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Blind Mice and Despairing Rats:
The Uses of *kurkanû*-Turmeric in Ancient and Modern Medicine[1]

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In order to assess the effectiveness of the plants used in ancient Mesopotamian medicine, it is necessary to compare, where possible, ancient and modern uses of the same plant. I see no benefit to be gained from taking the position of Niek Veldhuis, that refuses to accept as science any tradition that does not have a concept of nature defined as a "predictable universe that follows an impersonal regularity".[2]

Afterall, what is "science?" Is it carefully observing and using what works, and then trying to figure out why it works afterwards (as in ancient Mesopotamia) or is it dreaming up a perfect theory (humors "corrected" by bleeding, purging and blistering) and then applying your theory relentlessly for over three millennia even though it is demonstrably killing people because the theory says it should be working? No bad medicine just bad patients.

What is meant by "science" in the latter context is the disenchanted world of the mathematician Descartes and his mechanistic philosopher followers. In fact, every major advance in science, whether in medicine, biology or physics, has had to fight its way past this mechanistic philosophy. The rejection of occult properties including evolution and gravity were basic for Descartes' disciples. Indeed, the current intelligent design theory is a mathematically grounded resurgence of the view that God is life and all the rest dead matter. In the field of medicine, mechanists joined forces with Protestant divines to reject germ theory as a return of Babylonian demonology (Jastrow 1913) or false attribution of occult properties, depending on whom you asked. Truly modern scientists speak in animist terms, even if often disguised under made-up Greco-Latin words like macrophage, which literally means: "large eater". Dead matter does not "eat".

Ancient Greek philosopher-physicians were armed with an animistic view of nature not usually attributed to them, but unmistakable in their own writings. This orientation to life allowed them to discern a basic truth which study after study in modern plant medicine fully confirms, namely that body chemicals are in a delicate balance, whereby too much or too little of the same bio-chemicals in the mix can have equally disastrous consequences. Unfortunately, this brilliant insight was hitched to the service of a dangerously incorrect notion that what is in balance in the body are blood, bile, phlegm and an imaginarily pure substance (actually a mixture of blood and bile), namely black bile. And, apart from rebalancing humors, nothing else mattered. As a result, Hippocratic medicine, of which we shall see an example presently, had a distressing tendency to do the wrong thing, all too often with fatal results. Did they notice that patients were dying? Yes. Did this shake their faith in their method? No.

Neither did it shake the faith of early modern disciples of Hippocrates' revivifier, Galen. Fagon, court physician to Louis XIV, who essentially murdered a good part of the royal family with his Galenic medicine, excoriated a traditional healer who occasionally (and successfully) treated members of the royal family as a quack, the original usage of the word.[3] What his ilk had to say about the courageous woman who hid the future Louis XV from his

[1] Modern medical identifications are, unless otherwise noted, taken from Scurlock and Andersen, 2005. I would also like to personally thank Dr. Fauci who has been editor for the last ten editions of Harrison's Principles of Internal Medicine, the standard textbook and my modern medicine bible. In my humble opinion, he is far sexier than Brad Pitt who plays him on Saturday Night Live.

[2] Veldhuis 2014, 22-23.

[3] Saint-Simon 1967, 151.

doctors, and is the only reason that the royal family made it to the French Revolution, was doubtless unprintable.

Ancient Mesopotamian physicians were more careful observers and not at all prone to theory-first methodology. They were prepared to countenance attacks from without as well as disturbances within the body. Moreover, their fully enchanted world allowed them to discover, by trial and error, plants that worked then and, truth be told, work even today and in surprisingly sophisticated ways that we are still in the process of discovering.

I began my contributions in this field perhaps a bit too hastily by using traditional usages and modern studies to identify *kamantu* with henna.[4] The virtue of my approach I have since been able to confirm by studying a plant whose identification is really beyond doubt, namely *šūšu*-licorice.[5] In this article, we shall continue the process by studying yet another plant with a secure etymology, namely *kurkanû*-turmeric. We shall go through one by one each medical condition that ancient Assyrians and Babylonians used *kurkanû*-turmeric to treat, either singly or in combinrion with other plants, and then discuss what, if anything, modern medicinal studies have shown about such a treatment for that condition.

