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Journal of Clinical Toxicology

Review Article

Textual Review on the Origin of Fecal Medicine in China Based on the Book of "Everything" and "Formulas for Fifty-Two Diseases"

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ABSTRACT

Based on historical records and contemporary documents, more than 10 kinds of traditional Chinese components are material medica made from human feces, including various forms of human excrements, or plant products processed in procedures involving human waste. The clinical application of fecal drugs has strict collection and processing procedures. The theory of Traditional Chinese Medicine (TCM) is used to guide the selection of fecal drug donors, as well as the preparation, preservation of fecal products. Also, detailed documentation was made on the dosage, effects, contraindications and side effects during therapeutic application. According to the different kinds of diseases, different ways of administration were adopted. This paper traces the initial recognition and practice of fecal drugs in China, aiming to provide reference for international human microecology research.

Keywords: Feces; Origin; Microecology; Clinical application

Abbreviations: TCM: Traditional Chinese Medicine; Excrement Juice: Juice got from squeezing feces; Filtered Excrement Juice: Excrement juice filtered by layers of palmae bark, cotton paper and earth; Everything: Wan Wu; Formulas for Fifty-Two Diseases: Wu Shi Er Bing Fang

INTRODUCTION

The earliest official system characters and ancient documents in China can be traced back to the oracle bone inscriptions of the Yin and Shang Dynasties (1600-1046 BC) about 4000 BC [1,2]. Xiaotun Village, 2500 meters to the Northwest of Anyang City in the North of Henan Province, China, is the main site of the oracle bones of Yin Ruins. Oracles are divination files the royal wizard in charge of divination used to carve the divination words on tortoise shell and animal bone with a knife [3]. They were discovered and excavated in the late Qing Dynasty. On these oracles, the use of feces as fertilizer in plantation was first recorded.

In the oracle inscriptions during Wu Ding's dominance of the Yin Dynasty (1250-1192 BC), there was a pictograph of "excrement" [4]. The great oracle dictionary has an explanation on this: "In word explanations (Jie Zi) excrement is expressed as several dots under man, like excrement left by people". In text notes (Shuo Wen), there are no excrement words but only a word meaning excrement, which is a pictophonetic character of later generation. Explanation of this character includes the following two: One is to apply manure to the field; the other "not its excrement rain" with its meaning unclear. "In oracle bone inscriptions, the word "excrement" was written as a pictograph. Houxuan H, interprets this image as holding a dustpan to sweep excrement [5].

During the Shang Periods (1600-1046 BC), excrement was stored and processed as manure for agricultural production, improving soil properties and increasing soil fertility. Houxuan H, explains on this, saying that there are explicit materials about the application of artificial manure in the oracle, which can be interpreted as "Divination on the seventh day of the 13th leap month to ask about whether there will be a good harvest if manure is applied on the flat fields of Xidan from the seventh

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Received: 30-Jan-2023, Manuscript No. JCT-22-20917; **Editor assigned:** 01-Feb-2023, PreQC No. JCT-22-20917 (PQ); **Reviewed:** 15-Feb-2023, QC No. JCT-22-20917; **Revised:** 22-Feb-2023, Manuscript No. JCT-22-20917 (R); **Published:** 01-Mar-2023, DOI: 10.35248/2161-0495.23.13.531

Citation: Xiaohong S, Lijuan H, Songyi Z (2023) Textual Review on the Origin of Fecal Medicine in China Based on the Book of "Everything" and "Formulas for Fifty-Two Diseases". J Clin Toxicol. 13:531.

