

RNS Number : 78790  
Ananda Developments PLC  
10 February 2023

## ANANDA DEVELOPMENTS PLC

("Ananda" or the "Company")

Ananda is an AQSE-listed medical cannabis company creating UK-based operations to grow and provide carbon zero, consistent, medical cannabis for the UK and international markets.

# Medical Cannabis Research Roundup

Issue Sixteen

### Summary:

This month has continued the theme of more basic science exploring the *in vivo* efficacy and mechanisms of both certain individual cannabinoids and terpenes, particularly with regard to inflammation, but also the efficacy of mixes of cannabinoids and terpenes - which have demonstrated the higher efficacy of the mixes. We have highlighted three articles with interesting evidence regarding the efficacy of cannabinoids and terpenes on neuropathic pain and inflammation.

- CBD plus terpenes show greater efficacy than CBD only in *in vivo* models of neuropathic pain.
- Cannabinoids & Terpenes Found to Have Promising Anti-Inflammatory Properties.
- *In vivo* study shows that CBD suppresses 'cytokine storm' and may assist in reducing morbidity in patients with cytokine storm caused by severe infections such as sepsis.

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## **CBD PLUS TERPENES SHOW GREATER EFFICACY THAN CBD ONLY IN *IN VIVO* MODELS OF NEUROPATHIC PAIN.**

- Neuropathic pain (NP) is a chronic disease that affects the normal quality of life of patients.
- While there have been many studies on medical cannabis and NP the vast majority of these have involved medical cannabis with, mostly, high levels of THC.
- The principal aim of this work was to investigate the potential pain-relieving effect of two oil based hemp extracts - one treated so as to contain CBD plus minor other cannabinoids and very little terpenes (K1) and one treated to contain CBD plus minor other cannabinoids plus a terpene profile (K2).
- Oral administration of K2 (25 mg kg<sup>-1</sup>) induced a rapid and long-lasting relief of pain hypersensitivity in a mice model of peripheral neuropathy.
- In conclusion, these results suggested that K2 oral administration attenuated NP symptoms by reducing spinal neuroinflammation and underline the important role of the synergism between cannabinoids and terpenes.
- In addition, this study showed that the mechanism included regulation of CB2-mediated microglial neuroinflammation.



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## **CANNABINOIDS & TERPENES FOUND TO HAVE PROMISING ANTI-INFLAMMATORY PROPERTIES.**

- Novel compounds with anti-inflammatory effects are needed for addressing inflammation in a range of patients, including those with neurodegenerative disorders, such as Alzheimer's. For the first time, researchers have reported on the effects of minor as well as major cannabinoids and terpenes on specific immune and inflammatory cell types.
- Researchers selected 5 common cannabis terpenes ( $\alpha$ -pinene, trans-nerolidol, D-limonene, linalool and phytol) and 6 cannabinoids (CBDV, CBD, CBN, CBC, CBG and d9-THC). Human blood cells were treated with each individual compound and assessed for their response to 21 inflammatory markers and their ability to regulate immune responses.



- Cannabinoid d9-THC and terpene  $\alpha$ -Pinene showed the greatest effect on immune activity. Following d9-THC, other minor cannabinoids (CBDV, CGB, CBC, CBN and CBD) had significant effects on immune activity. Along with  $\alpha$ -Pinene, linalool, phytol and trans-nerolidol displayed immune activity.
- Interestingly, at the concentrations tested, limonene had no effect on the immunity or inflammation of the cells. CBDV shows the broadest anti-inflammatory properties and had the most activity on white blood cell functioning, significantly affecting 6 out of 7 of the immune responses measured. The study suggests terpenes have limited effects on immunity whilst cannabinoids can have a broader effect on immunity and inflammation.
- Future studies will measure the effects of proprietary mixtures of cannabinoids and terpenes in the human immune cell model. Further data will support the anti-inflammatory potential of CBPMs in patients.

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***IN VIVO* STUDY SHOWS THAT CBD SUPPRESSES 'CYTOKINE STORM' AND MAY ASSIST IN REDUCING MORBIDITY IN PATIENTS WITH CYTOKINE STORM CAUSED BY SEVERE INFECTIONS SUCH AS SEPSIS.**

- Cytokine release syndrome, also termed "cytokine storm," is the leading cause of morbidity and mortality among patients with various conditions such as sepsis.
- While cytokine storm is associated with multiple organ damage, acute cardiac and renal injury represents a hallmark of cytokine storm.
- Given the reported anti-inflammatory effect of CBD, this study was to examine the effect of CBD on cytokine storm-induced cardiac and renal injury using the lipopolysaccharide (LPS)-induced sepsis mouse model.
- Doses were CBD (15 mg/kg) or vehicle one hour before a single injection of either phosphate-buffered saline or LPS (10 mg/kg) for an additional 24 h.
- CBD was shown to improve cardiac function and reduce renal injury in a mouse model of cytokine storm. Moreover, our data indicate that CBD significantly reduces systemic and renal inflammation to contribute to the improvements observed in a cytokine storm-model of cardiac and renal injury.
- Overall, the findings of this study suggest that CBD could be repurposed to reduce morbidity in patients with cytokine storm particularly in severe infections such as sepsis.



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The Directors of the Company accept responsibility for the contents of this announcement.

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**About Ananda Developments**

Ananda is an AQSE-listed medical cannabis company creating UK-based operations to grow and provide carbon zero, consistent, medical cannabis for the UK and international markets.

For more information, please visit: <https://anandadevelopments.com/>

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