Insomnia and inflammation as drivers of depression

Depression in older adults is common, and treatment with antidepressants is not always effective. Key driving factors of depression are insomnia and inflammation, which affect each other as well as driving disease. Dr Michael Irwin and his team at the Norman Cousins Center for Psychoneuroimmunology at UCLA, in the US, have been researching the associations between depression, insomnia, and inflammation in order to develop new targets for therapies.

### Key Risk Factors for Depression

Two significant risk factors associated with the development of depression are insomnia and inflammation. Previous studies have delved into the link between inflammation and depression, showing that increased immune activation leads to a depressed mood and that specific inflammatory factors can be used as predictors for depression. The link between insomnia and depression, however, is less well characterised. Both factors can contribute to the disease separately and in combination, as they have been shown to be linked.

Sleep is usually a recovery time for the body, which allows for the production of inflammatory cytokines that help fight any virus or bacteria we may encounter during the daytime. The sleep cycle is effective when working properly but can lead to disarray for both sleep and immunity when disrupted. It is also incredibly well regulated, so minor differences in sleep can have significant impacts on the body. Stress can cause increases in inflammation as well as changes in the sleep cycle, both of which affect and exacerbate each other. Disruptions to sleep lead to changes in inflammation; these changes in inflammation can increase disruptions to sleep, producing a vicious cycle that is difficult to break.

This interplay between insomnia and inflammation contributes to biological and cognitive ageing and the development of depression. Since inflammation can lead to depression and sleep can cause inflammation, it’s clear that insomnia needs to be studied more closely – especially since one-third of older adults suffer from this sleep disorder. Learning more about how insomnia and inflammation lead to depression would help with preventing and treating the disease.

### Reduced Motivation

To better understand the relationship between sleep, inflammation, and depression, Dr Michael Irwin and his team at the Norman Cousins Center for Psychoneuroimmunology at UCLA, have undertaken two research studies. The first investigates the effects of insomnia on motivation and sensitivity to monetary reward. Insomnia, or a lack of pleasure, is a symptom of depression and can present itself in both sleep and inflammation; these changes in sleep can have significant impacts on the body. Stress can cause increases in inflammation as well as changes in the sleep cycle, both of which affect and exacerbate each other. Disruptions to sleep lead to changes in inflammation; these changes in inflammation can increase disruptions to sleep, producing a vicious cycle that is difficult to break.

As predicted, results from the study revealed that adults who have insomnia showed reduced motivation as they were more likely to select a low-effort task with a lower reward. On the other hand, adults who didn’t suffer from insomnia were more likely to choose a high-effort task with a higher reward. Insomnia was also revealed to be associated with reduced sensitivity to reward, as persons with insomnia were less responsive to increases in monetary reward.

### Emotion Processing

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The link to inflammation was also assessed in the study. This was done by measuring the levels of an inflammatory marker called CRP from blood samples provided by the participants. It was seen that CRP was elevated in patients with insomnia, once again highlighting the relationship between these two factors. Interestingly, the increase in CRP levels was particularly associated with a reduction in motivation in men, showing that some depression risk factors are sex-specific – this could point to more targeted treatments and preventions in the future.
The combination of disturbed sleep and inflammation with advancing age increases the risk of depression.

 Targeting Insomnia and Inflammation to Prevent Depression

The results gained from these studies highlight the importance of insomnia in driving depression in older adults. The combination of disturbed sleep and inflammation with advancing age is clearly increasing the risk of depression. Understanding how insomnia and inflammation affect depression is important, not only to develop treatments but also as a way of preventing depression. Indeed, Irwin has recently found that the treatment of insomnia prevents incident and recurrent depression over 36 months in 291 older adults with insomnia disorder but without depression at entry. Specific markers of inflammation as well as sleep-cycle analyses could be used to monitor and predict disease in a targeted way. Perhaps treating the inflammation or insomnia would be a way to prevent and alleviate these symptoms of depression. Mind-body interventions that can reduce insomnia, such as meditation, are effective in reducing depression.

Treating the inflammation or insomnia is to prevent and alleviate symptoms of depression.

Of note, another study by Irwin et al. (2020) found that the treatment of insomnia leads to a sustained remission of insomnia, the likelihood of depression is reduced by over 83%. Given that CBT-I leads to a sustained remission of insomnia, the likelihood of depression is reduced by over 83%. Given that insomnia contributes to prevention of depression. Both, a better understanding of the contributions of inflammation and mechanisms of reward and emotion processing will provide insight toward the development of more refined and precision-based strategies to prevent depression in those with insomnia, or to augment treatment outcomes in patients who are co-morbid for depression and insomnia disorder.

References


Personal Response

How can we use these results for targeted approaches to treating and preventing depression?

We have recently demonstrated that the treatment of insomnia with cognitive behavioural therapy for insomnia (CBT-I) reduces the likelihood of incident and recurrent depression by over 50% as compared to a comparator control, sleep-education therapy, in 291 older adults with insomnia disorder but no depression. Furthermore, when CBT-I leads to a sustained remission of insomnia, the likelihood of depression is reduced by over 83%. Given that inflammatory activation induces depressive symptoms and durable remission of insomnia reverses genomic, cellular, and systemic markers of inflammation, further secondary analysis is needed to examine whether mitigation of inflammation contributes to prevention of depression. Similarly, additional research will examine if insomnia remission leads to improvement in emotion regulation and reward processing, which may mediate the benefits of insomnia treatment in the prevention of depression. Together, a better understanding of the contributions of inflammation and mechanisms of reward and emotion processing will provide insight toward the development of more refined and precision-based strategies to prevent depression in those with insomnia, or to augment treatment outcomes in patients who are co-morbid for depression and insomnia disorder.

Behind the Research

Dr Michael Irwin

Research Objectives

Dr Irwin studies risk factors associated with depression.

Detail

Address

Cousins Center for Psychoneuroimmunology
300 UCLA Medical Plaza
Los Angeles, CA 90095, USA

Bio

Dr Michael Irwin holds the Norman Cousins Distinguished Professorship in the Department of Psychiatry and Biobehavioral Science at the UCLA Geffen School of Medicine for his lifetime contributions to understanding the reciprocal interactions between the central nervous system, the immune system and health; and for pioneering mindfulness meditation and tai chi for reversing and treating insomnia, and preventing depression.

Collaborators

•  Richard Olmstead
•  Domnique Piber
•  Richard Olmstead
•  Elizabeth Beeen
•  Naomi Eisenberger

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References


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