day to the twentieth day." Faeces are also written as pictograph in other oracle, which is interpreted by Houxuan H, as "shit" [6]. "Pictograph field" in oracle bone inscriptions is interpreted as “manure”, referring to agricultural activities including manuring the field. Another expression of “Faeces are enough for suburban fields” means to determine whether the excrement and urine stored are enough for the use of suburban fields. As for the storage of excrement during Yin Dynasty, there is oracle bone inscription during Wu Ding's dominance saying, “On the eleventh day for divination, the result is pig toilet”. It is a pictograph, symbolizing two pigs in one house. As for pictograph, the upper part symbolizing shelter and the lower part fence. In text notes (Shuo Wen), there is a saying that is a pigsty. Houxuan H, cited from many sources that in ancient times, pigsty was often used as a toilet. The toilet pigsty was a place for storing excrement, including both human excrement and animal excrement, just like the farmyard manure in modern fertilizer science. It is also recorded in the oracle:" Rotate the excrement to make it well-distributed, and then send it to the field", which bear similarity to the method of stirring fertilizer during fermentation in modern fertilizer science. In Shang periods (1600-1046 BC) people used pig toilets to store feces. According to the research of modern fertilizer science, feces must be stored for quite a long time before they can be used. The stored feces, plus other wastes, must often be stirred. As for the time of fertilization, "In February, sufficient manure should be applied". Later in the Western Zhou Dynasty (1046～771 BC), Rites of Zhou (zhou li) recorded that different animal excrements were used across different soil types. For example, "Choose the proper kind of excrement to fertilize the soil. For poor soil, use excrement. In addition, if the soil is stiff, use cattle dung; if the soil is red, use sheep dung. For graveyard, use the elk dung; for dry and infertile soil, use deer dung; for saline alkali soil, use porcupine dung; for fertile soil, use fox dung; for clay soil and hard black soil, use pig dung, etc. All the above means that the right dungs should be chosen according to the type of the soil". This shows that the application of animal manure has been extremely meticulous. However, in oracle bone inscriptions, excrement was only recorded to be applied to field, and there is no written record of fecal treatment of human diseases.

LITERATURE REVIEW

Origin of human excrement used as Chinese materia medica

In 1975, a relatively complete ancient medical literature on prescription, the silk book formulas for fifty-two diseases (Wu Shi Er Bing Fang), was unearthed in Mawangdui No.3 Han Tomb in Changsha, whose author remains unknown. The book is written around the Western Zhou Dynasty (about 11th century BC-771 BC) [7-8], or of the Spring and Autumn period and the Warring States Period (770 BC-221 BC) [9]. In this book, the first record of human excrement used as medicine was found. The relevant entries of excrement in the book are as follows.

- Original text: Prescription from Entry 316 [10].
- Original text: Prescription from Entry 317.

Interpretation: This part of formulas for fifty-two diseases (Wu Shi Er Bing Fang) is interpreted as the following: Mercury, golden juice and cinnabar are mixed and evenly placed in closed pottery pot according to 2:4:1, and then baked in warm fire for two to three days. After that, wrap it with cloth and apply it externally to the affected area for one month, which makes a treatment course. The patient should stay away from wind and cold and should not stay up late. This prescription can clear heat and resolve toxins, cool the blood and dissolve macules, eliminate putridity and promote regeneration, as well as whiten the skin. In this prescription, golden juice may neutralize mercury. Man’s aversion (Nan Zi Wu) according to formulas for fifty-two diseases (Wu Shi Er Bing Fang) is interpreted as golden juice, which is also called by later generations as filtered excrement juice, though there are other interpretations of it.

Origin of animal excrement used as Chinese materia medica

Everything（Wan Wu)

In 1977, a relatively complete ancient medical document of prescriptions, Everything (Wan Wu) was recovered in No.1 Han Tomb of Shuanggudui, Fuyang County, Anhui Province with its author unknown. Estimated to be earlier than formulas for fifty-two diseases (Wu Shi Er Bing Fang) which was compiled 3000 years ago, it sums up knowledge of materia medica in the Spring and Autumn Period, the Warring States Period and even earlier. Being a book about natural science, most of its content is about medicine and materia medica. Among them, most are one or two kinds of drugs for treatment of a disease. There is no clear compound formula, and very little about drug collection and processing [11]. All these indicate that it is an immature transitional work of "materia medica". Records of fecal drugs for disease treatment can be found in this book [12-13]. In Everything (Wan Wu), original text about animal excrement is from Entry W002, W003, W007, W031 and W040 [14].

Interpretation: The Han bamboo slips of Fuyang-Everything (Wan Wu): Entry 3: In formulas for fifty-two diseases (Wu Shi Er Bing Fang) there is record of the disease. Retention of urine which mainly manifests as decreased amount of urine and difficult urination can be treated with swallow excrement and Shearer's Pyrrosia Leaf (Shi Wei). Whether the disease named Niao Bu Yi (urine failing to pass out) which can be treated with excrement and shi fan (according to the annotation by the group responsible for sorting the Han bamboo slips of Fuyang, Entry 4 continues from Entry 3.

