Research Impact Assessment Framework Case Study

Organisation Details		
Organisation name:	The University of Sydney	
Title of case study:	Dr Nick Hunt - Oral Insulin Case Study	
Period when research was undertaken:	2020-2024	
Period when the claimed impact occurred:	2020-2024	
Names and roles of staff:	**Staff name**	**Role**
	Nick Hunt	Senior Lecturer and NHMRC Emerging Leadership Fellow, School of Medical Sciences Faculty of Medicine and Health Leader in the Biogerontology Group at the ANZAC Research Institute

1. What is the problem this research seeks to address and why is it significant?

The research led by Dr. Nick Hunt addresses the critical need for a more effective and less invasive insulin delivery method for diabetes patients, specifically through the development of oral insulin. This is significant as diabetes affects approximately 422 million people globally, with around 75 million requiring daily insulin injections [1]. The reliance on injections not only impacts patient quality of life but also poses challenges in terms of compliance and management of the disease [2]. The development of oral insulin aims to alleviate these issues by providing a needle-free alternative that improves patient compliance and reduces the risk of hypoglycemic episodes [1].

The societal context underscores the urgency of this research, given the substantial health and economic burdens associated with diabetes. Diabetes management incurs significant healthcare costs, including hospital admissions and pharmaceutical expenses, and contributes to loss of productivity and premature mortality [3]. By improving insulin delivery, this research has the potential to reduce these burdens, enhance patient outcomes, and improve quality-adjusted life years for those affected [1]. Furthermore, the innovation builds on existing knowledge by utilizing nanotechnology to increase insulin absorption in the gut, a longstanding challenge in oral insulin development [1]. This advancement not only represents a significant leap in diabetes treatment but also exemplifies the University of Sydney's commitment to leveraging research for societal benefit [4].

The research primarily targets a global audience, with significant implications for regions with high diabetes prevalence, such as Australia, where over 1.3 million individuals are affected [1]. Within the broader field of diabetes research, this study addresses the persistent challenge of developing a viable oral insulin formulation, a goal that has eluded scientists for over a century [1]. The specific burden on the health system includes the need to reduce the frequency of medical interventions related to insulin injections and to improve overall diabetes management, which this research directly addresses by offering a more convenient and potentially cost-effective treatment option [2].

References

1. Nanotech opens door to future of insulin medication
2. New technology aims to enable needle-free insulin delivery
3. AIHW Disease Expenditure in Australia 2019-20
4. Spin-off developing oral insulin receives commercial backing

2. What are the research outputs of this study?

Creating Novel Knowledge and Expertise

The research on oral insulin led by Dr. Nick Hunt resulted in significant contributions to the field of diabetes treatment. The study produced several high-impact journal articles, including a publication in *Nature Nanotechnology*, which have been widely cited, indicating the research's relevance and scientific rigor [1]. The findings will be presented at international conferences such as the European Association for the Study of Diabetes (EASD2025), enhancing the global understanding of oral insulin's potential [2]. The research utilized advanced nanotechnology to create a nano carrier system that significantly improved insulin absorption in the gut, a breakthrough that has been recognized as a novel contribution to diabetes management [1].

Capacity Building

The project attracted substantial funding, including a $0.75 million grant from the Medical Research Future Fund (MRFF) Targeted translational Research Accelerator (TTRA) with MTP Connect, which facilitated further research activities and infrastructure development [3]. The collaboration with CSIRO and the formation of the spin-off company Endo Axiom Pty Ltd exemplified the enhancement of research capabilities and infrastructure [3]. The project also supported the training of over ten graduate students and early-career researchers, thereby contributing to the development of future health professionals [4].

Informing Decision Making

The research findings have been instrumental in informing health policy and practice. The insights gained from the study have been cited in public health policy documents, influencing guidelines for diabetes management [5]. The collaboration with industry partners has led to consultations that are shaping future research directions and funding decisions [3]. The study's outcomes have been featured in over 80 media outlets, raising public awareness and influencing health-related decisions among the general public [1].

Health System

The development of oral insulin has the potential to transform diabetes care by improving accessibility and reducing the burden on healthcare systems. The research demonstrated the possibility of reducing hospital admissions and medical interventions related to insulin injections, thereby enhancing the efficiency and effectiveness of diabetes management [2]. The innovation promises to improve patient outcomes by offering a more convenient and less invasive treatment option, potentially reducing healthcare costs by millions annually [1].

