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Editorial

Dagmar Wujastyk*

Histories of Mercury in Medicine across Asia and Beyond

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Mercury is today recognized as a harmful environmental pollutant and one of the world's most dangerous elemental toxins. And yet, it was long considered a near-miraculous substance capable of eradicating the most severe diseases. The medical use of quicksilver (liquid metallic mercury) is already documented in ancient Greek, Indian, Persian, Arabic and Chinese treatises on medicine and alchemy. Particularly early instances of procedures for preparing mercury compounds are found in Chinese medicine.

In Europe, quicksilver and mercury compounds were increasingly used in medicine from the sixteenth century CE, especially after Paracelsus (1493–1541) advocated their use. At the same time, trade in mercury became a global phenomenon with European colonial expansion, particularly for use in gold and silver mining as well as for medical purposes. For the next four centuries, mercury compounds such as corrosive sublimate (HgCl_2), calomel (Hg_2Cl_2) and mercury sulfide compounds (HgS) were among the most important and heavily used drugs in both European and Asian pharmacopoeias. Mercury formed part of the flow of goods, medicine and knowledge that spanned the known world.

Mercury was used in a wide variety of medical applications: to treat inflammation in the nose and throat; corneal stains; ulcers and warts; as a laxative; to stimulate the biliary function; against diarrhoea and vomiting; against dropsy; against spleen, liver, and lung diseases; and most notably, against syphilis. In more recent times – up to the 1990s – it was used as a spermicide in chemical contraceptives and in antiseptic salves, and it is still used in dental amalgams, in vaccines (as the organo-mercury compound thimerosal), cosmetics, eye drops and saline solutions.

Mercury also continues to be used in Chinese and Tibetan medicines, as well as in those of Ayurveda, Unani and Siddha. However, its medical use has become a contentious issue in view of environmental and human health concerns. Through the processes of globalization, medicines from traditional Asian

THE TIMES OF INDIA

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THURSDAY, JULY 24, 2014

TIMES CITY | REGION

Mercury good for Ayurveda medicines: BHU expert

But Cautions Against Its Impact On Environment

Times News Service

Varanasi: Contrary to the debate on international regulations to ban trade of mercury owing to its toxicity and adverse impact on the environment, an Ayurveda expert at the Banaras Hindu University has advocated the use of mercurial preparations as medicine to treat acute and chronic diseases. However, he has also cautioned against its free use.

"Mercurial preparations in Ayurveda are not toxic in nature if prepared according to classical parameters with guidelines of good manufacturing practices," said head of the department of Rasa Shastra Prof Anand Chaud-

hary

He said that the international regulations to ban trade of mercury, being prepared by the United Nations Environment Programme (UNEP), US Food and Drug Administration and EU Med-

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and

Healthcare

Products Regu-

latory Authority

(MHRA), should be

rational. Looking to

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rites, which may include traditional medical uses of mercury. Nevertheless, the enactment of the treaty by regulatory bodies is likely to have serious implications for the trade in traditional Asian medicines and the practice of Asian medical systems.

Responses from stakeholders in Asian medical systems have been varied, and range from acknowledging the use of mercury in medicine as problematic, to arguing for more substantial scientific testing of the contested medicines instead of their wholesale rejection, to impassioned calls to defend mercurial medicines as integral and time-tested elements of their medical tradition.