Hair

Probably the parts of ancient Mesopotamian medicine that draw the most derisive laughter are treatments for hair growth. So we have:

HAIR:

the inner bark (*bukānu*) of *amilānu*-mandrake, *elikulla* and *kurkanû* are (wrapped) in [wool] from a virgin she-goat and worn on the neck as an amulet for hair falling out (BAM 480 iii 55 [Worthington, JMC 5.13:188'])

Actually, there are a number of plants that are capable of bringing some cover to bald pates. Key are anti-androgenic properties, giving some credence to the popular belief that bald men are sexier than their hairy counterparts. Ancient Mesopotamian use of *kurkanû*-turmeric (in the salve form typical to accompany amulets of the same ingredients) is supported by modern pharmacology. A study using the Thai variety (Srivilai et al. 2018) built on previous research to demonstrate the effectiveness of treatment with the extract, without the often experienced side effect of, surprise, surprise, decreased sexual performance (Srivilai et al. 2018, 140-141,144,148). The absence of this particular unwanted side-effect is probably to be credited to the fact that curcumin (the extract) is known also to have androgenic effects (Mohamadpour et al. 2017). Indeed, aging roosters who got their feed curried with curcumin would be happy to learn that the significant improvement in their semen quality and fertility rates (Kazemizadeh et al. 2019) was saving them from the stew pot.

Key here is dosage; as we shall see again and again with this plant, nothing happens with a really low dose of curcumin. As the dosage is increased, the expected effect appears and rises to a maximum. After that, no further improvement is experienced until a high dose threshold is crossed, after which the plant actually reverses course and enables what it had been blocking and vice versa. This sounds like a defect but it actually makes the plant more useful, since manipulation of the dosage allows you to take whichever tack you want or, to put it in enchanted world terms, to tell the plant what you want it to do for you.

So, for example, curcumin is famous as a protector of cells from inflammatory and oxidative damage when tested *in vitro* at low doses of 1-30μM. However, other studies suggest curcumin as a weapon against Y79 retinoblastoma cells. It is an efficient killer of these cells, up-regulating 903 genes and down-regulating 1,319 others, thus doing genetic damage comparable to that of radiation (Sreenivasan et al. 2012). But that is not all that it does. It also immobilizes them in place and closes cell membranes to their knock, thus

[4] Scurlock 2007.

[5] Scurlock forthcoming.

helping to prevent metastases (Li et al. 2018, esp.3-4). And how does our plant do all this to those poor little Y79 cells? By up-regulating the very pathways (JNK and p38 MAPK) and nuclear factor NF-κB that it down-regulates when producing its anti-inflammatory effects. For this, you need a high dose of 50-80μM of curcumin. Yu et al. 2016, 861, 862 864-867)

To note is that dosages for individual patients are never actually given in Middle and Neo-Assyrian texts, apart from the odd direction to use more for a man than for a woman. Dosage information thus remained part of the oral tradition until the late Babylonian period when individual dosages begin to be recorded. This practice fully justifies the warning that the trained expert, the one who knows, was not to show his texts to a neophyte, the one who does not know. As with the diagnosis of illness, sophisticated treatments of the sort employed by ancient Mesopotamian physicians were **not** for amateurs.

For the Thai baldness experiment (Srivilai et al. 2018), thirty-seven volunteers or perhaps better, volunteered, males aged from 3-15 years came in to donate their foreskins to science. Hey, free circumcisions and under hospital conditions—what was not to like? What was discovered by *in vitro* study of the foreskins was that, although effective by itself, turmeric works even better if combined with an already existing treatment, allowing the dosage of the latter to be reduced. In the latter application, monoxidil flux was increased 20-fold by turmeric essential oil. (Srivilai et al. 2018, 140, 142-148)

What was even more interesting was a series of experiments designed to emulate actual topical application. Here it was discovered that the essential oil did not substantially evaporate over 8 hours in the open air but the water or ethanol in which it was dissolved did, and with serious effects. In the first hour (so without the evaporation), the enhancement of monoxodil flux was 100 fold (Srivilai et al. 2018, 146-147). This more than justifies the common use of oil and ghee as solvents for salves and daubs in ancient Mesopotamia.

