



East Asian Science, Technology and Society: An International Journal

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/teas20

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To cite this article: Jen-der Lee & Chih-hung Chen (2024) EUMENOL—Merck's Patent Emmenagogue and its Chinese Connections (1896–1961), East Asian Science, Technology and Society: An International Journal, 18:3, 288-310, DOI: [10.1080/18752160.2023.2251784](https://doi.org/10.1080/18752160.2023.2251784)

To link to this article: <https://doi.org/10.1080/18752160.2023.2251784>



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Published online: 19 Sep 2023.



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EUMENOL—Merck’s Patent Emmenagogue and its Chinese Connections (1896–1961)

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Received: 16 September 2022 / Accepted: 21 August 2023

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Abstract This article examines the rise and fall of Eumenol, Merck’s patent emmenagogue extracted from *danggui* (當歸), and its destined connections with China. Understood to affect the blood, *danggui*, one of the most prolifically used substance among Chinese *materia medica*, had been included in recipes for women aged from before menarche to after menopause since the twelfth century, but it was not until its production and advertisement by the German pharmaceutical company that the multi-functional material was placed on the international stage with a sharpened gendered image. For Merck customers around the world, Eumenol was a long-awaited, harmless emmenagogue made from an obscure Chinese material; for Chinese who had been using the root to treat a wide range of disorders, the branded drug was a scientific refinement of a time-honored medicine. The success of Eumenol gave advocates of Chinese medicine a concrete example with which to rejuvenate their medical traditions, but the later cessation

Acknowledgements The authors are indebted to Chen Ming, Bettina Wahrig, Dominik Merdes, Albert Wu, Ku-ming (Kevin) Chang and Che-chia Chang for directing us to important primary and secondary sources for this research. We thank Sabine Bernschneider-Reif and the staff of the Merck Archives for their generous support. We are also grateful to Sean HL Lei, Michael Stanley-Baker and Wen-hua Kuo for their excellent comments when we presented earlier versions of this article in different venues. This article comes out of the Taiwan-Germany (DE) International Collaborate Project—Materialities in Medical Cultures in/between Europe and East Asia; we thank MOST (now NSTC) for its funding, and we enjoy constant stimulating conversations with our project members. We value the suggestions from the two anonymous reviewers; any errors and mistakes are of course ours alone.

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of Chinese imports forced Merck to eventually stop marketing the emmenagogue. Within this intersection of medicinal exchanges, Eumenol emerged as an indispensable piece of the puzzle in terms of both the history of an ancient remedy and the modernization of Chinese medicine.

Keywords Eumenol • *danggui* • Merck • women's medicine • China

1 Introduction

This article examines the rise and fall of Eumenol, an emmenagogue extracted from *danggui* (當歸) and patented by Merck, and its connections with China. It argues that the root, possibly the most prolifically used remedial substance among the Chinese *materia medica*, became a hope for traditional Chinese medicine after it was exported to Europe, made into a menstrual regulator, and sold in bottles across continents. Understood to affect the blood, *danggui* had been included in recipes for women aged from before menarche to after menopause since the twelfth century, but it was not until its production and advertisement by the German pharmaceutical company that the multi-functional material was placed on the international stage with a more clearly gendered image. For Merck customers around the world, Eumenol was a long-awaited, harmless emmenagogue made from an obscure Chinese plant; for Chinese who had been using the root to treat a wide range of disorders, the branded drug was a scientific refinement of a time-honored medicine. The success of Eumenol gave advocates of Chinese medicine a concrete example with which to rejuvenate their medical traditions, but the later cessation of Chinese imports forced Merck to eventually stop marketing their patented emmenagogue. Within this intersection of medicinal exchanges, Eumenol emerged as an indispensable piece of the puzzle in terms of both the history of an ancient remedy and the modernization of Chinese medicine.

Medicinal exchanges between China and other regions are far from being a new subject of historical inquiry, as demonstrated by scholars who have worked on the transmission of drugs as commercial goods and cultural agents. Medicinal materials used and traded along the Silk Road in the first millennium have attracted the attention of archaeologists, linguists, and historians for decades (Chen 2005). Following the trajectories of *asafetida* since the fifth century, researchers have found that the connotations and usages of that substance shifted from it being a culinary supplement and spirit-expelling drug to a solvent of blockages and of bad *qi*, as well as later becoming a species of plant in modern naturalist studies as it traveled between Central Asia, India, China, and Europe (Leung and Chen 2019). A more recent transnational exchange occurred in the fifteenth through the twentieth centuries when caterpillar fungus, an indigenous Tibetan organism, entered the global transformation of knowledge through an intricate network of people, institutions, and societies within a Sino-Indian-Tibetan context (Lu 2017, 2023).

In East Asia, the most visible medicinal substance may have been ginseng, whose efficacy and commercial value are not only cited as evidence of China's early interactions with the Korean peninsula but also examined as an inspiring resource for Chinese therapeutic cultures within which its production, consumption, and knowledge developed in the late imperial period (Chiang 2015). Ginseng has even become

the focus of a new approach to the political history of the Qing dynasty (1644–1912), which argues that this precious substance and peoples' movements in search of it shaped the nature of the Chinese empire's boundary with the Choson dynasty (1392–1910), causing its transformation from frontier to borderland and finally to border (Kim 2017).

Medicinal substances are particularly visible in political contestations because of their perceived healing properties, even if the information was misguided. The Chinese perception that Westerners, whose diet was believed to cause intestinal obstructions, could not survive without rhubarb gave credence to proposals to embargo rhubarb exports in the run-up to the Opium Wars (Chang 2005). Research on *changshan* (常山) demonstrates how Chinese doctors in the 1930s, facing competition from their Western counterparts and trying to find a magic bullet equivalent to quinine, re-networked traditional anti-malarial *materia medica*, leading to its "discovery" (Lei 1999).

Objects are never just themselves. Their functions and meanings are reoriented when interacting with people not only across places or regions but also through different periods and in diverse frameworks. Studies on the history of the betel nut show how this invigorating medicament, cherished by meditating Buddhist monks in medieval China, has become seen as a toxic foodstuff and a harmful crop within modern healthcare and environmental discourses—falling from heaven to hell, as it were (Lin 2014). "Dragon bones," a valuable material in Chinese medical tradition, likewise turned into *Os Draconis* when vertebrate paleontology, which arrived from the West, accused uneducated peasants of ruining scientific objects by digging for such "treasure" (Chen 2017).

The historiography of modern Chinese pharmaceuticals explores not only the shifting epistemology of medicinal materials, but also its diplomatic and economic ramifications. Notable Chinese plants that were transformed into biomedical enterprises brought both pride and prize to the state. Tu Youyou's research into artemisinin and the Nobel laureate bestowed upon her is just one recent example that epitomizes the new promises China intended, and was able, to offer with its ancient remedies (Meier zu Biesen 2020). Furthermore, traditional medicine became a profitable industry in addition to—among other things—nationalist symbols (Kloos 2022). Surveys of China's fast-rising pharmaceutical companies indicate that the industry's expansion in the last two decades has coincided with ballooning global interest in Chinese drugs and the promotion of exports by the Chinese government. Under newly established regulations, Chinese scientists have been following protocols in laboratory settings to discover "new" drugs from multi-herbal traditional formulas (Chee 2022).