In Shen Nong’s Classic of the materia medica (Shen Nong Ben Cao Jing), there is shi fan with the indication of stony strangury refers to urolithic stranguria with painful, difficult and unfinished urination caused by lithangiuria of the modern medicine, or enuresis of the modern medicine remains to be verified.

Entry 10: "Stone rat" is not identified. Its excrement can alleviate the symptom of heartburn and chest pain. In formulas for fifty-two diseases (Wu Shi Er Bing Fang), there is record of "male mouse excrement". In Shen Nong’s classic of the materia medica (Shen Nong Ben Cao Jing), there is record of “sky mouse

excrement", which is bat feces. In Dialect (Fang Yan), there is "fairy mouse". According to illustrated classic of materia medica (Ben Cao Tu Jing), the fairy mouse lives in cave, drinking water dripping from stalactite. Adult fairy mice are said to be thousand years old, they are pure white with a crown, and the size of a magpie or a turtledove. Young fairy mice which has not turned white yet is said to be a hundred years old, hanging upside down in stalactite. Choose their white excrement as medicine. In the Qing Dynasty, in half book of materia medica (Bencao Chengya Banjie), there is narration about the feces of fairy mouse: They are so shiny that they are named night shine. Its medicinal processing method is recorded as the following: Sieve the excrement with big-opening sieve several times, and then filter it with water to get rid of sandy soil. After that, put it into a cloth bag made of ramie fiber and wash it in a brook repeatedly until three tenths remains. Then put the residuum into a cloth bag made of fine ramie fiber and wash it again till one dou (one dou equals 10000 ml) residuum turns into one liang (one liang equals 37.3 g in Qing Dynasty). The shiny round ones are of good quality, while the thin and flat ones are the skin of mosquitoes and worms. If excrement is collected from bats feeding on the stalactite, process it according to the method mentioned. Among the processed products, the ones as bright as the pearls are the best. Dry them by mild fire through a piece of paper and grind them into superfine powder for medicinal use. Materia medica arranged according to pattern (Zheng Lei Ben Cao) of the later generations' records that stalactite can enhance the functions of various human zang-fu organs, tonify the kidney, and enhance sexual performance and cures infertility. Long term intake was recorded to prolong life. The selection of white feces of bats preserved in the natural conditions of caves, from bats with special eating habits and long-life body features may be enlightening for the selection of clinical fecal bacteria donors [15]. Besides, before the Song Dynasty, the concepts of "heartburn" and "stomachache" are the same. The so-called "heartburn" was in fact angina and myocardial infarction. And the so-called "stomachache" could include symptoms of acute and chronic gastritis, gastroduodenal ulcer, functional dyspepsia, prolapse of gastric mucosa and other diseases with upper abdominal pain. That is to say, white excrement of stone rat has therapeutic benefits on the above diseases.

About character printed from the opposite page after Entry 46, the one before a word is no longer recognizable. Entry 60: Wei, raw leather, refers to untanned leather. The next two incomplete characters are suspected to be "able to cure". The next word to "sheep" is like the character of excrement, referring to excrement of goat or sheep. As can be found in miscellaneous records of famous physicians (Ming Yi Bie Lu) by Liang Hongjing of the Liang Dynasty, burn the excrement of goat or sheep (to get the medicinal) to treat the disease of diarrhea or dysentery in children, the syndrome of borborygmus, and epilepsy induced by fright, etc.