So, this essential oil, the terpenes in turmeric, have the capacity to make whatever accompanies them pass more easily through the skin (Srivilai et al. 2018, 140, 146-147), thus bypassing the intestinal tract which does a number on curcumin (the most active part of the plant, which is what is usually used for study, a whopping 90% loss--Sun et al. 2018, 131). Although ancient Mesopotamians do take turmeric by mouth, it is striking how often recourse is had to salves and enemas where the terpenes which they have not removed may most effectively do their work. They also very rarely, if ever, used water as a solvent for *kurkanû*-turmeric, as is often the case with modern testing. (Sun et al. 2018, 130-131,137). Traditional healers in the back country of India and Thailand do, it is true, invariably use water as a solvent. However, to remember is that they are survivors of lost medical traditions. The number of these healers who have received training informed by the latest medical research may probably be counted on the fingers of one hand; indeed they are lucky to be legal. Under these circumstances, using preparations of a potentially dangerous medicinal plant that minimizes its bio-availablity is the morally correct choice. It should also be noted that using the whole plant rather than one of its fractions considerably improves absorption even when taken by mouth (Nasef et al. 2019).

Ears

Although the virtues of transdermal medication are gradually being discovered, fumigation as a delivery system, particularly the smoky variety, has had to fight an uphill battle for acceptance. What could be more magical, the modern western observer wants to know, than burning something on a brazier near the patient, the standard ancient Mesopotamian treatment for ear infections? So we have:

EARS:

bandages:

ḫarmunu, *aktam*, *imbû tâmtim*, *kukru*, *burāšu*-juniper, *erēnu*-cedar, *šurmēnu*-cypress, *atāʾišu*, *kurkanû*, *ṣaṣuntu*, *sīḫu*, *argānu*, *barīrātu* and "lone plant" are [ground], mixed with oil

and wax, massaged into leather and used in a bandage for the head roaring (BAM 3 ii 49 [Worthington, JMC 7.22])

fumigants:

kukru, *burāšu*-juniper, *suʾādu*, *kanaktu*-aromatic, *asû*-myrtle, *ballukku*-aromatic, *baluḫḫu*-aromatic, ["sweet reed"], *atāʾišu*, *maštu* (= *šammi ašî* seed), *kalgukku*-clay, [*kasû*], *kurkanû*, *šimeššalû*-boxwood, and *erēnu*-cedar are used in a [fumigant] for the ears (BM 32277+ iii 18)

kukru, *burāšu*-juniper, *ṣumlalû*, *kanaktu*-aromatic, myrrh, *asû*-myrtle, *ballukku*-aromatic, *baluḫḫu*-aromatic, "sweet reed", *atāʾišu*, *maštu* (= *šammi ašî* seed), *kasû*, *kalgukku*-clay, *kurkanû*, *suʾādu*, *šimeššalû*-boxwood and *erēnu*-cedar are used in a fumigant for "sick" ears (CTN 4.113 ii 26⁄⁄BM 76023 + 83009: 10')

ox kidney fat, gazelle dung, *kurkanû*, *imḫur-lim*, powdered *taskarinnu*-tree, *ballukku*-aromatic, "sweet reed", *kukru*, *kasû*, *suʾādu*, *šupuḫru*-cedar resin and *kalgukku*-clay are used in a fumigant for the ears (BM 32277+ iii 11)

ox kidney fat, gazelle dung, *kurkanû*, *zabi* (= *imḫur-ešra*) and powdered *taskarinnu*-tree are used in a fumigant for roaring ears (BAM 506:3'⁄⁄BAM 3 iv 32 [AMD 3 no. 143])[6]

tampons:

kukru, *burāšu*-juniper, *ṣumlalû*, *nikiptu*, *asû*-myrtle, *ballukku*-aromatic, *baluḫḫu*-aromatic, "sweet reed", *atāʾišu*, *maštu* (= *šammi ašî* seed), *kalgukku*-clay, *kasû*, *kurkanû*, *šimeššalû*-boxwood, and *erēnu*-cedar are moistened with *erēnu*-cedar resin and used in a tampon for ghost-like jabbing pain in the ears (BAM 3 iv 18⁄⁄Heeßel and Al-Rawi, Iraq 65.223 i 40 [AMD 3 no.163a])

burāšu-juniper, *kukru*, *ṣumlalû*, [*nikiptu*, *asû*-myrtle], *šimeššalû*-boxwood, *ballukku*-aromatic, "sweet reed", *atāʾišu*, *maštu* (= *šammi ašî* seed), [*kalgukku*-clay], *kasû*, [*kurkanû*], *baluḫḫu*-aromatic and *erēnu*-cedar are moistened with *erēnu*-cedar resin and used in a tampon for ghost-like hurting ears (RA 53.10ff r. 23 [AMD 3 no.163b])

