Lichen Metabolites Modulate Hydrogen Peroxide and Nitric Oxide in Mouse Macrophages

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The activities of perlatolic acid (**1**), atranorin (**2**), and lecanoric acid (**3**) and their derivatives, such as orsellinates and *b*-methyl orsellinates obtained by alcoholysis, were assessed for stimulation of the release of hydrogen peroxide and nitric oxide in cultures of peritoneal macrophage cells from mice. The hydrogen peroxide production was estimated by oxidation of phenol red, while the Griess reagent was used to determine the nitric oxide production. **1** and 4-methoxy-ethyl orsellinate (**XVII**) were the compounds that induced the greatest release of H_2O_2, whereas *n*-pentyl orsellinate (**IV**), *iso*-propyl orsellinate (**V**), *sec*-butyl orsellinate (**VI**), and **XVII** induced a small release of NO. These results indicate that lichen products and their derivatives have potential immune-modulating activities.

Key words: Lichens, Hydrogen Peroxide, Nitric Oxide