Formulas for fifty-two diseases (Wu Shi Er Bing Fang)

Fecal drug from birds chicken dung: Entry 380 and entry 397

Interpretation: The original text of Entry 380 means that for some allergic skin diseases caused by pain with unknown etiology and serious symptoms, make thick liquid by mixing chicken excrement with the soil left from digging rat. Paint the body (with the thick liquid) while reading incantations to avoid ghosts [16]. In the course of treating "diseases" relating to incantation, ancient shamans combined psychological, physical, physical therapy with folk secret recipes and psychological hints. In doing so, they not only enhanced patients' confidence in overcoming "diseases", but also obtained certain curative effect in clinical practice [17]. Being a transition from witchcraft culture to ancient medicine, with the ancient medical thoughts unknown, the ancient application of feces is proven by modern environmental microbiology to be scientific and rational to some degree. For example, soils are good breeding ground for microbial growth and reproduction, so that microorganisms can easily coexist with each other, predominantly overground and underground bacteria. Next come actinomycetes, fungi, spirochetes, etc. Most bacteria exist in soil 10 to 20 cm from the ground surface. And the deeper the soil is, the less the bacteria are. Most of the bacteria in the soil are beneficial to human. Whether they can promote the growth and reproduction of beneficial bacteria in feces, and how they interact during processing with the beneficial bacteria in feces to produce therapeutic effect on intractable skin diseases remain unknown until now.

Entry 397 talks about the treatment of insect sore. According to it, use the smoke from burning rooster excrement to fumigate the affected part. Insect sore, as explained in explanation on formulas for fifty-two diseases (Wu Shi Er Bing Fang Shi Yi) is the leaking sore disease after scrofula ulcerates, similar to scrofula of modern medicine. Besides, Great TCM Dictionary explains insect sore as symptoms of lip sore, yellow-water sore (huáng shuǐ chuāng, roughly equivalent to impetigo) or lip cancer [18-19].

There is a formula in huangdi's inner classic: Basic Questions (Huang Di Nei Jing Su Wen) named Chicken Droppings Wine (Ji Shi Li) which treats abdominal distension, similar to ascites due to cirrhosis in modern medicine. According to essentials of materia medica (Ben Cao Bei Yao) from the Qing Dynasty, in December, take the white part of rooster droppings, and mix it with vinegar or dry-fry it with rice for external application. According to the grand compendium of materia medica (Ben Cao Gang Mu) from the Ming Dynasty, stir fry dried 800 ml chicken droppings till it changes odor. Then add three bowels of good wine without lime into it, and decoct will one and a half bowls are left. After that, filter the liquid with cloth. Warm the decoction and drink it between 3 am and 5 am. Increased borborygmus shall be heard and between 7 am and 11 am, two or three defecation with black liquid shall be seen. After wrinkles appear at the heels, drink the decoction again till wrinkles are seen at the knees, an sign of improvement of the disease. It is believed that the white part of rooster dropping is cold in nature, and can disperse accumulation, relieve distention, and promote urination and defecation. Thus it has a wonderful effect on abdominal distension, which is caused by damp-heat and stagnation of pathogenic qi [20].

Magpie feces: Entry 190: Explanation on formulas for fifty-two diseases (Wu Shi Er Bing Fang Shi Yi) considers the "high grass under magpie's net" to be sweet wormwood, and sweet wormwood

can treat urinary tract infection and prostate infection. Yuhuan L, considers that it is wormwood under the magpie nest, and speculates that the ancients thought wormwood under magpie nest was nourished by magpie feces and thus had special medical effect [21].

Fecal drug from animals dung from sheep and goat and dung from male rat and mouse: Entry 10, entry 335 and entry 347

Interpretation: Entry 10 and entry 335: For knife cut, burn black male goat or sheep excrement, and then apply it externally to the wound. Supplement to 'Important formulas worth a thousand gold pieces' (Qian Jin Yi Fang) records that the excrement ash can be used with water to wash one's hair in order to promote hair growth. So sheep and goat excrement can nourish hair and promote its growth. And ash from sheep and goat excrement can stop bleeding, resolve toxins and promote granulation. Scab disease is interpreted as scabies and tinea by Interpretation of formulas for fifty-two diseases (Wu Shi Er Bing Fang Shi Yi) [22]. One formula uses black male goat or sheep excrement. First stir fry it until it becomes dry, and then soak it in young boy's urine (normally the boy is under ten years old) for external application on affected part. Another formula makes use of male rat or mouse excrement. Burn the excrement while keeping its nature (the original color and smell at its inside). Then mix that with vinegar for external application. According to manifestation of tinea from treatise on the origins and manifestations of various diseases (Zhu Bing Yuan Hou Lun Xuan Hou), the etiology of tinea involves nine kinds of worms. It is believed that there are pinworms in the intestines, and there are also worms in the tinea. This may provide some inspiration for the cause and treatment of modern tinea. Later, Ri Hua-zi's materia medica (Ri Hua Zi Ben Cao) cited Tao Hongjing's saying from the Liang Dynasty that a male mouse or rat's excrement has two sharp ends. Choose those with hard ends for medicinal use. It has a special effect on the patients who suffer from relapse due to lingering pathogens and overwork after being cured of cold damage disease and warm febrile disease. It can also treat epilepsy in children.

