Most chronic conditions (aging, cancer, diabetes, cardiovascular disease, allergies, AIDS) are linked to hyper or hypo-active immune functions and therefore the need to look for new anti-inflammatory functional food.

Objectives: This research aims at investigating the anti-inflammatory properties of oil palm leaf (Elaeis guineensis Jacq.) ethanol extract in aged Sprague dawley rats.

Methods: Delayed type hypersensitivity, induced by intraperitoneal injection of sheep red blood cells, was measured by footpad inflammatory response, and used as an indicator of cell mediated immunity.

Results: Oil palm leaf extract (OPLE) at 150 mg/kg body weight bw showed significant pro-inflammatory with enhanced 46% late phase inflammation recovery effects. While at high dose, inflammation was significantly suppressed prior to the sixth hour compared to other groups, and did not require much inflammation suppression between the 18th and 48th hour. OPLE 150 mg/kg bw decreased lymphocyte counts, but was not as severely as dexamethasone treatment.

Conclusion: This result suggests that OPLE extract possess strong in-vivo inflammatory-regulatory effects.

Keywords: Elaeis guineensis; Delayed type hypersensitivity; Inflammation.
Results are mean ± SD of 6 rats. *P<0.05 significant (Duncan multiple range tests) compared to control.

Lymphocyte counts [Table 2] was significantly reduced (P<0.05) at 150 mg OPLE/kg bw, but was not as severely as dexamethasone treatment compared to the vehicle and other treated groups.

**Table 2: Effect of OPLE on total and differential leukocyte counts after challenge by SRBC in rats**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Total WBC count (×10^9/l)</th>
<th>Lymphocytes (×10^9/l)</th>
<th>Neutrophil (×10^9/l)</th>
<th>Monocytes (×10^9/l)</th>
<th>Eosinophil (×10^9/l)</th>
<th>Basophil (×10^9/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle</td>
<td>13.8 ± 2.8</td>
<td>10.0 ± 1.4</td>
<td>2.5 ± 1.6</td>
<td>0.5 ± 0.1</td>
<td>0.4 ± 0.5</td>
<td>0.1 ± 0.1</td>
</tr>
<tr>
<td>Dexamethasone</td>
<td>4.5 ± 0.2*</td>
<td>2.1 ± 0.4*</td>
<td>2.0 ± 0.6</td>
<td>0.3 ± 0.1</td>
<td>0.04 ± 0.0</td>
<td>0.1 ± 0.1</td>
</tr>
<tr>
<td>OPLE 150mg/kg</td>
<td>11.0 ± 0.6</td>
<td>6.7 ± 0.6*</td>
<td>3.1 ± 0.8</td>
<td>0.6 ± 0.1</td>
<td>0.1 ± 0.0</td>
<td>0.2 ± 0.1</td>
</tr>
<tr>
<td>OPLE 300mg/kg</td>
<td>13.2 ± 0.4</td>
<td>9.0 ± 0.5</td>
<td>2.9 ± 0.4</td>
<td>0.7 ± 0.1</td>
<td>0.2 ± 0.1</td>
<td>0.2 ± 0.1</td>
</tr>
</tbody>
</table>

Results are mean ±SD of 4 rats. * P<0.05. Significant (Duncan multiple range tests) compared to the control.

Old age has been linked to decreased natural killer cell and T cell proliferation and response to mitogens. However, T cell lymphocytes play significant roles on immune system regulations such as DTH. In the present study, OPLE extract exhibited significant suppression of paw oedema against SRBC induced DTH, a case probably attributed to the ability of the active components of the extract action as antioxidant, have suppressed prostaglandin synthesis from arachidonic acid metabolism, as well as blockade of histamine release from pro-inflammatory mediators [8]. The suppression of paw inflammation is an indication that the extract active components may have polarized cytokine activities towards helper 1 T cells (Th1). As Th1 and Th2 antagonize each other in reciprocal patterns, this may however, assist in intracellular pathogens elimination, leading to an effect on DTH. The 150 mg/kg bw OPLE initially potentiated DTH as similarly reported for other herbs [9]. This was acclaimed to be due to the recruitment of immunocytes, and macrophages into the inflammatory locus, during immune system activation. It later enhanced paw inflammation recovery, explained by the compound activities at both ends of T cell activation and or suppression required to combat diseases [10]. The oil palm leaf contains various flavonoids [2], which may be the reason for the paw inflammation suppression in the high dose of 300 mg/kg bw [Table 1]. Green tea catechins reportedly produced similar effects on inflammation and immunomodulation [11]. Moreover, researches using animal studies have suggested that, a shift to a Th1 cellular immune response is adaptive in actions against infections, and therefore, may increase susceptibility to chronic inflammation and autoimmune diseases. This may be the case for normalization of the white blood cell and lymphocyte counts at the higher doses of 300 mg OPLE [Table 2]. Reduction of lymphocyte counts by the 2 g OPLE /kg bw dose, further indicates the immunosuppression properties by OPLE compounds. This may result to lymphocytopenia [12] and may be subject to intercurrent viral, bacterial, parasitic and or fungal infections.

**Fig. 1: Probable Mechanism of Oil Palm Leaf Extract (OPLE) Anti-inflammatory Effects.**

Mechanisms for the OPLE phenolic compounds immune system modulation may possibly include (i) innate immunity: cytokines release (IFN, IL, TNF, nitric oxides, eicosanoids, ROS, Leukocyte responses (phagocytosis) or (ii) acquired immunity: T lymphocyte
functions, B cell activations (antibody production), T cell (cell-mediated immune responses) Figure 1. This result suggests that OPLE extract possess strong in-vivo anti-inflammatory effects and therefore, may be potentially useful for various disorders related to aging and cell-mediated immune responses.

REFERENCES