

## Research Article

# Propolis Reduces Phosphatidylcholine-Specific Phospholipase C Activity and Increases Annexin a7 Level in Oxidized-LDL-Stimulated Human Umbilical Vein Endothelial Cells

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**Abstract.** Propolis is a natural product with various biological activities. In this study, we investigated the effect of propolis on phospholipase C (PLC) activity and Annexin a7 level in oxidized-LDL-stimulated human umbilical vein endothelial cells (HUVECs). The results showed that propolis treatment significantly reduced PLC activity and increased Annexin a7 level in HUVECs. The effect of propolis was dose-dependent. The results suggest that propolis may be a potential natural product for the treatment of atherosclerosis.

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## 1. Introduction

Propolis is a natural product with various biological activities. In this study, we investigated the effect of propolis on phospholipase C (PLC) activity and Annexin a7 level in oxidized-LDL-stimulated human umbilical vein endothelial cells (HUVECs). The results showed that propolis treatment significantly reduced PLC activity and increased Annexin a7 level in HUVECs. The effect of propolis was dose-dependent. The results suggest that propolis may be a potential natural product for the treatment of atherosclerosis.

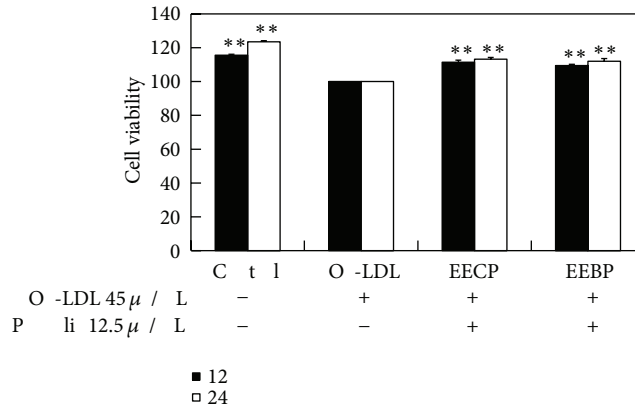
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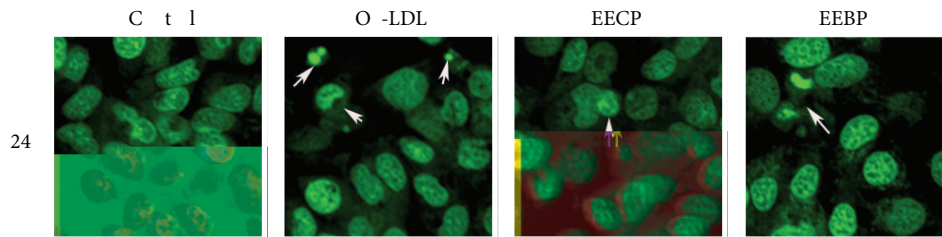
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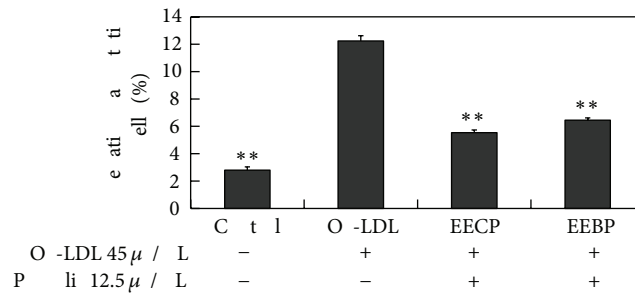
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... (  $\mu /$  ) - (  $\mu /$  ) ... (\*\* $P < 0.01$  ... ,  $n = 3$ ).

2.9. Western Blot Analysis. A A

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2.10. Measurement of ROS Production.

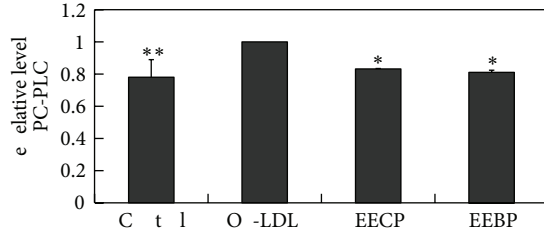
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2.11. Measurement of Mitochondrial Membrane Potential.

A

2.12. Statistical Analysis. A

$\pm$



Ox-LDL  $45 \mu / L$  - +  
 Phallo  $12.5 \mu / L$  - - + +

(\* $P < 0.05$ , \*\* $P < 0.01$ , n = 3).

t-test (A, A),  
 post hoc test.  $A P < 0.05$

### 3. Results

#### 3.1. Effect of EECP and EEBP on HUVEC Viability.

At  $45 \mu / L$  Ox-LDL, HUVEC viability was significantly reduced compared to control (\*\* $P < 0.01$ ; (A)).

