

Research review by Lissa Hilton

Reviewed:

Stimulatory effect of *Eucalyptus* essential oil on innate cell-mediated immune response

By:

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The goal of this study is to investigate whether *Eucalyptus globulus* essential oil is able to stimulate a natural immune response. The study includes two separate trials that both evaluate these effects. In one trial the phagocytic activity of human monocyte-derived macrophages (MDMs) *in vitro* is studied. Another trial within the same study looks at the phagocytic activity of peripheral blood monocytes/granulocytes from immuno-competent *in vivo*. This two-pronged approach yielded data relative to both isolated human tissue and live animals (rats) as subject pools.

The *in vitro* portion of this study was conducted with human macrophagic cells in glass containers in a highly controlled laboratory environment. These macrophagic cells were generated from human blood in the lab in culture plates or on cover plates. The cells were then treated with either 50 µg/ml (0.008%) or 100 µg/ml (0.016%) of *Eucalyptus Globulus* for 24 hours. Control samples were also run with Lavender essential oil and Tea tree essential oil to be sure that the results noted with the

*Eucalyptus globulus* was not simply a non-specific effect. Indigestible fluorescent beads were introduced into the cultures to allow for microscopic evaluation of the phagocytosis that occurred.

The results of this portion of the study are impressive: samples treated with 0.008% *Eucalyptus globulus* showed a dramatic increase in the phagocytic activity of MDMs. This increased activity was in direct relationship to the dose, with a 0.016% treatment exhibiting higher levels of phagocytic activity. Specifically, the untreated control cultures had 13.7% phagocytic cells with a mean of 11 beads phagocytosed per cell, while the cultures treated with 0.008% *Eucalyptus globulus* had 31.7% phagocytic cells with a mean of 24 beads phagocytosed per cell. At a treatment level of 0.016% *Eucalyptus globulus* the presence of phagocytic cells dropped to only 10% phagocytic, due to the extremely high level of activity which actually resulted in cell death (thereby decreasing the overall number of cells present vs. the original number in the culture). In this case, up to 64.8 beads were phagocytosed per cell.

The *in vivo* portion of this study was conducted by oral administration of the essential oil to male rats. The daily dose of 12 mg/Kg/day was given for 15 days by adding it to clean drinking water each evening. Two separate experiments were conducted within this *in vivo* part of the research. In the first experiment, the effect of *Eucalyptus globulus* on peripheral blood cells was measured in twelve dosed rats, with a control group of 12 non-dosed rats. In the second experiment, *Eucalyptus globulus* was tested to evaluate its ability to induce a recovery of peripheral blood cell activity after bone marrow suppression. For this second experiment rats from both groups were injected with a single dose of chemotherapy on day 7 of the treatment period. To measure the effects of the treatment the

rats, their blood was collected prior to treatment, as well as on days 7, 15, and 20 after treatment began.

This second portion of this study, conducted on animals, had similarly positive results. Measurements taken at the 15-day mark of the treatment period in live rats indicated a significant increase in the percentage of circulating monocytes in the peripheral blood of treated rats. At the same time, an increase in phagocytic activity was noted.

The authors of this trial concluded that *Eucalyptus globulus* essential oil is able to implement the natural immune response, providing additional support for the use of this essential oil beyond the referenced earlier studies confirming its antiseptic and anti-inflammatory properties. They made note of the fact that the profile of the monoterpenoids in eucalyptus essential oil changes among the different species, with potential variations in therapeutic properties resulting from these changes and point to the need for additional studies on the actual biological actions of these substances. They stated their belief that the findings of this current study will stimulate future investigations using single components of essential oil from various species of *Eucalyptus* for development of a possible new class of immuno-regulatory agents useful against infectious disease, as well as for use in chemotherapy for cancerous tumors.

There are several key distinctions about this study that I believe attribute credibility to the results. The authors appeared to carefully consider prior research in determining the parameters of their study. They included both human cells and live animals as subjects. They used the whole essential oil of *Eucalyptus globulus*, not just one or more of its constituents, taking care to ensure the quality of the oil as well as account for any non-specific effects that could not be attributed directly to the essential

oil. Careful attention was also given to the statistical analysis of the results, as well as the laboratory conditions and supporting materials used in the study. Several steps were taken to ensure that bias would not enter into the study's experiments, such as: evaluating essential oils in addition to *Eucalyptus globulus* to check for any non-specific effects, measuring the repeatability of effects using three antagonists (microbiological pathogens *E. Coli* and *Staphylococcus aureus*, as well as indigestible fluorescent beads), concurrently evaluating related inflammatory effects, considering both immuno-competent and immuno-suppressed subjects. Studies like this one will surely advance understanding and acceptance of clinical uses for aromatherapy.