Contemporary proponents of mercury medicines argue that if their traditional procedures for purifying and detoxifying mercury are followed carefully, mercury medicines are not only completely safe for human use, but offer the most powerful cures. Their perspective, however, is often countered with heavy criticism and stories of poisoning through medicines containing mercury and other heavy metals. In a recent issue of the German mass-circulation magazine *Der Spiegel*,² an article entitled “Pillen aus der Hexenküche” (“pills from the witches’ kitchen”) reported the case of a female patient in Germany, who had been admitted to a hospital in Hamburg with severe symptoms of poisoning. The patient had developed these symptoms after a week of treatments in an ayurvedic clinic in Sri Lanka and a subsequent course of ayurvedic medicines given to her at the clinic, which she had taken over several weeks at home. An analysis of the pills revealed extremely high levels of mercury and lead, the amounts of mercury apparently being 566110 times higher than levels considered safe for consumption. The doctor’s conclusion was that the patient’s intake of mercury and lead could have killed her and very nearly did. The article was unequivocal in its critique of the use of heavy metals in ayurvedic drug formulations, using the fact of their use in this medicine as an indictment against the “witches’ kitchen” of Ayurveda as a whole. The reader is left in no doubt that the intake of medicines that contain mercury will inevitably lead to serious, perhaps even irrevocable damage.

The tension between a long-established use of mercury in medicine and modern research on the deleterious effects of mercury on human health makes an inquiry into the beginnings of the use of mercury in medicine particularly topical. If mercury has always been known to be poisonous, why did different medical systems develop reasons for using mercurial medicines and methods for preparing them?

The articles in this issue examine the history of the uses of mercury in a number of medical traditions from the medieval period to the present. Drawing upon the primary textual sources of each respective tradition – European, South

² *Der Spiegel* 36/2015: 111–112.

Pillen aus der Hexenküche

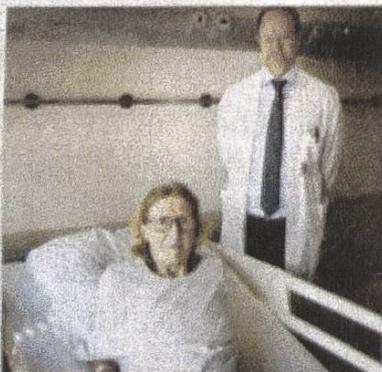
Esoterik Eine Deutsche stirbt fast an einer Quecksilbervergiftung – nach einer Ayurveda-Therapie. Das Schwermetall gilt in der indischen Heilslehre als Medizin.

Die Behandlung erschien der Frau aus Hamburg wie geschaffen, um ihren Körper zu reinigen. In einem Kurhotel im Süden Sri Lankas, oberhalb einer Meeresbucht mit Sandstrand, ließ sie sich nach traditionellen Ayurveda-Ritualen Ölmassagen, Kräuterbäder und Schwitzanwendungen verabreichen. Auch verzehrte sie Kost, die ihr „Verdauungsfeuer“ („Agni“) anfachte. Auf diese Weise sollten Giftstoffe und Ablagerungen („Ama“) gelöst und ausgeschieden werden.

Die Hamburgerin war nicht der einzige Gast aus Deutschland. Das Hotel wird von einer deutschen Ayurveda-Therapeutin geleitet, die nicht nur mit einer Behandlung nach der indischen Heilslehre wirbt, sondern auch mit sauberen Zimmern. So lockt sie viele Landsleute an den Ort, der manchen Besuchern wie das Paradies vorkommt.

Auch die Hamburgerin war begeistert. Gegen Ende der einwöchigen Behandlung bekam sie verschiedene Ayurveda-Medikamente verschrieben, darunter Kügelchen, die aussahen wie schwarze Pfefferkörner. Davon sollte sie viele Wochen lang jeden Tag sechs Stück nehmen – was sie dann auch tat.