First, the infection itself. What we are seeing in Mesopotamian texts are largely cases of otitis media. What is interesting about this condition is that what you have is a case of the cure being potentially worse than the disease. To know is that one of the body's defenses against infection not only in the ear but also the trachea and digestive and reproductive tracts is to envelop the invading pathogens in mucus so that they can be flushed out of the system by mucociliary clearance. Unfortunately, too much mucus gums up the clearance system and winds up impairing your hearing. The normal pathogen, *Haemophilus influenzae*, is a slippery customer for direct anti-viral treatment (although turmeric can do this too, as we shall see). Nonetheless, if the mucus overproduction problem can be solved, the pathogen will in any case be cleared out in the natural course of things. (Konduru et al. 2017, 1-2)

And this is where the anti-inflammatory properties of turmeric come in. As it transpired in *in vitro* testing of human ear cells and injection of a low dose of 50mg/kg into mice, curcumin was able to down-regulate mucus production which had been put into overdrive by the invading pathogen (testing was carried out after as well as before deliberate infection). Curcumin accomplishes this by de-activating pro-inflammatory p38MAPK pathways by up-regulating protein MAP Kinase Phosphatase-1 (MKP-1) (Konduru et al. 2017, 3-8)

Next the smoke. Fumigation is an extremely efficient delivery system for medicinal drugs. In fact, delivery of curcumin via the nasal passages is more effective even than injection (Chauhan et al. 2018, 30). Fumigation does its magic, so to speak, by forming nanoparticles, the hottest newest way to deliver curcumin to the body without losing most of

[6] Worthington, 2006, 26 missed the parallel and misrestored the symptom as a result.

it in the process. For cancer cell apoptosis, you need to maintain a consistently high dose of curcumin in the system, which nanoparticles can deliver. Moreover, you also need to worry about healthy cells getting lost in the process of killing those you want dead. Nanoparticles allow (although this is by no means always observed in practice) intermediate dosages to be used against cancer, a good way to kill what you want killed without hurting too many innocent victims. (Konduru et al. 2017, 7-9).

The artificial versions of nanoparticles (made from gold, silver and polymer) produce perfect particles. They are, however, hardly biodegradable. By contrast, the comparatively eco-friendly oil-encased carbon nanoparticles (and the hot new super high-tech equivalent of just mixing ground turmeric in oil or ghee, the liposomes-- Ng et al. 2018, 51-53) are somewhat irregular spheroids and ovoids that vary in size. The carbon nano-particles work just as well as their prettier sisters, fumigation by smoke yielding almost instantaneous drainage of mucus. (Chun et al. 2016, 1-2,4-6,10-11).

We may surmise from these articles that the virtue of the delivery to the ear by fumigation is to produce drainage. Other ancient Mesopotamian treatments for the ears also involve drainage as, for example the ones that use pomegranate juice. At the end, the drainage is stopped with alum, as in the following:

EARS:

tampons:

1 shekel of *nurmû*-pomegranate juice and 1 shekel of infusion of *kanaktu*-aromatic are sprinkled onto a tuft of wool and used in a three day tampon for the ears feeling heavy; on the fourth day, the ears are wiped off and alum is blown in with a reed straw (BAM 3 iv 28⁄⁄RSO 32.109ff iii 4)

1 shekel of *nurmû*-pomegranate juice and 1 or 2 shekel(s) of infusion of *kanaktu*-aromatic are sprinkled onto a tuft of wool and used in a three day tampon for fever spreading into a person's ears so that his hearing is heavy; on the fourth day, if the pus in the ears has come out the ears are wiped off; when the pus is finished, alum is blown in with a reed straw (BAM 503 ii 54'⁄⁄RSO 32 109ff ii 15)

erēnu-cedar oil, myrrh, 1 shekel of *nurmû*-pomegranate juice and 1 shekel of infusion of *kanaktu*-aromatic are sprinkled on a tuft of wool and used in a three day tampon for the right ear feeling heavy; preceded by drops with myrrh and … oil; on the fourth day, the ears are wiped off and alum is blown in (CTN 4.113 ii 11)

With the turmeric treatments, the virtue of the plant is at this latter end of the process, namely stopping any more mucus from being formed. Interestingly, the ancient Mesopotamian physician was aware of this fact—in Uruanna, *kurkanû*-turmeric is specifically recommended as a plant for opening/closing the nose ($nR2_{2a}$ i 10) and to stop phlegm (from flowing) ($nR2_{2a}$ i 4).