The uses and connotations of *danggui* through history similarly reflect different sets of knowledge and applications as the root was framed in different contexts. Research shows that, at the turn of the third century, *danggui* had already been noted in Chinese medical texts as an effective means to clear clogged blood and cited in historical documents as a common pain treatment option. When administered to women, it was more often enlisted to ensure complication-free deliveries than to promote conception—hardly a drug for menstrual regulation. For Tao Hongjing (456–536), the most esteemed pharmacologist in early imperial China, whose work *Collected Annotations to the Divine Farmer's Materia Medica* laid the

foundation of future pharmacology (Liao 1992), the first and foremost characteristic of *danggui* was managing general blood flow, and it thus served as an efficacious pain reliever. In an easy-to-use guide in which hundreds of herbal ingredients were listed under eighty different disorders to be located quickly and then applied, Tao included *danggui* in recipes used to treat chest pains, abdominal pains, toothaches, and fatigue. The root was not mentioned—not even once—when women's disorders were discussed in the guide (Tao 1994). However, when Chinese gynecology was gradually being established between the fifth and the thirteenth centuries, based on a gendered view of the body that saw *yin*-blood as a constituent of women versus the *yang*-essence of men (Furth 1999), *danggui*, perceived as a medicine for the blood, began to assume a gendered role. It was increasingly included in medical recipes for women of all ages, from menarche and postpartum to menopausal healthcare, so much so that the renowned pharmacologist Li Shizhen (1518–1593) called the root “essential medicine for women” in his encyclopedic work *Compendium of Materia Medica* (Lee 2017).

The functions and image of *danggui* were expanded in traditional China, but those East Asian countries and regions that had encountered Chinese medical canons and recipes did not necessarily share similar perceptions of the root. Related historical investigations indicate that Japanese pharmacologists since the tenth century had searched for indigenous *danggui* that most resembled its Chinese counterpart, the latter being considered the most authentic, so that they could apply it to the Chinese formulas they had learned; however, later physicians in the eighteenth century developed their own understandings of the root and some even questioned its efficacy as a medicine for the blood (Lee 2021). Likewise, medical historians working on early modern Korea have demonstrated the downplaying of the gendered view of the body in the Chosonization of Chinese medicine (Wu 2016). In the systematized *sasang* medicine of the nineteenth century, for example, Korean physicians did not categorize *danggui* as a medicine for women nor even a blood-harmonizing drug, instead assigning it as the basic treatment for the category of “lesser *yin*” persons regardless of sex, age, or race (Lee 2021).

Eumenol represents another transformation of *danggui*—and surely an extreme one in the worlds of binomial nomenclature and biomedicine. Previous research on the history of pharmaceuticals concerning both their earlier eras and contemporary development have helped illuminate the intercontinental entwinement in the early twentieth century between the Chinese state, the German company Merck, and medical science surrounding this emmenagogue.

China, the first republic in Asia, saw medicine as a branch of Western science contingent to modernity, and its Nationalist government proposed to abolish traditional Chinese medicine in 1929. To meet these challenges, traditional Chinese medical practitioners organized a mass movement to look for new ways to participate in modern state-building. Scholars have used the research and application of ephedrine, for example, to demonstrate the intertwined processes in which traditional Chinese medicine became an integral part of a modern Chinese state (Lei 2014: 1–19, 87–91). But *danggui*, the very first medicinal substance to offer a sign of hope within the movement, has barely been studied (Andrews 2014: 58). Eumenol, which had just secured a Chinese trademark in 1928, soon caught local attention since it was extracted from one of the most popular materials within the Chinese

materia medica. To give a more complete picture, this article shows when and how *danggui* assumed such significance via its route to Merck.

For Merck, Eumenol was the first new drug successfully produced from Chinese botanical material and exemplified its expanding business with this Asian country. Merck had previously imported other Chinese *materia medica*, but the raw material was mainly processed and distributed instead of being manufactured into branded products. Eumenol was different; it was not only sold in Germany but across the other continents, drawing a steady profit for the company for decades. Unlike research into ephedrine, which was undertaken by professors at Peking Union Medical College (PUMC), *danggui* was experimented with, transformed, and disseminated by German commercial industry. By investigating Eumenol's 60-year history, the present article provides a case study not only to reflect the strategies of and challenges faced by Merck to sell its products but also to show the ways in which a pharmaceutical company helped reformulate traditional Chinese medicine around the world.

For medical historians, Eumenol also presents an aspect of gendered materiality that warrants further exploration. Gender in China's medical history has been a flourishing subject, and scholars have accomplished a great deal in learning about changing perceptions of the female reproductive body and its related professions, as well as the men and women who practiced the art of medicine throughout two millennia (Furth 1999; Lee 2008, 2021; Wu 2010). *Danggui* and its decoctions are also mentioned in studies of late imperial medicine (Bray 1997). However, outside of its reputation as being essential for women in sixteenth-century China, this root was also included in recipes for many other disorders (Li 1578; 1596: 833–837). Tracing the journey of *danggui* across geographical and taxonomical boundaries, this article shows how the chemicalization of medicinal treatments narrowed the image of multi-functional *materia medica* and how Eumenol in particular solidified *danggui*'s relation with women in the modern world. This patent drug was a commonplace on the shelves of European gynecological clinics before estrogen stole the scene, and its life story deserves a closer look as we further tackle the gendering of medical materiality.

1.1 A Chinese Medicinal Material Reborn in the Biomedical West

The story of Eumenol was first told in an article in *Münchener Medizinische Wochenschrift* on 6 June 1899:

Of all the numerous medicinal products which contribute to the export trade of Chongqing, the most important, next to the large staple items rhubarb and musk, is the *danggui* root [...]. A compilation of such recipes, which can be traced back to the twelfth century, perhaps even further, shows that the root can be found whenever it is necessary to combat certain menstrual symptoms, especially amenorrhea [...]. One can almost say that the root is hardly absent in any Chinese recipe recommended for irregular menstruation, while it is hardly ever used in cases of illness of any other kind [...]. Since a specific remedy for amenorrhea is still lacking in the medicinal treasury of the European people, I believe that I am acting in the interests of the doctor and patient when I refer to this drug, which the Chinese have used for thousands of years as a panacea for menstrual disorders. The E. Merck company in Darmstadt has imported a large quantity of *Radix Danggui* from China and produced an extract from it, which it markets under the name Eumenol (Hirth 1899).