#### 3.2. Effect of EECP and EEBP on HUVEC Apoptosis.

At  $45 \mu / L$  Ox-LDL, HUVEC apoptosis was significantly increased compared to control (\*\* $P < 0.01$ ; (A)).

#### 3.3. Effect of EECP and EEBP on PC-PLC Activity.

At  $45 \mu / L$  Ox-LDL, PC-PLC activity was significantly increased compared to control (\* $P < 0.05$ , \*\* $P < 0.01$ ; (A)).

#### 3.4. Effect of EECP and EEBP on ANXA7 Level.

At  $45 \mu / L$  Ox-LDL, ANXA7 level was significantly increased compared to control (\*\* $P < 0.01$ ; (A)).

#### 3.5. Effect of EECP and EEBP on NF- $\kappa$ B p65 Level.

At  $45 \mu / L$  Ox-LDL, NF- $\kappa$ B p65 level was significantly increased compared to control (\*\* $P < 0.01$ ; (A)).

At  $45 \mu / L$  Ox-LDL, ROS level was significantly increased compared to control (\*\* $P < 0.01$ ; (A)).

#### 3.6. Effect of EECP and EEBP on ROS Level.

At  $45 \mu / L$  Ox-LDL, ROS level was significantly increased compared to control (\*\* $P < 0.05$ ; (A)).

#### 3.7. Effect of EECP and EEBP on Mitochondrial Membrane Potential.

At  $45 \mu / L$  Ox-LDL, mitochondrial membrane potential was significantly decreased compared to control (\*\* $P < 0.01$ ; (A)).

## 4. Discussion

At  $45 \mu / L$  Ox-LDL, HUVEC viability was significantly reduced compared to control (\*\* $P < 0.01$ ; (A)).

At  $45 \mu / L$  Ox-LDL, HUVEC apoptosis was significantly increased compared to control (\*\* $P < 0.01$ ; (A)).

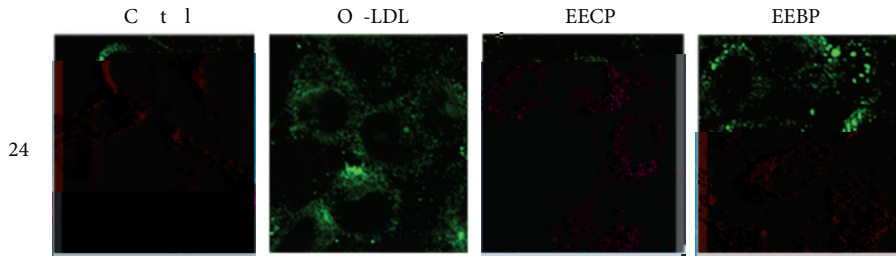
At  $45 \mu / L$  Ox-LDL, PC-PLC activity was significantly increased compared to control (\* $P < 0.05$ , \*\* $P < 0.01$ ; (A)).

At  $45 \mu / L$  Ox-LDL, ANXA7 level was significantly increased compared to control (\*\* $P < 0.01$ ; (A)).

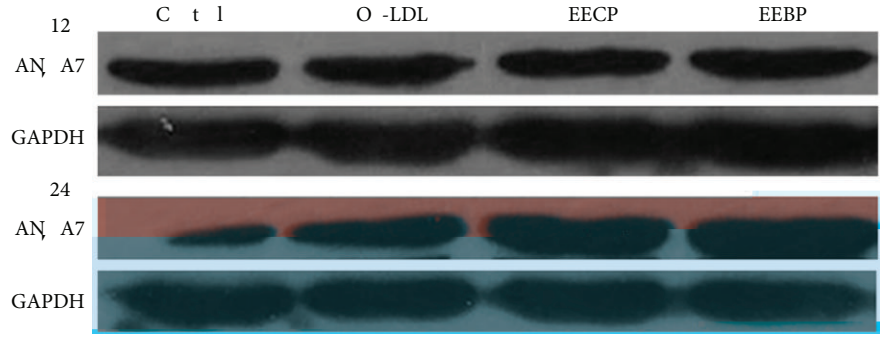
At  $45 \mu / L$  Ox-LDL, NF- $\kappa$ B p65 level was significantly increased compared to control (\*\* $P < 0.01$ ; (A)).

At  $45 \mu / L$  Ox-LDL, ROS level was significantly increased compared to control (\*\* $P < 0.01$ ; (A)).