Jetzt liegt die Frau in der Asklepios Klinik Barmbek in Hamburg. Mit aufgerissenen Augen schaut sie den Besucher an. Ihr Gesicht ist zerfurcht. Sie ist 55 Jahre



Giftpatientin, Nephrologe Meyer
„Die Frau kann froh sein, dass sie noch lebt.“



Apothekerin mit ayurvedischen Medikamenten: Gefährliche Mixturen

alt, sieht aber älter aus. Sie ist von 68 auf 52 Kilogramm abgemagert. Der rechte Fuß wackelt unkontrolliert. Die Frau war wochenlang völlig verwirrt, aber inzwischen weiß sie, was mit ihr geschehen ist. Sie sagt: „Es ist ein Schock, dass ich Gift eingenommen habe.“

Die Ayurveda-Medikamente haben ihren Körper keineswegs gesäubert – sondern mit Schwermetallen verseucht. Das haben Mitarbeiter des Hamburger Zentralinstituts für Arbeitsmedizin und Maritime Medizin herausgefunden, als sie die schwarzen Kügelchen untersuchten. Zunächst streifte ihr Analysegerät, weil die Probe extrem hohe Konzentrationen aufwies. Erst durch Verdünnen und Nachjustieren konnten die Laboranten den Wert bestimmen: Der Quecksilbergehalt der ayurvedischen Globuli liegt um das 566 110-Fache über der zulässigen Norm.

„Das ist Rekord“, sagt Tobias Meyer, Chefarzt der Nephrologie der Klinik Barmbek, der die vergiftete Frau behandelt. Auf einem Tisch breitet er Tütchen aus, die sie aus Sri Lanka mitgebracht hat. Die Analyse hat ergeben: Die vier verschiedenen Ayurveda-Medikamente sind allesamt mit Quecksilber und Blei belastet. Ein weiteres Mittel zur Darmreinigung („Triphala“) hat die Hamburgerin sich von Deutschland aus übers Internet besorgt; auch darin ist der Quecksilbergehalt erhöht, aber nur leicht.

Meyer, 47, hat ausgerechnet, dass seine Patientin 426 der schwarzen Kügelchen geschluckt hat. „Wenn so ein Ding ein Gramm wiegt, dann hat sie 213 Gramm Quecksilber eingenommen.“ Meyer schüttelt den Kopf. „Damit können Sie einen Menschen umbringen. Die Frau kann froh sein, dass sie noch lebt.“

Das Schicksal der Hamburgerin wirft einen Schatten auf das Ayurveda, das in Indien von Millionen praktiziert wird und auch in der westlichen Welt viele Anhänger hat. Neben Massagen, Ölgüssen, Meditationen, Ingwerwasser, Getreidebrei gehören zu der traditionellen Lehre auch Medikamente, die aus Arzneipflanzen, Edelsteinen, Mineralien und Schwermetallen hergestellt werden.

Die Mittel gelten in Deutschland oftmals als Nahrungsergänzung und sind nur schwer zu kontrollieren. Den ayurvedischen Alchimisten zufolge sollen diese Mixturen („Rasa Shastra“) ungefährlich sein, doch schon früher ist es zu Vergiftungen gekommen.

Vor einiger Zeit berichteten Ärzte in Stuttgart über eine 60-jährige Frau, die mit Verstopfung, Erbrechen, Übelkeit und Schmerzen am Kiefer ins Krankenhaus kam. Gegen ihr Rheuma hatte sie mehr als sieben Monate lang Weihrauchpillen aus Indien genommen – und diese waren voller Blei gewesen, wie die nachträgliche Analyse ergab.

In den USA haben Ärzte über 25 Websites 193 verschiedene Ayurveda-Medikamente gekauft und analysiert: Mehr als 20 Prozent aller Mittel waren mit Blei, Quecksilber oder Arsen belastet. „Befürworter des Ayurveda in Indien behaupten, dass Rasa-Shastra-Medikamente seit Jahrtausenden wirksam und sicher eingesetzt werden“, schreiben die Ärzte im Fachblatt „Jama“. „Doch viele Konsumenten ayurvedischer Medizin dürften unerkannte, fehldiagnostizierte oder subklinische Metallvergiftungen haben.“

Von dieser Hexenküche ahnen die Menschen nichts, wenn sie zum Ayurveda-

Figure 2: Article in *Der Spiegel*: “Pillen aus der Hexenküche” – “Pills from the witches’ kitchen”.

