new active polymers include their thermal stability, ability to be combined with porous substrates, and their support for the growth of mammalian cells.

Overall, these advantages make the active polymers readily applicable across the range of sectors listed above. The anti-bacterial mechanism of action of these agents has been investigated using transcriptomics and the analysis of super-sensitive mutant bacteria. Our data supports a hypothesis where an antimicrobial polymer challenge leads to bacterial cell death through iron dysregulation, oxidative stress and a loss of membrane integrity.

A Commercialization Strategy was adopted in the final years of this contract which involved the recruitment into the team of two former business executives, the engagement and prioritizing of key New Zealand and international companies, Joint technology Planning Meetings with selected companies, the development of an accelerated commercial proposal system, the development of scale-up manufacturing and the redeployment of PhD students (after thesis submission) as Development Technologists working on contracted commercial projects. One benefit of the last of these steps was the rapid recruitment of these commercially experienced PhD graduates by New Zealand companies. Given the relatively few PhDs in industry management in New Zealand, this has the potential to lift the level of national industrial innovation in the long-term.

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