Dog excrement: Entry 112

Interpretation: Dog excrement is used to treat epilepsy or eczema (according to different interpretations), which is similar to allergic skin disease and scabs. Burn dog excrement while keeping the original color and smell at its inside. (Great dictionary of Chinese materia medica: Calcine till charred, making it withered but not broken. Cover it with earthen bowel to keep the heat inside till it cools down naturally in order to preserve its property. If fire is overused, it breaks into pieces and scatters and thus becomes useless. Also, according to Pharmacopeia, burn it till the outside becomes carbonized and the inside brown.) Mix it with water and apply it externally on shaved head to expel wind and resolve toxins, and to draw toxins out of the body. Burning dog excrement while keeping the original color and smell at its inside can enhance its therapeutic effect of drying dampness and closing sore. However, using dog excrement to treat epilepsy or eczema mentioned in formulas for fifty-two diseases (Wu Shi Er Bing Fang) is rarely mentioned in books on formulae and materia medica of later ages.

Entry 381

Interpretation: A formula for treating allergy caused by lacquer. Burn rat or mouse excrement while keeping the original color and smell at its inside. Mix it with well water and drink it or apply it externally. This also prevents relapse for a relatively long time. Mouse and rat excrement are nontoxic, sweet in taste and cold in nature. It can resolve toxins and reduce swelling. Applied externally, it can treat sores caused by various toxins. Based on the text above, we can refer that when applied to man, mouse and rat excrement may act on the immune system, causing autoimmune response, which is similar to vaccine in making human body produce substances like specific antibodies, though its pathway and therapeutic mechanism remain to be further explored.

Pig dung: Entry 314 and entry 378

Interpretation: Pig dung, when decocted with proper amount of well water and then soaked in proper amount of vinegar or wine, has relatively good therapeutic effect on skin burn and scald when applies externally. Cold in nature, pig dung can clear heat, resolve toxins and reduce swelling. Vinegar can neutralize acid and base. Wine can disinfect, relieve pain and warm the channels. In entry 378, the psychic method mentions applying pig dung externally to treat disease caused by lacquer.

Horse dung

Interpretation: 1200 ml of horse dung [23], is used to treat serious swelling of scrotum. First, put horse dung into a wood container and soak it in water till the water becomes clear. Decoct it to get rid of water, and then put it in *Physalis pubescens* L. solution. Use mustard greens to dip the solution and wash the scrotum externally. Therapeutic effect should be seen once this is done, and swelling should be relieved after four or five washings. Horse dung can resolve toxins and close sores. In the grand compendium of materia medica (Ben Cao Gang Mu), horse dung is described to be slightly warm in nature, which can enhance the effects of other medicinal once used in combination. It is also recorded to be used after decoction with water to wash the affected part [24].

Fecal drug from insects earthworm excrement: Entry 61

Interpretation: Stir the mixture of earthworm excrement and sediment of soil at the bottom of stean used for getting water out of a well with vinegar, and then make it into bolus. Heat the bolus and apply it externally at the wound to treat dog bites. It can neutralize and eliminate toxins. Warm bolus made of soil, when externally applied, can remove hair, allow sweat glands to expel pathogenic factors and enhance the therapeutic effect of medicines. Its effect on dog bites remains to be further explored. However, according to newly revised materia medica (Xin Xiu

Ben Cao), earthworm excrement, similar to this recipe, has remarkable effect on dog bites.