Asian, Chinese, Tibetan, Japanese, Arabic and Persian – the authors explore the epistemologies of the use of mercury in medicine. Why, when and how was mercury used in the different medical traditions, and why does it sometimes continue to be used?

The research presented here is part of an ongoing conversation between a group of scholars from a range of backgrounds, including anthropology, Tibetan studies, South Asian studies, neurology, and history and medical practitioners in Tibetan and traditional Chinese medicine that began at the Humboldt University in Berlin in 2012 with the symposium “Mercury – Elixir of Life or Poison? Purification of toxic substances in medical systems in Europe and Asia”. This meeting was convened by Barbara Gerke, who invited participants to reflect on how different medical traditions understand the characteristics of mercury and deal with the issue of its toxicity.³ Several of the papers presented at the symposium were published in the special issue *Mercury in Ayurveda and Tibetan Medicine* of the journal *Asian Medicine – Tradition and Modernity*.⁴ This is recommended reading particularly for those interested in the use of mercury in the Tibetan and ayurvedic medical traditions.

In order to deepen the discussion begun in Berlin, I convened a further meeting at Zurich university in February 2013. Entitled “Mercury in medicine: fluid economies of knowledge and trade”, it allowed participants to develop the group’s previous research.⁵ The field of enquiry was broadened to encompass the history of mercury therapies in Chinese and Burmese medicine, as well as in works written in Arabic or Persian, i.e., works belonging to the so-called Graeco-Arabic or Islamic medical tradition.⁶

The present volume is based on the presentations and discussions at the Zurich meeting. Regrettably, not all contributions of the scholars present at the workshop are represented here. The work of two scholars who did not attend has been added: Claudia Preckel on Unani medicine and Brigitte Sébastia on Siddha medicine and alchemy. It is to be hoped that the research not included here will

³ See the symposium’s schedule at http://www2.hu-berlin.de/zentralasien/dokumente/veranstaltungen/2012_05_04_One_Day_Symposium.pdf

⁴ Gerke 2013.

⁵ See http://www.asienundeuropa.uzh.ch/events/conferences/mercury_en.html for the schedule of the workshop. Recordings of several of the talks can be watched on the YouTube channel Mercury in Medicine: Fluid economies of knowledge and trade. A report of the workshop by Barbara Gerke can also be read in the “Asia & Europe Bulletin” 3/2014. I would like to thank the URPP Asia and Europe and VAUZ of Zurich University, as well as the Swiss National Fund for their generous support for this workshop.

⁶ For a discussion of the categorization of the medicine represented by these works, see the articles by Bachour and Thomann in this volume.

become available in due course. Ulrike Unschuld gave an excellent introduction to the history of the medical use of mercury in China. Andrew Cunningham offered a valuable exploration of the inner-European medical trade of mercury, focussing on the production of mercury at the Almadén mines. He is currently working on a monograph on the history of mercury in European medicine that will complement the more Asia-focussed research in this issue. Following up on questions that had arisen at his presentation in Berlin, Jürgen Aschoff spoke about modern research on the safety and efficacy of mercury in traditional Asian medicine, noting the dearth of relevant data and the lack of serious scientific research in this field. Some of his conclusions can be found in his article in *Asian Medicine* 8.1.⁷ And finally, Ian Baker presented the use of mercury by modern-day alchemists in Burma (Myanmar) whose mercury-based practices seem both vibrant and surprisingly well-known to the populace at large. Burmese alchemy is practised both in Buddhist monasteries and in lay settings and centres on the forging of amalgamated mercuric *dhatlon*, or “essence balls”. These are derived from liquid mercury and are used medicinally, but are also ascribed with the power to give consumers *siddhis*, or special abilities.⁸

Although heavily influenced by Buddhist tantric ideas, these practices also seem closely related to those of Tamil Siddha practitioners, as described by Brigitte Sébastia in this volume. The connections between these traditions would constitute a fascinating research area, and further study of either tradition’s literary past and present practice are very much a desideratum.⁹ Happily, plans for a research project focussing on Tamil Siddha iatrochemical literature are underway at the French Institute of Pondicherry and should add to our understanding of this tradition.

