Project Title: The Cancer Clock is Ticking: Circadian Rhythms and Tumour Hypoxia	**Code: NCS8**

Host School / Institute: Northern Clinical School / Kolling Institute/ Charles Perkins Centre	**Address:** Charles Perkins Centre, Camperdown Campus

Certificates & Clearances required: No

Primary Supervisor: Dr Kristina Cook

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Co-Supervisor/team: PhD student - Chloe-Anne Martinez, Research assistant - Bernadette Kerr

Project Type: Laboratory based

Project Category: Cancer; Sleep Medicine

Skills / Attributes of a successful student: Basic knowledge of molecular and/or cancer biology. Some experience in basic molecular and cellular biology techniques desired but not essential. Interested in laboratory research. Ability to work both independently and as a team. All research techniques will be taught during the project.

Project Keywords: cancer; sleep apnoea; oxygen; circadian; transcription factor

Project Description: Background: Low-oxygen (hypoxic) environments are a universal hallmark of advanced solid tumours due to rapid cellular proliferation and few oxygen-carrying blood vessels. Hypoxia activates the transcription factor HIF (hypoxia inducible factor), which controls genes involved in metastasis & chemotherapy resistance and is associated with cancer progression and poor prognosis.

Tumour hypoxia is hypothesized to disrupt circadian rhythms (day/night cycles), which can enhance tumour growth. Circadian rhythms are genetically encoded by a molecular clock and both hypoxia and circadian disruption are commonly observed in tumours. The molecular pathways involved may be interacting to increase cancer progression.

Project: This project will investigate how hypoxia and HIF in tumours can disrupt circadian rhythms with the goal of finding new drug targets. Activity of transcription factors such as HIF and CLOCK are proposed to increase in tumour cells and students will be involved in investigating these pathways and their downstream effects. This includes studying changes in mRNA and protein expression to understand how this might alter tumour behaviour. We aim to publish the results of this work and present the results at both national and international conferences.

Techniques: cell culture, gene expression arrays, qRT-PCR, SDS-PAGE and western blotting