DISCUSSION

In ancient literature, there are descriptions of the use of fecal drugs in the treatment of intractable skin diseases. Their successful clinical experience is similar to the effective drug use records by ancient medical practitioner. Many of the skin diseases listed in this paper belong to modern difficult miscellaneous diseases without radical cure method, so it has important guiding significance for clinical research of modern skin diseases. Taking rat dung as an example, we processed it into medicine according to the ancient processing methods, and observed the changes of microbial community, the structure of micro ecological lesion area and the characteristics of community after treatment by using gene sequencing technology, protein and metabonomics technology. It can be seen from the literature that ancient doctors have recognized the pathogenic factors of "insects" and used fecal drugs effectively. Some factors in fecal drugs may treat the skin lesions caused by this "insect poison" by using microorganisms as media. Moreover, fecal microecological samples can be co cultured with skin lesion samples for direct observation by naked eyes.

The microecosystem of human body maintains a dynamic changeable balance between the inside of the body and the outside natural environment by ascending, descending, existing and entering. There is energy flow, material exchange and gene transfer between human body and microorganism. The treatment of microecological disorder is based on the principle of restoring the "movement" of flora and achieving "balance". Intestinal microecosystem, as a complementary metabolic pathway of drugs, can activate mammalian liver enzyme system, thus affecting human metabolism of foreign compounds such as drugs. Studies have shown that exogenous miRNA can regulate the expression of target genes of animal physiological function. The four properties and five flavors and meridian tropism of Chinese materia medica may relate to the type and amount of miRNA included. The undegraded miRNA of human body regulates the stability of metabolism and immunity by making use of the template in the body. Chinese materia medica may change its miRNA conformation through different processing methods. miRNA may be the information carrier of Chinese materia medica. Currently, it is considered that the intervention of Chinese materia medica on the microbial flora works by intervention in changing the composition of the microbial flora in order to improve it. The flora may transform the chemical components of Chinese materia medica into metabolites with different biological activity/toxicity and different bioavailability, and may also mediate the interaction between different components of Chinese materia medica to produce curative effect. Researchers have begun to recycle the fermentation supernatant of compound Chinese medicine residues, and found that it can slow down the inflammatory cell infiltration, and significantly reduce the production of IL-6, IL-8 and TNF-α. The host shapes the intestinal flora through miRNA in feces. The half-life of miRNA in blood, body fluid and tissue is long, difficult to degrade. There is a stable correlation between free miRNA in serum and miRNA expression in tissue. Host miRNA enters bacteria and regulates gene transcription of the bacteria. Previously, it has been reported that miRNA can enter mitochondria to regulate mitochondrial gene expression. Given that it is generally accepted that mitochondrial evolution originated from bacteria, this provides a theoretical basis for miRNA regulation of bacteria. miRNA can affect cell growth by regulating gene transcription in bacteria [25].

A latest report shows that *Aspergillus fumigatus* found in soil also exists in the human lungs. One of its polysaccharide components can activate the host's inflammasome by binding with ribosome, thus protecting the host against fungal infection. This study suggests that ribosomes may play an important role in the activation of inflammasome and antifungal innate immune response, or provide new intervention ideas for the treatment of related infections. However, mouse feces and rat feces have more chances to contact with soil, and the relationship between *Aspergillus fumigatus* and the feces of mouse and rat is worthy of further study [26]. Increasing evidence suggest that host microbiome is a predictor of immunotherapy response, although the optimal composition of host microbiome has not yet been determined. Metabonomics, a new field of medicine, aims to analyze the metabolic spectrum of a biological system. Microbial derived metabolites, such as feces and serum, represent the final products of microbial metabolism. In regard of function, they may be more important than the species of bacteria of the optimal microbiome. Many studies have confirmed that there is a certain correlation between good flora and enhanced immune response. However, there is no consensus on which microorganism can improve the response rate of immunotherapy. Studies have shown that the microbiome can affect the immune response and help regulate the response to checkpoint inhibitor therapy. Currently, a number of ongoing clinical trials aim to obtain more favorable response to immunotherapy by regulating the composition of microbiome. Symbiotic microorganisms in intestinal tract play an important role in regulating local immunity, innate immunity and adaptive immunity. Microbial metabolic activities in intestinal tract can mediate the immune response of various pathological systems, including autoimmune diseases, such as inflammatory bowel disease. The final metabolites of different microflora may affect the immune response of patients treated with checkpoint inhibitors by affecting T cell homeostasis or other mechanisms that have not yet been found. These metabolites may also be potential therapeutic targets for regulating immune response [27]. Microecology may give us a chance to rediscover the therapeutic mechanism of Chinese materia medica. It also provides immunological evidence for the treatment of allergic diseases by mouse feces recorded in ancient literature.