Several articles in this issue present processing methods, recipes and applications of mercury medicines and their development over time, and also seek to identify and trace connections in medical theory and techniques with other medical traditions. Some of these connections between medical cultures are fairly well known, such as the trajectory from Greek medicine to Arabic and Persian medicine and thence to Unani medicine. Or indeed from Greek to Arabic to European (works in Latin) and back to Arabic medicine, as Natalia Bachour

⁷ See Aschoff 2013.

⁸ A recording of Baker’s presentation can be viewed at <https://youtu.be/GYkuHKt13as> (last viewed 21.09.2015).

⁹ There is an excellent study of the Siddha medical tradition in its modern and politicized incarnations by R. Weiss (2009), as well as a number of articles by various scholars. These, however, do not primarily deal with the contents of Siddha medical literature, much of which is to date only extant in manuscript form. On Burmese alchemical cults, see Brac de la Perrière et al. 2014.

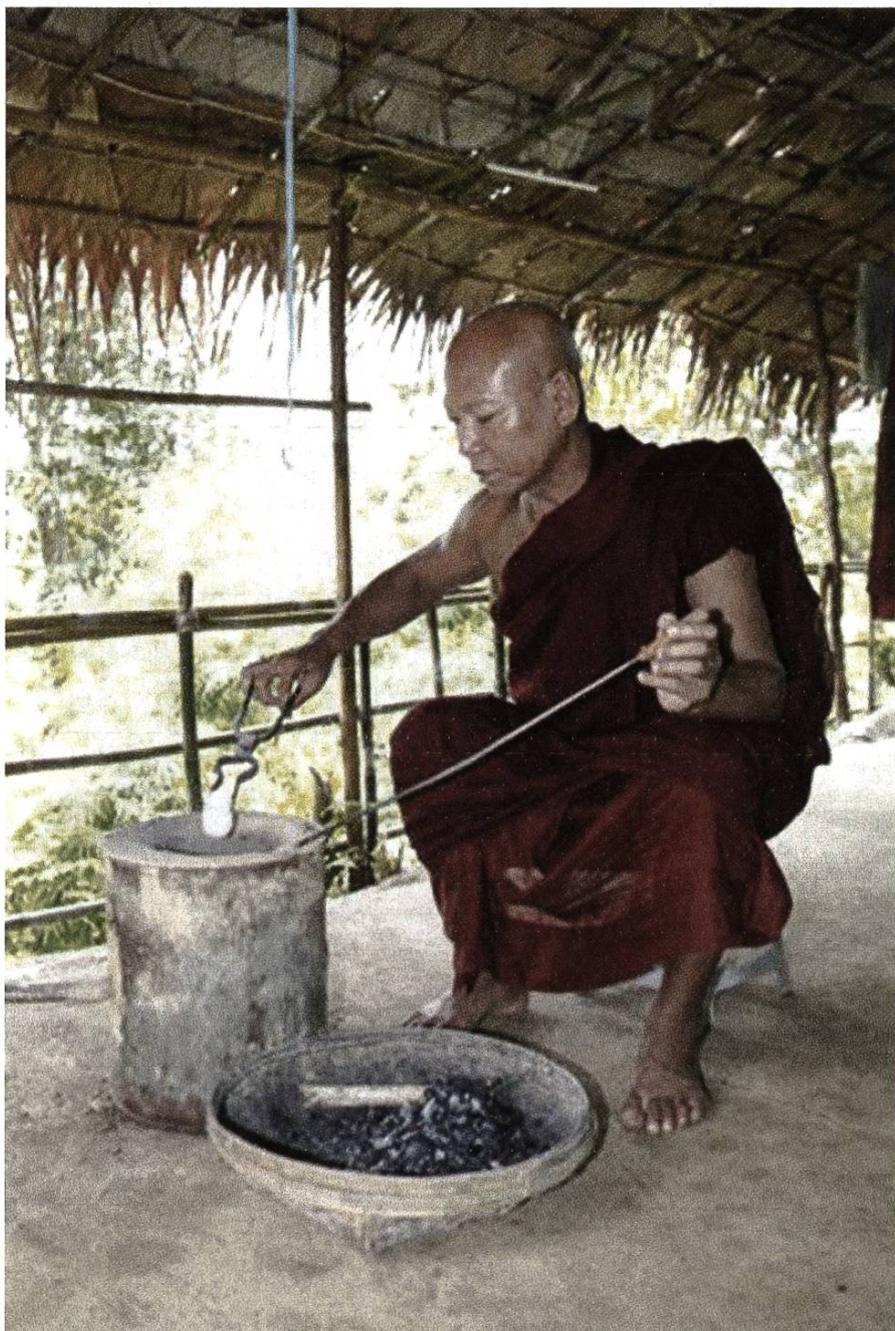


Figure 3: Burmese monk holding a *dhatlon* in his palm. Image: © Ian Baker.

shows in this volume. Here, links can be traced through literature, as medical authors translated and commented on older literature, developing new practices on the basis of older ones. However, even in traditions that are connected in this way, certain key moments in which mercurial practices appear cannot be fully explained as a continuation of earlier practices. This is partly due to the limited number of sources we were able to consult for our research and the general focus on medical, rather than alchemical texts, but also partly due to some sources not being available or perhaps simply not known at present.

Therefore, there are a number of missing links in our reconstruction of how concepts concerning mercury were shared or transferred. Some of these can be guessed at: There are certain clues, sometimes even clear statements in the

textual sources about the provenance of recipes, methods of preparation, applications and sourcing of ingredients. However, often these hints or statements present us with further puzzles. For example, one Persian author, discussed by Thomann in this volume, attributes some of his antisyphilitic recipes to Indian sources, others to Chinese ones and yet others to European ones. However, a comparison with recipes in the surviving