The author of this article, Friedrich Hirth (1845–1927), was a customs officer who returned from China after 27 years of service and would later become a renowned Sinology professor at Columbia University (Hirth 1923). He displayed his erudition in the article, explaining the production, trade, and literary tradition of Chinese medicine. Here the new drug Eumenol was for the first time mentioned in a public document, and for several decades afterward it would regularly appear in medical essays and commercial pamphlets in Europe, America, and Asia. *Danggui* was not introduced to the West for the first time, but henceforth it would enter scientific discussion and stimulate a series of researches in modern Europe.

Michal Boym (1612–16359), a Polish Jesuit who served the collapsing Ming court (1366–1644) and was in part known for his depictions of “Chinese flora,” once listed 289 items of “simple-to-use” Chinese medicinal plants in his medical collection and described *danggui* as an exceedingly useful root, with a bitter and sweet taste and warm quality. It functioned to replenish the blood; and according to Boym, not only could the stem of the plant invigorate the blood, but the root hairs were also able to remove deteriorated blood (Bu 2013: 410).

Nearly a century later, in 1735, Du Halde (1674–1743), a French Jesuit, published his encyclopedic introduction to the Chinese Empire. In his *Description of China*, Du Halde urged his readers to take note of *danggui*, a plant with a strongly aromatic root, which appeared moist because of the oils it contained. According to Du Halde, it was originally from Sichuan, rather cheap, and readily available in large quantities; and he reminded European merchants that, so long as they took precautions as the Chinese did, they would not need to worry about the roots turning bad during transportation. Du Halde dismissed the ability of Chinese physicians to theoretically analyze the underlying mechanisms of its efficacy, but did confirm that the Chinese saw the plant as useful for replenishing the blood, helping with blood circulation, and therefore strengthening the body (Du Halde 1735: 612).

Both Jesuit priests expressed their interest in the root and confirmed *danggui*'s effect on the blood, but neither of the two mentioned its usages for women, in contrast to Hirth's resolution to introduce it as a remedy for menstrual regulation. Hirth claimed to have based his understanding on Tao Hongjing's reputed work (Hirth 1899: 769), but the previous research discussed above shows that *danggui* was not always affiliated with women's health and that Tao Hongjing was certainly not the person to promote its efficacy for gynecological issues.

Friedrich Hirth received his doctor's degree in 1869 and by 1870 was serving in the Chinese Maritime Customs Service. He became the head of the European customs office in May 1895 and enjoyed the opportunity to travel to Sichuan, where he was informed of the export trade in local medicinal materials and so decided to take the most popular ones back to Europe. In going so far as to declare that *danggui* was “hardly ever used” in instances other than menstrual disorders, Hirth overlooked not only Tao Hongjing's categorization of drugs but also the multiple functions of the most prolifically used substance within *materia medica*.

Returning home as an authority on China, Hirth's knowledge attracted the attention of German pharmaceutical experts. His signature (as Prof. Dr. Friedrich Hirth) appears on a three-party contract dated August 1896, together with those of R. Heinz, a Munich physician, and E. Merck, head of the Darmstadt company. The document, held in the Merck Archives, designated Heinz to conduct chemical,

pharmacological, and clinical examinations on *danggui*, whereas E. Merck reserved the right to conduct further research to identify the specific chemical composition of the specimen, promising to consult with the other two parties while deciding on the form and name of any new drug extracted from the root. The contract stated that it was to be in effect for ten years (or for 15 if a patent was granted) and spelled out the net profit sharing for Heinz and Hirth once Merck began to sell the medicine (Eumenol, Vertrag, 1896, Merck Archiv W38, no. 0282-001).

The preliminary results of Heinz's animal tests confirmed the non-toxic nature of the root; specifically, it would not induce abortion but was effective in promoting menstruation. Another Munich gynecologist, Dr. Arthur Müller, also received *danggui* from Hirth and tried to include an extract of it in his prescriptions. But it was not until 1899 when Merck's Eumenol became regularly available that Müller could help his patients suffering from amenorrhea or dysmenorrhea. Müller's report was published in the same journal just one week after Hirth's piece, and his findings were promising (Müller 1899).

Among the 18 women Müller treated, 14 showed obvious improvement. His treatments sometimes combined massage and iron pills with Eumenol, and his trial dosage were one coffee spoonful three times a day, a few days before the onset of menstruation. After treatment periods ranging from two to six months, the women either experienced more regular menstruation cycles or the quantity of blood and its color were more satisfactory. Several patients spoke about their relief and comfort as well as an improved appetite after taking the medicine. It was particularly thrilling for the doctors that two of the women were pregnant but, just as Heinz's previous tests had indicated, no abortions occurred after using Eumenol.¹

Müller's was the very first clinical experiment on the administration of Eumenol, and his report was quickly included in the German yearbook of practical medicine in the following year (Börner et al. 1900). Another positive report appeared in 1899, with Dr. De Buck, a Ghent physician, introducing the success of Hirth, Heinz, and Müller in an article, and adding five examples of his own: patients suffering from abnormal menstruation, lumbar pains, and headaches as well as those who felt nausea or loss of appetite. De Buck tried Eumenol on these women and concluded that it was efficacious in alleviating neuropathic reactions, which caused menstrual difficulties and in inducing or accelerating delayed flows. Since he gave only Eumenol and no other auxiliary treatments to his patients, De Buck celebrated the new drug as "an absolute cure for dysmenorrhic syndrome" (De Buck 1899).

Citing Hirth's authority as a "well-known Sinologist" and based on the preliminary successes of Müller and De Buck, E. Merck decided to market the new drug and summarized his breakthrough in the 1899 innovation report. He introduced Eumenol as "the fluid extract of the root of an Araliaceae grown in China" and claimed that it had all the pharmacodynamic properties of its source material. The emmenagogue-induced menstrual bleeding in amenorrhea and relieved pains and unpleasant

¹A physician experimenting on patients with novel drugs, whether at the request of a pharmaceutical company or not, and such procedures at the turn of the twentieth century should not be confused with the standardized clinical trials used in pharmaceutical research since the 1950s. For the changing methods, protocols, and significance of medical experiments in the twentieth century, see Marks (1997).

sensations without any abortive effect. E. Merck followed Müller's recommended dosage, and quoted De Buck to speak of a complete cure for dysmenorrhea when Eumenol was applied to neuropathic in which no gynecological lesion was identified (Merck 1900).

The benign nature of Eumenol, particularly in pregnant women, strengthened doctors' confidence in the experiments, and the tremendous revenues, even without much advertising in the early years, testified to the great need for a safe and effective emmenagogue (Rahn 1899/1900: 159).² The company invited further research, and positive reports continued to come in. Bufalini, a pharmacology professor in Florence, decided to further examine Eumenol in view of its earlier positive outcomes, because, up until then, "the treatment of neuralgic dysmenorrhea has only a few resources often with no safe and favorable results" (Bufalini 1900).

