# *Zingiber Officinale* antioxidant activity and immunomodulatory effects on human polymorphonuclear neutrophils

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**Abstract:**

**Introduction**: Human beings are constantly exposed to microorganisms attacks, their survival is linked to their capacity to defend themselves, hence the development of an extremely complex immune system. The protection is therefore maintained thanks to the first line of defense: innate immunity, provided mainly by polymorphonuclear neutrophils (PMNs) being the first to react. However, sometimes the reponses of these cells can be exaggerated or inappropriate, requiring their modulation. Indeed, throughout history, numerous societies have utilized medicinal plants for their healing abilities and nowadays researchers have also marked a profound interest on immunomodulatory effects of medicinal plants, such as *Zingiber Officinale (Z. officinale).*

**Objectives**: In order to deepen our understanding of the biological properties of *Z. officinale*, we were specifically interested in studying the *in vitro* antioxidant and immunomodulatory effects on PMNs *of its* aqueous extract (ZOAE).

**Methods**: Phytochemical composition of ZOAE was firstly investigated using colorimetric assays, then its antioxidant effects were examined *in vitro* using $DPPH^{\bullet}$ radical scavenging assay, nitric oxide radical inhibition, and total antioxidant capacity method. As for the immunomodulatory effect of ZOAE, the measurement of human PMNs degranulation was carried out monitoring the release of lysozyme, an enzyme known to be stocked in the different PMNs granules, subsequent to an extract treatment of isolated PMNs, with increasing concentrations of 250, 500, and 1500 µg/mL followed by fMLP (N formyl-methionyl-leucyl-phenylalanine) stimulation ($10^{-6}$ M).

**Results**: Phytochemical screening of ZOAE revealed the presence of phenols, flavonoids, coumarins, terpenoids, saponins and alkaloids. Nitric oxide radical inhibition did not show any significant activity, whereas, this extract showed antioxidant activities by scavenging $DPPH^{\bullet}$

radical, reducing molybdate to molybdene, and inhibited significantly in a dose-dependent manner the PMNs degranulation, starting with an inhibition of lysozyme release of 28.6% and reaching 63.61%, suggesting the immunomodulatory effect of ZOAE on PMNs.

**Conclusion**: Our study showed that ZOAE has both an *in vitro* antioxidant activity and an immunomodulatory effect on human PMNs. Further investigations are required to develop our knowledge on ZOAE, concerning its *in vivo* immunomodulatory effects on human PMN and the signaling pathways involved in these effects.

**Keywords**: medicinal plants - phytotherapy –- *Zingiber officinale* – antioxidant effect – immunomodulatory effect – polymorphonuclear neutrophils.