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Investigation on heavy metals and trace elements in nine Chinese medicines

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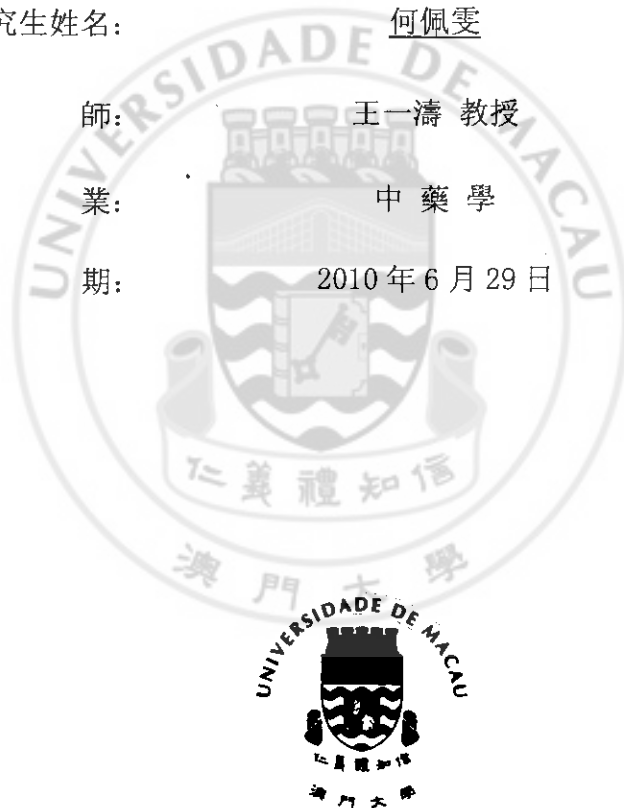
中藥材中重金屬及微量元素分析研究

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ABSTRACT

In recent years, as Chinese medicines develops constantly, the prevention and treatment functions of CMs and their preparations are being re-introduced to the world. The curative effects and the pharmacology of CMs are not only related to organic compounds, but also closely connected to the contents of trace elements of them. Though contents of trace elements are low in the human body, they are significant components in the composition of various substances such as enzymes, hormones and vitamins. Indispensible to the maintenance of normal metabolism of the body and vital activities, trace elements also participate in different biochemical reactions in the body and possess high bioactivity. While the West learns gradually the curative effects of CMs, the heavy metals and the contents of harmful elements is one of the quality control indices in the export of CMs. The phenomenon of exceeded standards is a threshold hindering the introduction of CMs to the world.

The thesis mainly studies the following:

Chapter One discusses the progress of research in heavy metals and trace elements in CMs and the phenomenon of contents analysis tests. It also introduces the progress of research in the analysis of the mode of the heavy metal chromium, laying the research background and the meaning of the research of the thesis.

Chapter Two emphasizes the establishment and the investigation of different methodology of elements cadmium, chromium, lead, arsenic, mercury, cobalt, tin and vanadium. Content tests of the aforementioned elements are conducted using nine kinds of CMs with 90 batches of samples from Macau, Beijing, Inner Mongolia, Zhejiang, Jiangxi, Jiangsu, Sichuan, Shanxi, Guangxi and Taiwan.

Results show that the median of cadmiums, chromium and arsenic exceeded those of the sample of GS, while the contents of cadmium and mercury in a certain portion of the samples exceeded standards. This explains that the contents of heavy metals vary among the same kind of CMs. Moreover, content tests of trace elements of the samples show that sample *Radix Angelicae Sinensis* contains higher amount of tin than other CMs. In general, CMs possess a relative high amount of manganese, among which that of *Rhizoma Copidis* is the highest. The median of cobalt and vanadium of all the samples are more or less the same, but some of the samples show contents far higher than the median. It indicates that there is a certain difference in contents of trace elements even among the same kind of CMs.

Chapter Three focuses on the mode analysis of the relatively high content of chromium in Chinese medicinal plants, as the toxicity of heavy metals is closely related to their species. The experiment adopts strong basic anion exchange resins absorption, separating Cr(III) and Cr(VI). Results indicate that the chromium in CMs is dominated by hexavalent chromium.

In conclusion, the thesis conducts a systemic analysis in regard to the contents of trace elements (cobalt, manganese, tin and vanadium) and heavy metals (cadmium, chromium, lead, arsenic and mercury) present in nine CMs purchased in various regions. At last, mode analysis is conducted focusing on the high content element chromium. The aim is to guarantee the safety of medication, providing valid evidence for CMs quality control.

Keywords: Chinese medicines, heavy metals, chromium, species analysis