Dr. Hubert Langes, a general practitioner in Stuttgart area, also applied the standard dosage to his patients, and all but one of his 12 cases responded well to the new drug, patients who either suffered from nulliparous dysmenorrhea with no obvious uterine problems or those with multiple children who were experiencing excessively heavy menstruation. When Eumenol was given to women with severe postpartum endometrorrhagia, the flowing would either stop or slow down, and, even better, Eumenol also brought about brilliant results when administered to women who suffered from bleeding in the fifth week of pregnancy (Langes 1901).

Most of the women who were mentioned in these reports, however, were passive receivers of what was prescribed; it is not until Dr. Palm's article of 1910 that we clearly hear women's voices for the first time. More than half of Palm's 12 amenorrhea patients saw "full and prompt success" after taking the emmenagogue. One woman "became anxious and wanted to take Eumenol" when her period was late, and another happily informed the doctor from her home that "her menstruation had started after a bottle of 50 g, and that it had always returned at the right time since then." Three women even took the new drug as a pregnancy test: one immediately began her period, and the other two, after several dosages, finally confirmed that they were pregnant.³ The first woman was 36 years old and had previously experienced three births and two abortions, and in the final analysis of his article Palm added a special note about her apparent relief with the result: "[T]his woman was so pleasantly surprised by the rapid onset of the period that she would later always handle her delays with the extracts. Occasionally, with great satisfaction, she would tell me that Eumenol had never failed her" (Palm 1910).

With its demonstrated efficacy in amenorrhea patients, Palm praised Eumenol as an emmenagogue that had "no disadvantage whatsoever." The only issue seemed to

²According to Dr. Rahn's report on 1899/1900, sales "increased tremendously" to 4,145.50 marks in 1900, but there is no record of the sales figures for Eumenol in the previous year.

³The way women used Eumenol as pregnancy test reminds us of what physicians and women in late imperial China would have done to treat amenorrhea. See Bray (1997: 320–321). Francesca Bray provides three examples, namely *xionggui* syrup, Buddha's hand powder, and *xiaoyao* powder, which physicians would prescribe to women or which women would buy and use for themselves if their menstruation had stopped for a few months. The preparations would produce a menstrual flow if the woman was not pregnant; if nothing happened, or if there was a movement in the abdomen, the chances were that she was pregnant. But most importantly for our analysis here, the leading active ingredient in all three recipes was *danggui*.

be the bitter taste of the liquid, and Palm said that some women had also disliked the smell. To meet the needs of consumers, Merck quickly addressed the problem by manufacturing Eumenol tablets, and a 1912 flyer informed its buyers that the core of the extract was coated with white sugar, easy to swallow, and sold in bottles of 50 or one hundred. The following year, H. Ziemann, a physician who practiced in tropical countries, saw Merck's bulletin on the new form and strongly recommended the drug for European women living in the colonies, asserting that the remedy was by far the most successful in easing menstrual cramps (Ziemann 1913).

From then onward, summaries of Ziemann's own findings continued to appear in various Eumenol advertisements, often listed together with quotes from Hirth, Heinz, Müller, and the other authors discussed above. Commercial brochures titled "Effective and Harmless Emmenagogue in a New Tablet Form" were sent out to doctors in different German cities and Merck's oversea agencies. In one of the earliest promotional folders, in 1914, E. Merck not only cited these clinical reports but also gave full references to a set of nine journal articles at the end of his introduction. Scientific persuasion became the key strategy for Merck to sell its products, and this was definitely the case with Eumenol, a new drug with an unfamiliar origin.

1.2 Selling the Medicine to the World: Science as Advertisement

Merck established its Advertising Department in 1897 under the scientific office and resolved to use scientific persuasion within commercial expansion efforts, an innovation, which is considered one of the most important in the company's history (Burhop et al. 2018: 198–215). Eumenol was created during this time, and its sale squarely reflects the company's promotional strategy for new drugs.

The original plant material *danggui* was almost entirely foreign to both European physicians and patients. Although fragmentary records show that it had already been introduced to the West several centuries before, its gynecological efficacy was not mentioned until the late nineteenth century, most importantly through its gendered image as presented by Hirth.⁴ The confirmation that the root was benign and efficacious in regulating menstruation later came from a series of clinical trials that Merck had initiated at the turn of the twentieth century. Their Darmstadt headquarters continued to send out samples of Eumenol and invited physicians and pharmacologists in Germany and other European countries to experiment, to research, and to publish on the new emmenagogue. As a result, original scientific articles on Eumenol amounted to 11 pieces in 1899 and grew to 30 in 1900 (Rahn 1899/1900: 149, 159). When in 1901 the company decided to insert extensive advertising brochures into selected scientific journals, Eumenol was on the first list of 18 drugs for promotion (Rahn 1900, 1901: 335–336).

In step with the business expansion of Merck, funds for propagating the emmenagogue also increased. The company opened a New York office in 1906, and within

⁴Before Hirth's introduction, D. Hanbury (1825–1875), a British botanist, did expound that *danggui*, together with *chuanxiong*, was given to women before childbirth to diminish the potential for complications when in labor, while F. P. Smith (1833–1888), a missionary in China, also listed menstrual and puerperal disorders among a variety of diseases that *danggui* was used to treat in Chinese medicine. But neither mentioned the root's effect on the blood nor proposed any applications for Western medicine. See Hanbury (1876: 260–261) and Smith (1871: 20, 133).

a few years Eumenol's budget share amounted to 50 times more than it had been when first introduced to market. Multilingual advertising pamphlets were delivered not only to German physicians domestic and abroad, but also to pharmaceutical agencies in various European countries, the Americas, Australia and New Zealand, and China. Backed by scientific articles and promotional literature, Eumenol was soon enumerated as a remedy for amenorrhea in German gynecology textbooks, often listed after analgesic drugs such as sodium salicylate or traditional abortifacients including apiol (Runge 1907: 139).

The distribution of Eumenol kept expanding in the first decade of the twentieth century. Research on notable German pharmaceutical companies of the time shows that branded and trademarked specialties were most profitable, because the products as monopolized medicines were protected by patent regulations and their prices were stable over an extended period (Cramer 2015: 57–59). Indeed, Merck made discernible efforts to obtain authorization to sell its products globally in 1907. A complete list reveals that 53 drugs were trademarked in nearly 30 countries and that the company successfully registered Eumenol in Austria, Hungary, Italy, and the United States (von Rothenburg 1907: 141, 145, 247).

In countries where the emmenagogue was not listed as an official medicinal drug, it was still imported by local pharmacies and advertised by Merck in medical print media. One medical newspaper in Poland printed advertisements for Eumenol in 1907 (Wicherkiewicz 1907); a 1908 French version of a booklet on Merck's special medicinal preparations introduced Eumenol and the original Chinese plant material (*Spezialpräparate 1904–1934*); according to sales reports, Eumenol sold best in Russia from 1909 to 1911 (*Orient-Bericht 1910*: 262; *Abteilung Russland 1911*: 86). Although there are no records of the emmenagogue's official authorization in these three countries in the above years, sales went on. Sweden did not authorize the sale of Eumenol until 1939, but Merck had already targeted Scandinavia in 1925 and its sales reports began to list revenues from all Scandinavian countries starting in 1930 (*Jahresbericht der Propaganda-Abteilung 1925*: 10–17; *Abteilung Neumann 1931*: 128).