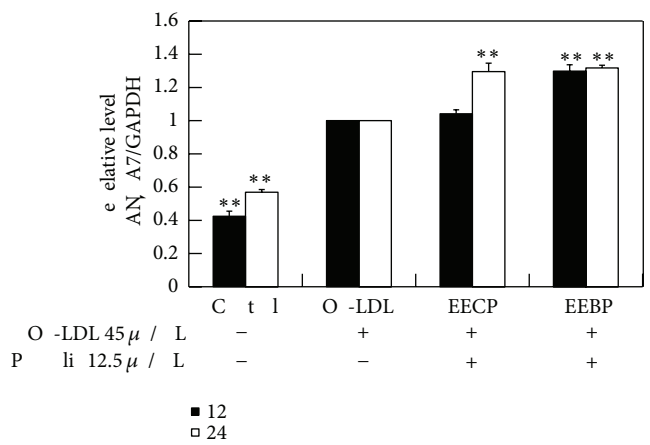
At  $45 \mu / L$  Ox-LDL, mitochondrial membrane potential was significantly decreased compared to control (\*\* $P < 0.01$ ; (A)).



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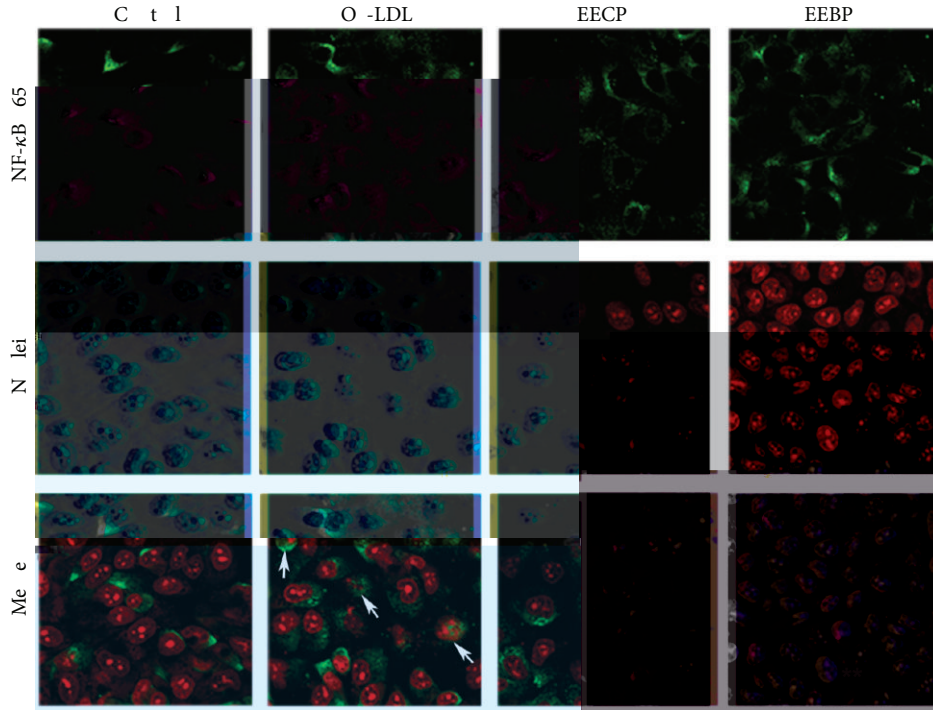
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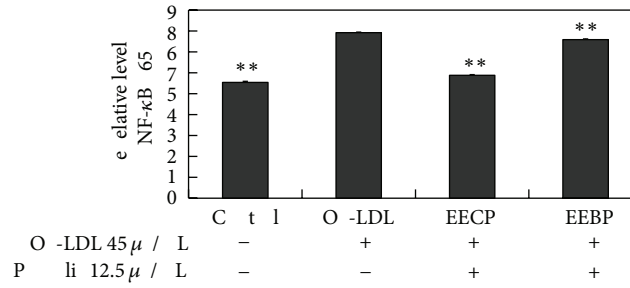
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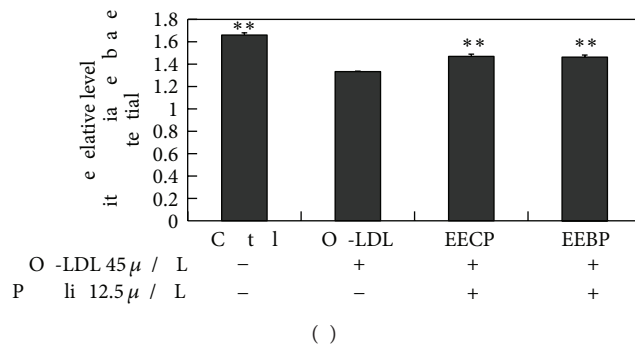
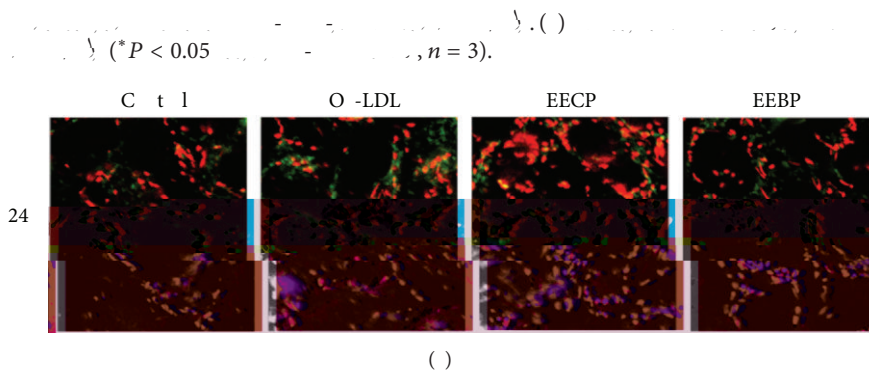
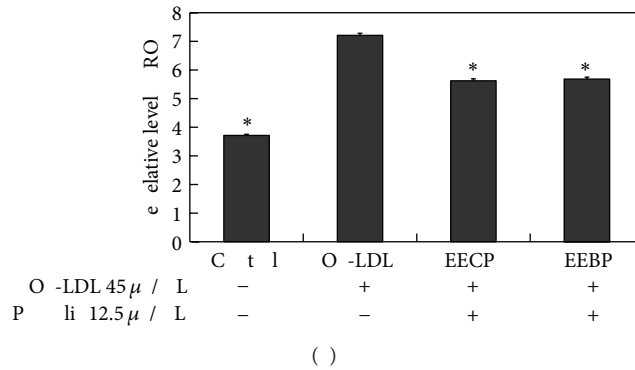
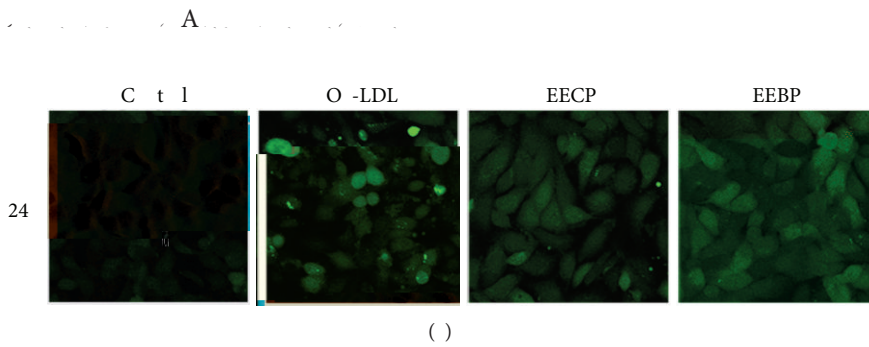


