

Immune Cell Study

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Solution used: Earth Science Tech, Inc. (ETST) Full Spectrum Crude/Unfiltered Cannabinoids derived naturally procuring from industrial hemp plants.

Study type: In Vivo trial

Report and Effects of ETST's Full Spectrum Cannabinoids on Macrophages

A. Objectives:

The purpose of this study is to investigate the effects of full spectrum cannabinoids on immune cells.

B. Materials and Methods:

B.1. Preparation of full spectrum cannabinoids solution: The full spectrum cannabinoids (5.5% CBD) used in this experiment was provided by ETST. The full spectrum cannabinoids solution was prepared by dissolving the hemp oil in DMSO solution to achieve appropriate full spectrum cannabinoids concentration.

B.2. Animal immune cell line: RAW264.7, a mouse macrophage-like cell line, was used. The cells were cultured in DMEM, supplemented with 10% fetal calf serum (FCS), in 5% CO₂, 95%air, at 37°C in a humidified incubator.

B.3. Stimulation of macrophages: The stimulation of macrophages was assessed by TNF α production, using a mouse TNF α ELISA kit. To study the effects of hemp oil on macrophages, cells were seeded in a 24-well plate (2×10^5 cell/well) in 1-ml medium in each well for 12 h, and then incubated with hemp oil solution of different CBD (0-10 μ M) for 24 h. Cell supernatant was collected for ELISA analysis. To study the effects of hemp oil on enhancing macrophage stimulation by lipopolysaccharides (LPS), cells were seeded in a 24-well plate (2×10^5 cell/well) in 1-ml medium in each well for 12 h, and then incubated with LPS (1 ng/ml) and hemp oil solution of different full spectrum cannabinoids concentrations (0-10 μ M) for 4 h. Cell supernatant was collected for ELISA analysis.

C. Results:

C.1. Dose dependence of stimulation effects on macrophages by the full spectrum cannabinoids: After the macrophages were incubated with hemp oil of different full spectrum cannabinoids concentration (0, 1, 2.5, 5, 10 μ M), the TNF α production by the cells was detected. The effects of full spectrum cannabinoids are given in Figure 1. The results indicate that the impact of full spectrum cannabinoids on macrophages in the concentration range of 0 to 5 μ M is not significant. However, full spectrum cannabinoids with a concentration of 10 μ M induced TNF α production at a significantly higher level.

C.2. Effects of full spectrum cannabinoids on enhancing LPS induced TNF α production: After macrophages were incubated with LPS (1 ng/ml) and CBD (CBD concentrations of 0, 5, and 10 μ M) for 4 h, the TNF α production was detected. Effects of the LPS combined with hemp oil are shown in Figure 2. The results in Figure 2 show that hemp oil can enhance TNF α production by macrophage stimulated with LPS, especially at a full spectrum cannabinoids dose containing 10 μ M of CBD.

D. Conclusion:

The results of this preliminary study indicate that with appropriate full spectrum cannabinoids concentrations, hemp oil can stimulate macrophages to produce TNF α and can also enhance the TNF α production stimulated by LPS. The effects of full spectrum cannabinoids on immune cells may be used to improve cancer treatment. However, further experiments, particularly in vivo studies, are needed to determine the effects of full spectrum cannabinoids on inducing and enhancing anti-tumor immune responses.