Indian medical sources does not bring up corresponding formulations. In turn, the Sanskrit medical texts use loan-words from the Persian in the relevant sections and there is also a certain overlap in the use of ingredients, which seems to point to Persia or authors writing in Persian as the source of the new formulations (see my article in this volume). Bachour suggests that the sudden appearance of mercury medicines in Arabic medical literature may go back to contact with Indian physicians and also the translation projects of the ninth century, when certain Indian medical works were translated or paraphrased into Arabic (in some cases via Persian translations). The problem here is that the works known to have been used for these translations predate the widespread use of mercury and particularly the associated practices of processing mercury in Indian medicine.¹⁰ The answer may lie in currently undiscovered or unstudied texts: much remains to be done in the textual study of Sanskrit, but also Arabic and Persian medical texts.

Answers may also be found in alchemical, rather than medical sources. David White notes that “nearly all the mercury the Indian alchemists would later use came from China: given the fact that there exist no mercurial deposits on the subcontinent, China was India’s nearest and most obvious supplier.”¹¹ White summarizes the Sino-Indian points of contact as follows: “(1) the mountain passes located in the northwestern region of the subcontinent (Himalayan Pakistan and Afghanistan) and (2) Assam to the east – these being the two regions through which the Indian spurs of the Silk Road passed – as well as (3) the major seaports on the coastlines of Tamil Nadu and Gujarat, which linked India to China and the west (...).”¹² The route between Assam and China linked Szechuan, Yunnan, and Burma with Assam.¹³ Further, many of the goods carried along the Silk Road were transported by Persian traders, which explains why

¹⁰ Works translated include the seventh-century Sanskrit medical work *Aṣṭāṅgahṛdayasaṃhitā*, which does contain several recipes with mercury as an ingredient. However, Bachour notes that passages from this Indian text appear only in fragments in Arabic works and that these fragments do not include the mercury recipes. The *Aṣṭāṅgahṛdayasaṃhitā* also does not describe the making of mercury ash, which is a form of mercury that appears in the Arabic texts as ‘dust of mercury’ (*turāb al-zi’baq*).