Eumenol was well received abroad both before and after the First World War, although the most profitable markets shifted along with changing world politics.⁵ The losses seen by Merck's New York office (Merck & Co. 1930) and its South American business during the war did not recover until the 1930s, and central Europe became the most vibrant market for Eumenol in the 1920s. The drug must have grown to such fame in gynecological practices that it was even mentioned in a Czech poem in 1921: The youthful lovers receive a bottle of Eumenol after a doctor performs an abortion on the girl (Wolker 1926).

While central Europe took off, we can note an absence of sales records in Russia during this timeframe. Research shows that the year 1918 ended in paralyzed anxiety for Merck; among earnings from abroad amounting to 2.8 million marks,

⁵For instance, among the 15,302 marks from sales in 1912, domestic sales only totaled 4,143 marks (*Jahresbericht 1912*: 20–21, 32, 158). The 1922 report shows that only 635 kg were sold in Germany, while a total of 269 kg was sold in Czechoslovakia alone (*Jahresbericht 1922*: 13, 62).

almost 2 million owed from Russia alone had to be written off (Burhop et al. 2018: 222–223). But the best years for Eumenol in Russia provided the company with important scientific information. Among the nine journal articles E. Merck cited in his 1914 promotional literature, one piece of Russian research stood out: it did not testify to the efficacy of the new drug but verified the botanical identity of its source material.

Eumenol was so popular in Russia during the period that it aroused great interest in scientific communities other than obstetrics and gynecology. The pharmacologist Lezenius set out to do comprehensive research on the drug in 1910, and in a lengthy journal article he cited traditional Chinese *materia medica* texts from Tao Hongjing to Li Shizhen, reviewed previous European literature that had described *danggui*, and introduced prior pharmacognostic efforts to decide on a botanical categorization of the root (Lezenius 1910). At one point in 1857, according to Lezenius, a Russian scientist studied a specimen received from Beijing and named it *Radix Levistici sinensis*, which may very well be the first binomen of *danggui* in European literature. But it did not settle the case, and suppositions since then have ranged from *Levisticum officinale* and *Ligusticum acutilobum* Sieb. et Zucc. to *Aralia cordata* Thunb., *Aralia edulis*, and *Angelica polymorpha* var. *sinensis*.

Lezenius decided to collect his own materials and procured samples of *danggui* roots from a number of sources: The collection of Dr. Tatarinov (1817–1886), a former Imperial Russian consulate doctor in Beijing; the collection of Chinese plants held at the Imperial Botanical Garden in St. Petersburg, originally received through a merchant from Kalgan (present-day Zhangjiakou); the Chinese trading city of Maimatschin (Altanbulag), on the Russian border across from Kjachta; E. Merck, Darmstadt; and the collection at the Hamburg Botanical State Institute. He observed the external appearance of the samples and made microscopic specimens to analyze their structures. Moreover, he prepared fluid extracts from the roots purchased in Maimatschin and compared them with extracts from *Radix Levistici officinalis* and with Eumenol from Merck. After a series of comparisons, Lezenius concluded that *danggui* roots came from an umbelliferous plant, which was very close to *Levisticum officinale* Koch.

The research conducted by Lezenius updated E. Merck's knowledge of Eumenol. Revising his 1899 statement, he began his 1914 promotional brochure as follows: "For a long time, the view prevailed that the parent plant was an Araliaceae, identified as *Aralia edulis*. However, recent pharmacognostic studies indicate that it is an umbellifer, probably *Angelica sinensis* or *Angelica decursiva*." E. Merck may have had additional information in mind when citing Lezenius, seeing that he provided a different binomen for the root; nonetheless, it is certain that from that moment onward the source material for Eumenol was an umbelliferous plant. Although Merck's internal documents from the 1920s mention *Aralia edulis* from time to time, indicating the staff's habit of fixing upon a previous nomenclature (Raiss 1920, 1923, 1928), we do know that by the early 1930s Merck had confirmed the categorization of the Chinese medicinal material and tried to find indigenous substitutes.

While preparing to participate in the 1934 *Deutsches Volk, Deutsche Arbeit* ("German People, German Work") exhibition in Berlin, the company made efforts to comply with national policies by striving to use resources and production

methods that could demonstrate the scientific strength of Germany.⁶ In the case of Eumenol, the Alkaloid Research Department was given the tasks of isolating the active components of the emmenagogue, conducting studies on native pharmaceutical drugs, and, most importantly, discovering indigenous umbellifers to produce Eumenol substitutes (Küssner 1933). Regrettably, no evidence left in the Merck Archives indicates successes in any of the three assignments. For the next quarter of a century, Merck continued to produce Eumenol with the raw material delivered from China, marketed it with scientific research, and promoted it to the world—including China.

1.3 Arrival of a “New Drug” and China’s Reaction

China became a potential market for Merck in the late nineteenth century. Willy Merck (1860–1932), then representative and later head of the entrepreneurial family, visited China in 1888 to explore a possible trade relationship, and Merck began to distribute commercial materials to the country in 1897 (Bernschneider-Reif 2019). During the 1907 effort to register products globally, however, the Patent Department achieved limited success in China, attributing it to the insufficient trademark law of the old empire (von Rothenburg 1909: 247). Moreover, the company experienced difficulties in securing capable and trustworthy agents and had to change business partners every few years. It was not until 1927 that we see Eumenol included in advertisements targeted at German- and English-speaking physicians in Shanghai and Hong Kong, and only in 1928 did Merck finally procure a trademark for the drug in China.

A Chinese booklet in 1928 testifies to Merck’s strategy of scientific persuasion. *Patent Medicines*, rendered as *Jingliang yaopin* (精良藥品, lit. “excellent medicines”), was issued by E. Merck Darmstadt Chemical Works and distributed by its agents in China.⁷ The preface was written by Ding Mingquan, a Chinese medical doctor who had received his degree from Würzburg University and was practicing in Shanghai. He was the co-founder of, and regular contributor to, a new Chinese medical journal, most likely sponsored by Merck.⁸ Ding praised the pharmaceutical company for its reputation around the world and, most importantly, its successes in producing efficacious new drugs from indigenous Chinese plants such as *danggui* and *mahuang* (a source material for ephedrine).

In the booklet, each Merck product was given a Chinese name, followed by a brief introduction to explain its function and to confirm its efficacy. Eumenol was branded as *Danguijing* (當歸精 “essence of *danggui*”) and was described as an

⁶The exhibition was the first annual show following the Nazis’ rise to power and was perceived as unprecedented by contemporaries. See, for example, “Deutsches Volk – Deutsche Arbeit. Spiegelbild der nationalsozialistischen Revolution – Verkörperung des Wesens und Wollen des neuen Staates” in the Nazi Party newspaper *Der Führer*, 22 April 1934 (*Deutsches Volk* 1934: 3).