Eyes

Ancient Mesopotamian treatments for the eyes using *kurkanû*-turmeric involve opaque spots and dimmed vision, a condition often associated with eyes full of blood. So, we have:

EYES:

salves/rubs/daubs:

Emesallim-salt, *kuppû*-fish gall, *kurkanû* and "white plant" are mixed with ghee and used in a daub for removing opaque spots (*ṣillu*) (BAM 382:5⁄⁄BAM 22:20')

2 carats of *daʾmātu*-clay, 2 carats of *kurukummu*,[7] a carat of "white plant" and a carat of *imbû tâmtim* are integrated(?), wetted(?) with the blood of a male and female *ḫurri*-bird and used in a daub for dimmed eyes; may also be daubed on dry; followed with hot milk drops

[7] *kurukummu* is the Aramaic/Hebrew equivalent of *kurkanû*, see AHw 510b.

four times a day and a daub with *asḫar*-kohl (SpTU 2.50:5-9//BM 132097 obv. 11'-15' [AfO 35:22-23])

These references are presumably describing cataracts and retinopathy, respectively. The development of retinopathy (and glaucoma) has been linked to over-activation of N-methyl-D-aspartate (NMDA) which results in cells swelling up (necrosis) and dying (apoptosis). (Matteucci et al. 2005, 641-642, 643). *In vitro* experiments indicated that pre-treatment of retinal cells with very small amounts of curcumin (1 and 5 μM) did essentially nothing to protect the cells from the onslaught. However at 15μM, there was significant protective activity. But doctor beware, at 50μM, the cells they were trying to protect died (Matteucci et al. 2005, 642,643-644).

To know is that NMDA is no villain; on the contrary, it is essential to cell survival. But when something goes seriously wrong, NMDA gets over-stimulated and a massive influx of calcium ions through NMDA receptors results in cells beginning to die. Curcumin seems to calm things down. (Matteucci et al. 2005, 643-645). The modern competitors to curcumin for this condition include actual blockers of NMDA. There are to this latter style of treatment a few little side effects: memory impairment, psycho-mimetic effects and ataxia. (Matteucci et al. 2005, 647). So you can't walk and people think you are crazy but your eyes are better, or at least you think so, since you can't actually remember how well you saw before. Seriously, this is not what anybody wanted to happen, although nobody wants to know how they found out about the side effects. Medicinal plants used safely for millennia are tested to death, designer drugs produced by big pharmaceutical companies — not really, no.

In addition to excitotoxicity, eyes can be done in by inflammatory processes in which curcumin is also something of an expert. Salted corneal epithelial cells were soon bursting with pro-inflammatory cytokines such as interleukins IL-1β and IL-6 and tumor necrosis factor TNF-α. A mere 5μM of curcumin solved this problem by down-regulating the p38MAPK pathway, returning IL-1β, IL-6 and TNF-α to normal levels, and suppressing nuclear factor kappa light chain enhancer of activated B cells (NF-κB) activation (Chen et al. 2010, 437, 439-442).

As if this were not enough, eyes also, over time, develop oxidative damage which appears to be the underlying cause of cataracts. Once again, curcumin to the rescue. In one study (Awasthi et al. 1996), rats were given oxidative damage to their eyes by the simple expedient of feeding them corn oil, not the most reassuring thing for an American whose food culture is awash with corn products. Careful experimentation established that 500mg/kg was the top end, and 50mg/kg the minimum necessary to produce the desired effect with 75mg/kg optimal. The rats were thus given a dose of 75mg/kg of curcumin mixed with their corn oil and were proven significantly less likely to experience opacification (Awasthi et al. 1996, 761,762).