¹¹ White 1996: 62.

¹² White 1996: 63–64.

¹³ White 1996: 380, note 88.

some drugs from China arrived in India with Persian names.¹⁴ For example, China root was known as *cobacīnī* in India, a Sanskritized form of the Persian *chub-i-chini*. This root was used in antisyphilitic therapies in Persia, India and China and was also associated with alleviating the side effects of mercury therapy. One can easily imagine not only medicinal goods, but also alchemical and medical ideas being transported along the trade routes, being adapted and developed along the way as traders encountered both different substances and other modalities of alchemical and medical thought as well as the pressure to sell their wares.

Finally, one should also not discount another possibility, namely the absorption of popular medical practices into scholarly medicine. Bachour mentions a relevant citation from the seventh-century Byzantine physician Paul of Aegina that states:

It [i.e. mercury] is rarely used for medical purposes because of its lethal effect. Some people burn it until it becomes like ash, mix it with other substances and give it as beverage to the sufferers from colic and the so-called ileus.¹⁵

While Paul of Aegina advised against the medicinal use of mercury, the dust of mercury mentioned by him later appears in Arabic medical works, al-Ṭabarī's *Firdaws al-ḥikma fī l-ṭibb* (The paradise of wisdom in medicine) being an early example, as Bachour shows. This seems to suggest that practices that had previously been rejected by medical scholars found their way into scholarly medicine eventually. What remains unexplained is the process which allowed this to happen. What changed scholar-physicians' minds?

Daniel Trambaiolo's article in this volume describes how Chinese alchemical and medical practices involving mercury, which had been developed at a much earlier period than the other medical traditions explored in this volume, became less and less popular in the Tang (618–907) and Song (960–1279) periods. Strikingly, this decline in the use of mercurials coincided with the appearance of and then growing importance of mercurials in medicine in South and Central Asia. However, the medicinal use of mercury went through a renaissance in sixteenth-century China, due to the arrival of a new disease, which was considered

¹⁴ On the presence of Persian and Arabic merchants in China between the seventh and eleventh centuries and the possible ways in which this brought Chinese influences into Arabic alchemy (and presumably also medicine), see Needham 1980 [1959]: 418–423. Needham also points out the possible role of Jewish merchants, who in the ninth century CE traveled regularly both by land and sea between China and Provence, with Damascus and Oman as stops on their route, as a link between the Chinese alchemists and the Jābirians. See Needham 1980 [1959]: 421, note a.

¹⁵ See Bachour in this volume for the translation and discussion of this passage.

particularly terrible and which challenged doctors to experiment with new forms of therapy, as Trambaiolo argues. It seems likely that this new disease was syphilis.¹⁶ Several of the articles in this volume (those by Bachour, Thomann, Trambaiolo, Preckel and myself) discuss how the arrival of this new disease impacted on medical practices. Mercury played a particularly important role in the treatment of this disease throughout Asia, just as it did in Europe. And it is in this context that transfers of knowledge between the various medical traditions seem particularly likely, though the articles in this issue reveal significant differences in approaches to treatment as well.