⁷On the front and back pages of the booklet, Schmidt & Co. gave three offices in Shanghai, Beijing, and Tianjin, while another agent, Bornemann & Co., provided an address in Hong Kong.

⁸Ding Mingquan, together with other physicians, revived the earlier *Zhongxi yixue bao* (中西醫學報, *International Medical Journal*) to create the *Deu Hua Medizinische Monatsschrift* (德華醫學雜誌 1928–1929), with Merck appearing as the only name on the first page of the new journal.

upgraded form of the popular Chinese medicine, whose benefits were known to all but refined to perfection only after research and production by Merck:

(Introduction) *Danggui* holds a time-honored reputation in China as essential medicine for women. However, Chinese medicines are of mixed quality; if it is not of superior class, the beneficial compositions are often scarce while the damaging ones are plenty. Exactly because no obvious effect can be seen, more drugs are prescribed, and that is the habitual trick of Chinese doctors. Therefore, it is rare that the patients are really cured by *danggui* even if they have taken *danggui*. Our company pities that the medicine is erroneously used and purposefully imports great amounts of the material to Germany. We study and examine it repeatedly, extracting the essence of *danggui* with much thoughtfulness, and finally produce this Eumenol. This drug indeed carries supreme value, going through a hundred tests by German gynecologists and never once it fails. Now the true efficacy of *danggui* can stand out and will no longer be dismissed (*Patent Medicines* 1928: 31–32).

The rhetoric is obvious. The benefits of precious Chinese medicine were lost in the unsound hands of Chinese doctors; the true efficacy of the material could only be rescued with science brought by the German company, and scientific methods, which involved material analyses, lab experiments, and clinical tests. If the whole process was too foreign for Chinese readers, Merck was accommodating enough to precede the introduction with the subtitle: “No Other Way except This One to Regulate Menstruation and to Help Beget a Son”. While marketed around the world, Eumenol was always promoted as an “effective and harmless emmenagogue”; the clinical reports quoted in commercial brochures outside of China merely emphasized its characteristics concerning alleviating discomfort, never mentioning its benefits for women trying to conceive. Akin to producing Eumenol tablets to meet the taste of Western consumers, Merck slotted the new drug into the Chinese context of a strong patrilineal society to attract potential buyers.

We do not know how successfully this worked; there are no extant concrete numbers that reveal the volume of Eumenol sold in China. Records show that European physicians, instead of Chinese patients, may have been the regular visitors to the sales points of Merck’s agents (Bernschneider-Reif 2019). Chinese newspapers, however, did mention that “new physicians” often purchased this “new drug” (*Xinwenbao* Aug., 1932). Even before it was officially distributed in China, Eumenol had gained a favorable reputation, with doctors in missionary hospitals referring to it as an example of Chinese drugs retaining therapeutic value for Western physicians (Kiang 1923). When Western-trained scientists stationed at PUMC decided to explore the medicinal benefits of traditional Chinese materials, *danggui* was at the very top of their list. PUMC publications indicate that the reasons to study the substance were twofold: first, the root was too frequently used in Chinese prescriptions to be ignored; second, precisely because the product from Merck had obtained positive results—the reports cited Müller and Palm—and was already being sold around the world (Read and Schmidt 1923; Schmidt and Chen 1924).

Instead of commercial achievement, the return of indigenous *materia medica* in a totally unique form was significant in other ways. Merck successfully registered a

Chinese trademark for Eumenol in 1928, which was only four years after the PUMC team had published their findings and right amidst debates over the abolition of traditional Chinese medicine. To counter the encroachment of the West in not only political but also medical matters, Chinese entrepreneurs established new style chemical/pharmaceutical companies to produce emmenagogues from *danggui* extract to help their amenorrhic sisters. To persuade potential consumers to try the domestically manufactured product, Chinese journal articles and newspaper ads not only referred to ancient medical canons and renowned *materia medica* texts, but also quoted Hirth to confirm that the technique and efficacy of the “scientific new drug” were already proven by a German pharmaceutical company and gynecological experts.

Foci (佛慈 “Mercy of Buddha”), founded at the end of 1930, was among the first companies of this kind (Jingjibu 17-23-01-72-11-0221930), and *Dangguisu* (當歸素 “extract of *danggui*”), its billboard product, was soon marketed in various Shanghai newspapers. The newly launched advertisements often take up more than one-eighth of a page and read more like short essays, with many of them containing at least three lengthy paragraphs and easily adding up to 1,000 Chinese characters in total. In a comprehensive manner, the first paragraph would summarize Hirth's 1899 article, informing readers how he had learned about Chinese *materia medica* and exported *danggui* to Germany for further research and production. In some, Hirth was credited with having done all the experiments himself and sending samples to university hospitals for verification. The second paragraph would then expound Euro-American women's favorable experiences with the drug, citing names of physicians who wrote clinical reports for Merck—Müller is, as expected, almost always on the list. The final paragraph would proceed to introduce Foci's product and its source material, emphasizing its “scientific features” and guaranteed quality (*Xinwenbao* Aug., 1932; *Shenbao*, Oct., 1932).

Whether a fuller account or an abridged version, several themes are recurrent in the Foci ads. First, Hirth was portrayed not as a Sinologist but as a gynecologist who knew that Europe lacked an effective and harmless emmenagogue while the Chinese had been using *danggui* as a menstrual regulator for thousands of years. Through the testimony of a Western expert, Foci confirmed the supremacy of traditional Chinese medicine in one point and, inevitably following Merck, singled out the gendered aspect of the most prolifically used medicinal root in another. Second, the German drug was presented as a proven remedy that even Chinese physicians would use if they had gone through new-style training; hence, Foci, a pioneer in the reformation of “national medicine” with science, had decided to join in production. These statements echo the reasoning of the 1928 Chinese booklet from Merck, which lamented the waste of precious Chinese *materia medica* in the hands of unworthy doctors. Foci acknowledged the choice of the “new physicians” who would be its potential customers as well as compatriot reformers in a new medical movement. The third, and perhaps most important, theme is that Foci used an indigenous material to manufacture exactly the same product as the one the Germans had been importing over long distances. Through the comparison, the ads made it clear that consumers of Foci's *Dangguisu* could get the same quality drug, if not even better, at a much lower price and ready availability.

As with Merck's marketing of Eumenol, Foci also enlisted scientific reports to promote its new drug. Articles not only appeared in *Kexue guoyao* (科學國藥

Scientific National Medicine), a publication funded by Foci, but also in other medical journals such as *Jiating yixue* (家庭醫學 *Family Medicine*). In similar expositions, these pieces would review the historical Chinese application of *danggui*, cite Merck reports to describe its pharmacological features as well as chemical composition, and finally introduce the new and scientifically proven extract for menstrual health (*Kexue guoyao* 1931; *Jiating yixue* 1933). Unlike Merck's worldwide adverts, however, these Foci ads and articles often boasted "enhancing conception" as one major effect of *Dangguisu*.