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Figure 1. Effect of EECP and EEBP on NF-κB activation in THP-1 cells. THP-1 cells were treated with O-LDL (45 μg/ml) for 24 h. Cells were then treated with EECP (10 μg/ml) or EEBP (10 μg/ml) for 24 h. The relative level of NF-κB (p65) was determined by Western blot analysis. The results are shown as mean ± SD. (\*\*P < 0.01 vs. O-LDL, n = 3).

Figure 2. Effect of EECP and EEBP on Nlel activation in THP-1 cells. THP-1 cells were treated with O-LDL (45 μg/ml) for 24 h. Cells were then treated with EECP (10 μg/ml) or EEBP (10 μg/ml) for 24 h. The relative level of Nlel was determined by Western blot analysis. The results are shown as mean ± SD. (\*\*P < 0.01 vs. O-LDL, n = 3).

Figure 3. Effect of EECP and EEBP on ROS production in THP-1 cells. THP-1 cells were treated with O-LDL (45 μg/ml) for 24 h. Cells were then treated with EECP (10 μg/ml) or EEBP (10 μg/ml) for 24 h. The relative level of ROS was determined by flow cytometry analysis. The results are shown as mean ± SD. (\*\*P < 0.01 vs. O-LDL, n = 3).



### Acknowledgments

### Conflict of Interests

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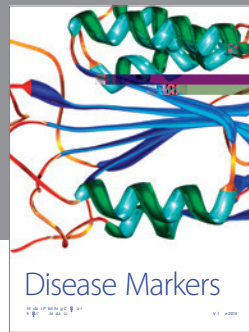
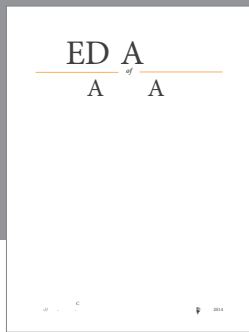
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