The relationship of Japanese medicine with Chinese medical sources is fairly straightforward: Trambaiolo gives examples of how Japanese medical authors made use of recipes of Chinese authors, in particular for making mercury chloride compounds. He argues that the familiarity with Chinese formula for making these compounds paved the way for the later reception of European style mercury chloride drugs. Mercury compounds had been produced in Japan since at least the eighth century, using mercury and cinnabar from Japanese sources, particularly from the cinnabar mines around Ise. However, when the mines around Ise became exhausted in around the eighteenth century, supplies of mercury were obtained through Chinese or Dutch merchants. And it is in this period that Dutch procedures for making sublimated mercury compounds made their way into Japanese medicine. However, these were considered to result in quite separate products with significant functional difference from the mercury chlorides made following Chinese recipes. And while Japanese doctors found ways of using mercury chlorides produced according to European methods, it seems these did not include administering them according to Dutch or European prescriptions. The Dutch had the monopoly in making and trading mercury compounds (corrosive sublimate and calomel) in eighteenth-century Europe. However, the Swiss physician and chemist Christoph Girtanner warned of the bad quality of the Dutch products, claiming that their sublimates were often adulterated with arsenic and suggesting methods for recognizing and countering adulterations.¹⁷

16 The identification of historical disease categories is always problematic and the use of the term “syphilis” is used as a “pragmatic translation for a group of related terms” (Trambaiolo in this volume). Given that microorganisms as causative factors for diseases were not known until the nineteenth century and that the bacterium that causes syphilis, *treponema pallidum*, was only identified in 1905, we cannot know whether the disease described in older historical sources in fact describe syphilis as we understand it today. However, skeletal evidence shows syphilis to have been common in Asian countries.

17 Girtanner 1797: 324–331.

Timothy Walker's article in this volume shows how Jesuits, using the new global networks of trade that emerged with the sixteenth-century discovery of the New World, formulated new medicines that contained substances from all parts of the Portuguese imperial world. The Portuguese use of mercury depended almost exclusively on commerce with imperial Spain and its mercury in the mines of Almadén,¹⁸ as neither Portugal itself, nor its territories, produced appreciable amounts of mercury, as Walker points out. However, mercury – often combined with exotic substances from the colonies – was nevertheless a staple ingredient in many Jesuit formulations.

Three papers in this volume deal with continuing practices of using mercury: Claudia Preckel's article describes the continuation and development of practices first found in Arabic and Persian sources in Unani medicine, examining Unani sources from the fifteenth century to the present. As mentioned, Brigitte Sébastia discusses the role of mercurials for Siddha medicine, questioning the prominent position mercurials take in representations of this medical tradition. Her paper also explores the discourses surrounding the toxicity of mercury and the responses of modern practitioners of Siddha to research publications by biomedical scholars and the public reaction to them. Finally, the article by Barbara Gerke in this volume discusses the more recent history of the transmission of mercurial practices in Tibetan medicine. Tibetan medical practices were strongly influenced by the Chinese take-over of Tibet in the 1950s, and the following Cultural Revolution (1966–1976). As Gerke shows, these events affected the opportunities to transmit the knowledge and practice of making certain mercury compounds called *tsotel*. Her paper traces the personal histories of two Tibetan physicians, Tenzin Chödrak (1924–2001) and Troru Tsenam (1926–2004) and their role in the transmission of the *tsotel* practice, revealing how existing practices of making *tsotel* in India and the PRC are directly linked to these physicians.

The papers in this special issue of *Asiatische Studien/Études Asiatiques* cover much previously unexplored ground in the history of the use of mercury in medicine. However, further study and translations of medical and alchemical texts are needed to complement if not complete our picture of how mercury was

18 Arguably, the dependance on the Spanish extended to various groups of bankers. The mines of Almadén were controlled by the Fuggers from 1524 to 1645. The Fuggers were given a lease on the mines by Charles V, to pay for a loan he had taken in order to be elected from King of Spain to Holy Roman Emperor. See Goldwater 1972: 62–63. Other banking houses implicated in the control of the mercury trade (through both the Almadén and Idria mines) included not only the Fuggers, but also Bartholomew Belser, the Hochstetters, the banking firm of Dentz and the Rothschilds. See Goldwater 1972: 66–71.

used in medicine and how the various medical and alchemical traditions connect through these practices.

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