We do not have revenue figures for Foci's *Dangguisu*,⁹ but the product must have been somewhat profitable, or the idea to sell products manufactured from accessible local materials was at least tremendously appealing. Similar drugs emerged in no time and at least five more companies put out newspaper ads between 1932 and 1944—some also published reports—to promote different brands of *danggui* extract. To target Chinese men and their wives, these promotional pieces often emphasized the drug's effect on conception and, with increasing focus, used familiar phraseology: "regulating menstruation to help beget a son."¹⁰

Merck, however, dropped the Chinese fertility rhetoric quite quickly. The wording appeared only briefly, in a 1930 journal (*Yiyaoxue* 1930), and was nowhere to be seen afterwards. When Foci launched its *Dangguisu*, Merck no longer referred to conception issues and propagated Eumenol in China mainly as an emmenagogue, helping women with difficult menstruation, just as it did in other parts of the world.

Whether withdrawing from Chinese culture or attempting to survive with local competition, Merck had to intermittently close its Shanghai office during the Second Sino-Japanese War (Bernschneider-Reif 2019). In terms of turnover, Europe was still the major market for Eumenol. But the booming trade of the time was interrupted by the Second World War, and no sale records of the drug survive after 1943. We do know from archival collections, however, that the company continued to issue marketing pamphlets for the emmenagogue, and brochures from 1950 even enriched their scientific citations by including research from the 1930s. The last extant advertisement for Eumenol was reprinted in 1961, indicating its continued popularity after the war when Merck surged back to become a global pharmaceutical company during the "Miracle on the Rhine".¹¹ The year 1961, however, witnessed the end of Eumenol, despite Merck's rising up to face different challenges, when intensifying difficulties in obtaining the raw material terminated its production and, eventually, its sale.

⁹Unlike the case with the Merck Archives, Foci does not have accessible archival materials for research and, therefore, we can only base our discussions of the Chinese company on public material such as journal articles and newspaper ads.

¹⁰Ads for another *danggui* extract named Gimenor appeared in 1932, just a few months after Foci launched its product; the earliest available ads for Tancnol, by the pharmaceutical company Xinya, began in 1933, and comparable products such as Omensal/Eumenal, *Dangguijing*, and *Dangguimu* materialized in *Shenbao* and other newspapers. See *Jinshiliao zhoubao*, 17 September 1932; *Shenbao*, 25 September 1933; 11 April 1940; 19 January 1942; 11 April 1944; *Xinwenbao*, 20 November 1934. For further research on China's reaction in the context of national medicine and follow-up government-sponsored studies on *danggui* after Foci's first move, see Lee (2023).

¹¹For the impact of WWII on Merck's production, sale, and business identity, see Burhop et al. (2018, 293–349). For Merck's post-WWII reconstruction and expansion, see Burhop et al. (2018, 353–406).

1.4 The End of a Popular Emmenagogue: Disconnected from China

Since its raw material came from China, trade and import issues invariably affected the Eumenol production line from day one. Shortages in supply during the First World War made it difficult for the Manufacturing Department to keep up with its production goals. The 1920 yearbook indicated that, after continuous hard work and quite a long wait, Merck representatives in China had finally been able to secure and deliver a large batch of the root to Darmstadt (Raiss 1920). Internal reports showed a great need for Eumenol, both in liquid and in tablet form, and the impending arrival of the raw material was exceedingly welcomed. A 1922 document lamented the loss of the material to a factory fire, and a 1927 account described experiments to adjust the ratio between the Eumenol extract and original material to generate more product (Raiss 1923, 1928).

Although Eumenol was undoubtedly in great demand in the 1920s, scientists had begun to look for new remedies. When German gynecologists recommended Eumenol for the treatment of amenorrhea in textbooks, they had already been warning of the unreliability of the traditional emmenagogue (Runge 1907: 139); similar evaluations continued in several revised editions.¹² On some occasions, the introduction to “Chinese *danggui* root-Eumenol” would end with a qualifying note that “their effects are altogether uncertain” (Schröder 1926: 77). In the 1920s, scientists expressed their reservations for the traditional emmenagogue further when they saw the potential of hormone therapy. A textbook praised Eumenol over other conventional remedies, but reminded the reader that the patent drug was expensive and recommended only because the truly effective cure of modern ovarian preparations was even pricier and not yet fully available (Novak 1928: 33–34).

Evaluated as “rarely failing but occasionally unsuccessful” in the 1930s, Eumenol was considered a better choice than other “conservative therapies” and endorsed by books discussing medicines of “the indigenous people” (Kahr 1934: 40). But new editions of gynecological textbooks no longer mentioned it for amenorrhea treatment. One author even concluded that drugs and procedures known as emmenagogues had almost become obsolete as “new hormone preparations represent an essential addition to our therapeutic treasury” (Jaschke and Pankow 1933: 110–113). Another, despite considering hormonal treatments useful only in a few limited situations, did not favor traditional emmenagogues either and only listed Eumenol in its appendix for the purpose of inclusiveness (Stoekel 1933). In 1960, the latter author finally had to hand his popular textbook down to a new generation for revisions; in a new preface, he apologized for not being able to stay up to date with the latest developments in endocrinology as well as the “internalistic turn of gynecology” (Stoekel 1960). Within a year, in 1961, Schering, a small research-centered German pharmaceutical company that worked on hormones, introduced an innovative oral contraceptive pill that became a bestseller (Burhop et al. 2018: 389). The era of hormonal therapies for women had arrived (Schlünder 2005).

¹²Bernhard Krönig, Otto Pankow, and Rudolf Theodor von Jaschke took turns to work on the revisions of the series after Runge passed away in 1909, but the publisher kept Runge's name in the title. Eumenol was listed in the revisions published in 1915, 1921, and 1923, but was dropped for the 1933 edition (see below).

Another blow similarly came in 1961, but this time from within. The German government issued its first Medicinal Products Act in May, which required new drugs to be registered at the German Ministry of Health and all special medicinal preparations already on the market to be registered within a given period (Gesetz 1961). Not long after that, the thalidomide scandal erupted when thousands of mothers gave birth to babies with deformities after they took the tranquilizer for morning sickness (Maio 2001).¹³ Undoubtedly, to register and continue marketing a menstruation drug for pain relief would have been rather sensitive in Germany at the time.

In spite of all the seemingly negative forces, however, Eumenol was still making profits. A memo dated 15 September 1961 showed that sales in the first quarter alone totaled 28,999 marks, compared to annual sales of just 79,500 marks in 1960, and the turnover was much higher abroad than it was at home (Eumenol Tabletten, Merck Archiv, L101-13). But it was increasingly difficult to secure *danggui* roots after the Communists came to power in China and while the country was in the depths of the Great Chinese Famine in 1961 (Yang 2012). A memo dated 12 September 1961 from the Production Department indicated that their stockpiled raw material could only produce another 800,000 tablets. Merck tried to replace its suppliers, but laboratory chemical analyses showed that angelica roots obtained from India were a different species and thus did not meet the needs of production. There was mention of Hamburg imports, but the place of origin was uncertain and the price was several times higher (Eumenol Tabletten, Merck Archiv L101-13).