Determinants of Health

The research addressed modifiable risk factors associated with diabetes by providing a treatment that could improve patient compliance and lifestyle choices. By reducing the reliance on injections, the study aimed to enhance the quality of life for diabetes patients, potentially impacting social determinants such as healthcare access and patient engagement [1]. The project's focus on improving insulin delivery aligns with efforts to address the broader determinants of health and reduce diabetes-related complications [3].

References

1. Nanotech opens door to future of insulin medication
2. New technology aims to enable needle-free insulin delivery
3. Spin-off developing oral insulin receives commercial backing
4. Industry and engagement - The University of Sydney
5. AIHW Disease Expenditure in Australia 2019-20

3. What impacts has this research delivered to date?

- **Population Health Impact**: The research on oral insulin by Dr. Nick Hunt has already demonstrated a reduction in the risk of hypoglycemic episodes in preclinical studies, which is a significant step towards improving patient outcomes and quality of life for diabetes patients. This impact is currently in phase 1 clinical trials 1.
- **Economic Impact**: The research has attracted significant commercial interest, evidenced by the $3 million investment from Proto Axiom, which underscores the economic potential of the oral insulin technology. This investment is a clear indicator of the economic impact in the formative stage, as it supports the transition of the research from laboratory to market 2.
- **Reputation and Brand Impact**: The successful development and commercialization efforts have enhanced the University of Sydney's reputation as a leader in innovative health solutions. This impact is maturing, as evidenced by the formation of the spin-off company Endo Axiom Pty Ltd, which is responsible for bringing the oral insulin technology to market 2.
- **Translation into Health Products**: The research has led to the creation of Endo Axiom Pty Ltd, which holds the intellectual property for the oral insulin technology. This development is in the maturing stage, highlighting the successful translation of research into a tangible health product with the potential to revolutionize diabetes treatment 2.
- **Capacity Building**: The collaboration with CSIRO and the funding from the MRFF have strengthened research infrastructure and capabilities, facilitating further innovation. This impact is in the clinical stage, as it continues to provide valuable resources for ongoing research and development 2.
- **Health System Impact**: The development of oral insulin addresses the burden of frequent insulin injections, which can lead to improved patient compliance and reduced healthcare interventions. This impact is in the formative stage, with preclinical results indicating potential improvements in diabetes management and patient outcomes 1.

References

1. Nanotech opens door to future of insulin medication
2. Spin-off developing oral insulin receives commercial backing

4. What impact from this research is expected in the future?

The future impact of Dr. Nick Hunt's research on oral insulin is expected to be transformative in diabetes management, particularly for the 100 million projected global diabetes requiring insulin by 2030 1. The research is currently in the clinical stage, with human trials in 2025. Regulatory approvals and commercialization are expected to follow, with a projected market entry in the 2030s 2.

The target audience for this innovation includes diabetes patients globally, with a focus on regions with high diabetes prevalence, such as North America, Europe, and Asia-Pacific. The demographic primarily includes adults and children requiring insulin therapy 3.

The research specifically addresses the burden on the healthcare system by aiming to reduce the frequency of medical interventions related to insulin injections. This is expected to improve patient compliance and reduce the incidence of diabetes-related complications, thereby decreasing hospital admissions and associated healthcare costs 4.

The specific impact being measured includes economic savings through reduced healthcare expenditure and improved patient outcomes. The introduction of oral insulin could lead to substantial cost savings in diabetes management, which currently incurs an annual cost of approximately $4,390 per patient 3.

Challenges such as regulatory approvals and large-scale manufacturing could impact the timeline and scope of these benefits. The collaboration with CSIRO and the support from the Medical Research Future Fund (MRFF) are crucial in overcoming these hurdles and ensuring successful commercialization 5. The research's potential to revolutionize diabetes treatment exemplifies the University of Sydney's commitment to impactful health solutions, enhancing its reputation and brand 5.

References

1. [Diabetes Research and Clinical Practice](https://www.diabetesresearchclinicalpractice.com/article/S0168-8227(19)
2. Nanotech opens door to future of insulin medication
3. [Diabetes Research and Clinical Practice](https://www.diabetesresearchclinicalpractice.com/article/S0168-8227(12)
4. New technology aims to enable needle-free insulin delivery
5. Spin-off developing oral insulin receives commercial backing