Research Highlight

Antcin A contributes to anti-inflammatory effect of *Niuchangchih* (*Antrodia camphorata*)

Zhen-ming LU, Zheng-hong XU*

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Inflammation is the responses of body to harmful stimuli in many pathological conditions. Prevention and treatment of inflammation are the main indication of a variety of natural products. Recently, *Niuchangchih* (*Antrodia camphorata*), a medicinal mushroom in Taiwan, has received considerable attention from the public due to its potent bioactivities, such as anti-inflammation, anti-cancer, immuno-modulatory and anti-hepatitis activities^[1]. Till now, researchers have identified a total of 26 compounds from *Niuchangchih*, including 11 succinic/maleic acid derivatives, 8 triterpenoids, 1 benzenoids, 1 benzoquinone derivative, 5 miscellaneous compounds and polysaccharides, that possess anti-inflammatory effect^[2, 3]. However, the mechanisms underlying their anti-inflammatory actions remain elusive.

A recent study by Chen *et al* elucidated the molecular mechanisms of anti-inflammation of *Niuchangchih*. The authors isolated and purified 5 major antcins (A, B, C, H, and K) from fruiting bodies of *Niuchangchih*. They found that antcin A was most similar to glucocorticoids among the 5 compounds in the chemical structure. Furthermore, they

demonstrated in human lung cancer cell A549 that antcin A was the active ingredient responsible for the anti-inflammatory effect of *Niuchangchih*, which might act via the same molecular mechanism triggered by glucocorticoids^[4]. Finally, they showed the docking of antcin A to glucocorticoid receptor (GR) in a molecular modeling study. Thus, via mimicking glucocorticoids, antcin A may diffuse across the cell membrane and bind to the cytosolic GR that forms a dimer after dissociated from the heat-shock protein (HSP) and then translocates into the nucleus to initiate the suppression of inflammation at the gene regulation level. Molecular docking showed that C-7 of antcin A was attached to the hydrophobic side of the steroidal backbone of GR, while C-7 of the other antcins was attached to the hydrophilic group, thus being expelled when docking to the binding cavity of GR.

Chen's work is an important landmark in research of anti-inflammatory compounds in *Niuchangchih*. Hsien *et al* recently showed that the anti-inflammatory activity of antrocamphin A, another anti-inflammatory compound from *Niuchangchih*, resulted from suppressing pro-inflammatory molecule release via down-regulation of iNOS and COX-2 expression through NF- κ B pathway^[5]. Both the studies provide solid evidence for the potential of *Niuchangchih* to

treat inflammation. To elucidate the mechanisms of action of antcin A and antrocamphin A *in vivo*, more animal experiments and randomized controlled clinical trials should be carried out. Since more than 20 compounds in *Niuchangchih* have been shown to possess anti-inflammatory activity^[6–8], further studies are needed to elucidate their mechanisms. It is also of interest to figure out whether these compounds act synergistically or independently. Notably, most anti-inflammatory compounds in *Niuchangchih* have been derived from the fruiting bodies so far. Further research is needed to uncover whether they can also be produced in fermented mycelia. Besides antcin A and antrocamphin A, many unknown ingredients responsible for the anti-inflammatory effects of *Niuchangchih* remain to be discovered.

References

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Laboratory of Pharmaceutical Engineering,
School of Medicine and Pharmaceutics, Jiangnan University, Wuxi 214122, China
Correspondence: Prof Zheng-hong XU
(zhenghuxu@jiangnan.edu.cn)

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