

## Editorial

# Special Issue Entitled “Immune Regulatory Properties of Natural Products”

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Although the immunomodulatory effects of natural products have not yet been completely elucidated, attempts to use natural products in the treatment of immune-mediated inflammatory diseases such as autoimmune diseases, chronic inflammatory diseases, mutant viral infections, and even immunosenescence-related cancers are ongoing [1]. Many Asian countries, such as Korea, China, Japan, and India, have traditionally used natural products to treat diseases; even in recent times, various research reports on the pharmacological effects of natural products have been conducted [1].

Traditionally, natural products were consumed as crude extracts; as such, the crude extracts of natural products had been used in the exploration of pharmacological efficacy [2]. With the development of analytical science, specific components were extracted from natural products, and their pharmacological efficacy was able to be identified at the molecular level [3].

Research on the biomedical efficacy of these natural products is currently being conducted through the use of various research methodologies such as *in vitro* assays [3], *in vivo* experiments [4–7], *in silico* studies [8], clinical research [9], review studies [10,11], systematic reviews [12], meta-analysis research [13,14], data mining studies [13], network pharmacology methodologies [13–16], and molecular docking studies [8]. Among the various biomedical effects of natural products discovered, many notable reports have been issued about their pharmacological effects in regulating immune function and alleviating inflammation [17].

This Special Issue thus presents five research papers (three articles and two reviews) that are related to the topic of immune regulation, with the aim of these being to further deepen our understanding of the immunoregulatory effects of natural products. These contributions are listed below.

As shown in Table 1, these contributions include an *in vivo* study, two *in vitro* studies, and two systematic literature reviews. The main research material in contribution 1 is medicarpin; in contribution 2, anti-SARS-CoV-2 IgG; in contribution 3, *Conioselinum tenuissimum* root; in contribution 4, *Salvia Miltiorrhizae* radix; and in contribution 5, herbal medicines. Contribution 1 explored the ameliorative action of medicarpin on cognitive impairment using *in vivo* experiments. Contribution 2 explored digitizing images of anti-SARS-CoV-2 IgG enzyme-linked immunosorbent assay (ELISA) plates using a simple table scanner. Contribution 3 explored how *Conioselinum tenuissimum* root extract regulates lipopolysaccharide-induced macrophage activation. Contribution 4 explored activities of the *Salvia Miltiorrhizae* radix and presented a systematic literature review study. Contribution 5 explored effects of herbal medicine combined with pirfenidone on idiopathic pulmonary fibrosis (Table 1).



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**Table 1.** Brief analyses in this Special Issue.

| N# of Contribution | Document Type | Research Type                | Research Material                    | Related Pathology             | Focus                                                                |
|--------------------|---------------|------------------------------|--------------------------------------|-------------------------------|----------------------------------------------------------------------|
| 1                  | Article       | In vivo study                | Medicarpin                           | Cognitive impairment          | Cognitive function improvement                                       |
| 2                  | Article       | In vitro study               | Anti-SARS-CoV-2 IgG                  | COVID-19 pandemic             | Scanner-digitized ELISA plate images                                 |
| 3                  | Article       | In vitro study               | <i>Conioselinum tenuissimum</i> root | Hyper-inflammation            | Anti-inflammation                                                    |
| 4                  | Review        | Systematic literature review | <i>Salvia Miltiorrhizae</i> radix    | Blood stasis-related diseases | Pharmacological activities                                           |
| 5                  | Review        | Systematic literature review | Herbal medicines                     | Idiopathic pulmonary fibrosis | Pharmacological effects of herbal medicine combined with pirfenidone |

In their in vivo study, Oh et al. (contribution 1) reported that medicarpin ameliorates cognitive function along with increased brain-derived neurotrophic factor and phosphorylated cyclic adenosine monophosphate response element-binding protein, which suggests that medicarpin is an effective treatment for neurological disorders such as Alzheimer's disease and Parkinson's disease.

One unique paper reported on the ELISA method. Soares et al. (contribution 2) suggested that scanned images from ELISA could be used to measure anti-SARS-CoV-2 IgG. Their presented method will be useful for examining the anti-inflammatory activity of natural products.

Another paper reported on the anti-inflammatory activity of natural products using macrophages; Kim et al. (contribution 3) reported that *Conioselinum tenuissimum* root water extract lowers levels of cytokines (IL-6, G-CSF, etc.), nitric oxide, and H<sub>2</sub>O<sub>2</sub> in lipopolysaccharides-stimulated mouse macrophages, as well as reduces transcriptions of *Chop* and *Stat1*.

Two papers presented a systematic literature review. Kim et al. (contribution 4) reported that the pharmacological effects of *Salvia Miltiorrhizae* radix are related to cancer and diabetes mellitus, among other, and Cho et al. (contribution 5) reported that herbal medicine combined with pirfenidone improves idiopathic pulmonary fibrosis treatment; however, they also suggested well-designed future randomized controlled trials to evaluate the effects of herbal medicine on idiopathic pulmonary fibrosis.

As the Guest Editors for this Special Issue, we are thankful to all the authors who contributed to this Special Issue, as well as the dedicated staff at MDPI who provided invaluable editorial support. We are confident that readers will find the papers published in this Special Issue meaningful for understanding the immune regulatory properties of natural products.

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**Conflicts of Interest:** The authors declare no conflicts of interest.

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