In addition, modern endocrinology studies have confirmed that some steroid hormones are excreted in the form of coprosterol. Chun L, et al. [28], mentioned that in the 1950s, some scholars confirmed that human feces contained estrogen and measured it by radioimmunoassay. Biochemical studies show that there is a balance between sex hormones in animals. In males, the balance

contains more androgen, so more estrone is excreted in the urine of male animals. For females, the balance contains more estrone, so more androgen is excreted in the urine. Although the ancients did not know the micro level differences in different ages and genders, it can be observed from the works of past dynasties that the ancients accumulated relatively mature experience by selecting age and gender of fecal drugs in their clinical diagnosis and treatment. According to this reasoning, when human fecal drug is applied, it seems that female feces should be chosen for male patients and vice versa. This hormone balance therapy of ancient doctors is in accordance with "taking the other's excess to tonify my deficiency". This may be one of the breakthroughs in the therapeutic mechanism of fecal drug.

The adverse reactions and side effects of fecal drugs on gastrointestinal tract, cardiovascular system, liver and kidney are rarely recorded in the literature. As recorded in seeking accuracy in the materia medica (Běn Cǎo Qiú Zhēn), if patients with insufficient qi and blood take faeces trogopterori (flying squirrel faeces, wulingzhi), namely bat dung, the vitality of human body and the motive force of life activities will be seriously damaged. According to dictionary of Chinese pharmacy, human faeces are forbidden for people with cold constitution, weak constitution and anemia. Faeces are the end-products of diet metabolism, so by its very nature, it belongs to the drugs produced by human body. Using feces to treat diseases of the human body is like using bamboo to repair broken bamboo, and using eggs to hatch chickens. It may be the best way to eliminate the pathogenic factors of human body by using feces, the transformed food by stomach.

In the processing process of fecal drugs, some of them are selectively co-prepared with specific soil. This processing procedure has something in common with production practice. At present, in some areas of China, it is still customary to bake feces at a low flame for production. After the winter solstice, frozen feces from animals such as cattle and horses are collected, and then baked at a low flame for more than 3 months. Is this a fermentation process which makes the bacteria in the feces multiply in large quantities? What is the internal change of pH in fermentation caused by heating? Is there a selective preservation of certain bacteria due to temperature rise caused by heat generation? Does humic acid exist and participate? Zhang Xingyi mentioned that the soil, termed isohumic soil, contains a large amount of organic matter. Comprehensive fertility of sterile black soil in regard of physical, chemical and biological aspects can be regained after excrements from human and livestock are applied. Microbiology mentioned earlier that a variety of microorganisms in the soil above the ground surface are beneficial to human beings. Do they promote the growth and reproduction of beneficial bacteria in feces? If so, how do they interact with each other? What's more, are trace elements in activated soil involved? The experience of fecal drugs accumulated by ancient doctors can provide valuable reference for modern medicine, inspiring the thinking of scientific research and clinical practice. It can further enlighten us to learn the thinking methods of ancient people to understand nature and human life phenomena.

CONCLUSION

Chinese pharmacists have been continuously seeking for the medical value of fecal drugs. Much valuable documentation was discovered in the past few hundred years on the use of fecal products as a part of TCM. Research and development of its treatment information in difficult and miscellaneous diseases can provide inspiration in new concept formation, curative effect mechanism exploration and even new product research and development of fecal drug treatment in TCM. The development of modern microecology also brings new opportunities and prospects for the research of TCM.

AUTHOR CONTRIBUTIONS

Shi Xiaohong wrote the paper in Chinese; Zhang Songyi read and gave suggestions to it; Hu Lijuan translated the paper into English. All authors read and approved the final manuscript. Based on the contributions, Shi Xiaohong is listed as the first author and the corresponding author. All authors read and approved the final manuscript.

FUNDING

This work was funded by Administration Office of Zhejiang provincial Traditional Chinese Medicine (No. 2018ZQ040).

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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