Opinions diverged on whether they should simply remove the drug from production altogether. An internal note dated 26 October 1961 proposed halting domestic sales immediately so that the supply could be reserved for foreign countries, stating that “the loss of stock here would have a significant impact.” But a 6 November memo announced that company authorities had already determined to cease production of Eumenol and that, therefore, the Purchasing Department could stop trying to secure angelica roots moving forward. By the end of 1961, the Sales Department received the final decision that Merck would stop selling Eumenol in Germany from 1 January 1962 (Eumenol Tabletten, Merck Archiv L101-13).

This is the last piece of information concerning Eumenol in the Merck Archives, and, regrettably, there is no extant data for us to get a glimpse of its remaining international markets. From other references, however, we can be certain that the drug was no longer available soon afterwards. *Gehe's Codex*, a catalogue published starting in 1910 by the biggest European wholesaler for industrially produced medicines, stopped including Eumenol for amenorrhea after 1960; and *Merck's Index*, one of the journals published by the company, did not list Eumenol in its 1961 version. Instead, both *Gehe's Codex* and *Merck's Index* began to list estrogen and, later, different hormonal drugs, under the section on amenorrhea and dysmenorrhea. We would not read about this once very popular emmenagogue and its Chinese origin for another five decades.

¹³Research shows that the Act was first issued to ensure the exportation of German medicinal products to countries of the newly established European Economic Community, and that the thalidomide scandal at the end of that year helped direct and substantiate future revisions of the Act.

2 Concluding Remarks

“*Shi fang jiu gui*” (十方九歸 “nine out of ten recipes contain *danggui*”). The Chinese saying demonstrates the popularity of the root in medical practices, mostly owing to its warm and non-toxic nature as well as its fragrant smell and sweet taste. Believed to affect the blood, *danggui* had been used to ease a variety of body pains since the third century and was increasingly included in preparations to treat women's disorders when Chinese gynecology was gradually established upon a gendered view of the body that saw *yin*-blood as fundamental to women's health. However, such a gendered position was neither adopted by all the East Asian communities that had been introduced to medical canons and prescriptions from China, nor by Catholic missionaries from Europe before the nineteenth century. It was Eumenol, Merck's patented emmenagogue, that brought this time-honored substance within the Chinese *materia medica* to a global market and with a sharpened female image, and it was this international reputation that prompted the Chinese to look afresh at the widely used material, seeing in it the hope of a new national medicine.

This article has traced the rise and fall of Eumenol, Merck's transformation of *danggui* into a biomedical product, and its connections with China. It has shown Hirth's focused endorsement of the gynecological function of the medicinal root and demonstrated the scientific strategies and practices that the pharmaceutical company enlisted to promote the drug around the world. Science was exactly what China was looking for when Eumenol arrived as a new medicine; the emmenagogue was appreciated by “new physicians” and soon emulated by the burgeoning Chinese chemical industry. Journal and newspaper articles that advertised domestically manufactured *danggui* extract quoted ancient medical texts to confirm the value of the material, but simultaneously referred to German lab and clinical reports to guarantee the quality of the products.

Merck tried at first to accommodate itself to local culture and once promoted Eumenol as a pharmaceutical aid for conception, but it soon dropped the fertility rhetoric when comparable Chinese products continued to emerge with an emphasis on such efficacy. The company encountered difficulties during and after the Second World War, but Eumenol continued to produce profits in Europe. Sales of this traditional emmenagogue grew increasingly stagnant in Germany, with hormone therapies steadily gaining popularity and newly enacted medical regulations, but foreign trade continued to flourish until the source material from China was cut short.

Indeed, it was its Chinese connections that first gave birth to Eumenol and eventually put an end to the drug, and in the middle of its 60 years of life the emmenagogue inspired China within its own processes of medical modernization. One might say that *danggui* has been twice gendered in its history: firstly, in the traditional period, the root was drawn into encompassing Chinese preparations for women, but its gendered image and application were not fully recognized beyond China's geographical borders; and secondly, in modern times, its usage as a menstrual regulator crossed not only spatial but also epistemological boundaries. Whereas both East Asian physicians and Merck pharmacologists looked for comparable domestic substitutes for *danggui* in the formulas they concocted, Korean and Japanese experts still discussed its features and functions within a shared *materia medica* tradition. The German company, however, despite acknowledging to its customers that the

extract was made from a Chinese plant, never enlisted indigenous rhetoric to testify to its efficacy.

German pharmaceutical companies began to work with university academics in the late nineteenth century, earlier than their United States counterparts (Cramer 2015: 68–72); Merck may have thus refrained from elaborating on the Chinese usages of *danggui* from the beginning to avoid possible indications of its being quackery or Oriental medicine. Except for Hirth's essay that introduced the traditional medicinal material, promotional citations of Eumenol always referred to the root simply as a source material from China without any mention of its replenishing the blood within a long medical tradition. Foci, on the other hand, repeatedly quoting scientific references originating in the West before presenting its product to reiterate the value of traditional Chinese medical knowledge in general and the *danggui*-blood-women nexus in particular.

Both Eumenol and *Dangguisu* lack records that go beyond the 1960s, but China's endeavor to find new remedies from old materials continued. And Eumenol was once again brought into the limelight in the early twenty-first century. To decide whether *Angelica sinensis* was safe enough to be included in drug and food supplements for its citizens, the European Union conducted comprehensive research and provided a thorough assessment. Eumenol, as the root's one and only scientifically produced medicine in Europe, was given a generous mention in the final report. The assessment report published in 2013, however, came to a negative conclusion, citing concerns about the substance's toxicity, questioning its efficacy in its gynecological applications, and pointing out the insufficiency of its pharmacological and clinical data as required by EU regulations (Committee 2013).

Eumenol is now perhaps forever out of the picture, but the usages and perceptions of *danggui* as a pain reliever and women's medicine have robustly made their way down through history. As a blood replenisher, the root is frequently mentioned in nutritional literature and medical websites in the Sinophone community. Meanwhile, anthropological reviews and sociological statistics show that *danggui* continues to rank high as a dietary supplement used by women of childbearing age. The dried roots are either sliced and cooked in a nourishing soup or served as the leading ingredient in the legendary "four-agent tonic" consumed by women after menstruation (Chang 2007: 71–116; An 2010: 89–148). Both emergent trends regarding food supplements and the increasing attention paid to traditional *materia medica* indicate that *danggui* is still very much in the picture. Hopefully, the boundaries it has crossed, from Asia to Europe and from herbal medicine to bioproduct, demonstrated in this article can serve as a case study and a point of departure for us to further investigate the materiality and gendered aspect of medical history in the future.

Disclosure Statement

No potential conflict of interest was reported by the author(s).

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