As for how curcumin is able to prevent oxidative damage, opinions vary. Some say that curcumin actually scavenges the reactive oxygen species (ROS) that cause lipid perioxidation, others that curcumin works by up-regulating the body's own anti-oxidant defenses (Awasthi et al. 1996, 761). What the researchers who fed corn oil to the rats discovered was that, the formation of cataracts aside, what makes them turn opaque so that you cannot see through them is 4-hydroxy 2-nonenal (4-HNE). This is only mildly electrophilic and thus does not come into play right away, but kicks in as the cataract matures. 4-HNE is one of the infamous reactive oxygen species (ROS). They are called electrophilic because they do their damage by literally stealing electrons from other molecules, including those of membrane lipids and nucleic acids. ROS are not evil; in fact, one of their jobs is to protect the body from outside attackers. However, things can easily get out of hand, since if only one membrane lipid molecule gets oxidized, you get a free radical chain reaction, and

eletrophiles get mass-produced as a result. So the body also has an anti-oxidant system on hand to protect itself from its own soldiers, as necessary. One of the body's anti-oxidant enzymes that curcumin up-regulates, namely one of the glutathione S-transferases (GST), uses 4-HNE as a substrate, thus automatically reducing the amount of it available to keep you from being able to see (Awasthi et al. 1996, 761, 763-766).

A major cause of retinopathy and cataracts is diabetes mellitus. Here, the usually ignored terpenes of turmeric come into their own. Whereas curcumin is very useful in treating the cataracts, retinopathy as well as peripheral neuropathies of diabetes, it is the sesquiterpenes that deliver the bulk of the hypoglycemic punch, treating the underlying cause and not just the symptoms produced (Aldebasi et al. 2013, 196; cf. Grover et al. 2019).

This by no means affects the ability of curcumin alone to prevent the formation and delay the maturation of diabetic cataracts. A study (Suryanarayana et al. 2003) induced cataracts in rats by feeding them galactose, thus making them hyperglycemic. They then tested the effects of curcumin on the development and maturation of the resulting cataracts. Sensibly, they also tried different doses of curcumin. It should come as no surprise by now that the smaller of two doses tried (.002%) worked as expected, whereas the larger dose (.01%) delayed the onset of the cataracts, all right, but it also made them mature even faster than they would otherwise have done. To be precise, at the two-week mark, all of the rats fed galactose alone (100%) had stage II cataracts and at the four week mark, 72% had mature stage IV cataracts. At two weeks, the low dose of curcumin with galactose group had 50% with Stage II and 17% free and clear and at four weeks only 58% had Stage IV cataracts. As for the high dose of curcumin with galactose group, 92% had Stage II after two weeks and none actually clear. Shockingly, four weeks found 100% with Stage IV, a jump of 28% from the galactose only group. Meanwhile, no adverse effects were experienced by a high dose curcumin-alone group. What this means is that, as might have been guessed from the common use of turmeric as a spice, that it does not do much of anything unless it senses that there is something wrong (Suryanarayana et al. 2003, 223, 226).

What is happening here with the curcumin effect on cataract development and maturation is that, if Awashti et al. 1996 know what they are talking about, the small dose will be inhibiting 4-HNE by up-regulating its friendly glutathione S-transferase (GST). The larger dose will, true to form, be down-regulating the GST, allowing 4-HNE to proliferate unchecked. Indeed, a later study identifies the larger dose as pro-oxidative (Raju et al. 2006, 733-734, 736).

Instead, however, of simply lowering the dose, the researchers in this project decided to see what happened when curcumin was combined with vitamin E. Vitamin E is a well-known scavenger of free radicals and can cancel the pro-oxidative activities of high doses of curcumin. So, they put their galactose alone group II up against galactose plus .01% curcumin group III, galactose plus .01% curcumin plus 15mg vitamin E group IV, galactose plus .005% curcumin group V, galactose plus .005% curcumin plus 15mg Vitamin E group VI and galactose plus 15mg Vitamin E group VII. The two doses of curcumin behaved as expected, but not even the low dose could match Vitamin E alone. However, when the two were put together, not only were the results even better than with the vitamin alone but, curiously, it was the high dose of curcumin that did the best job when combined with the Vitamin E. The reason for this is quite simple, the low dose by itself works by stabilizing the system, preventing the galactose from raising malonaldehyde (MDA) levels and increasing lipid peroxidation. However, when combined with Vitamin E you get a sudden significant decrease in MDA levels which is not at all what you want. Since the high dose raises MDA levels and Vitamin E lowers them, putting them together serves to prevent the wild fluctuations that ensue whenever the system gets out of balance (Raju et al. 2006, 733-738).

It would be interesting to know which of the other plants and animal substances used with turmeric by the Mesopotamians contain significant amounts of vitamin E.

Anxiety and Depression

Ancient Mesopotamians suffered from anxiety and depression. Those with public business of any kind had, sometimes with good reason, suspicions that competitors or opponents in legal cases or even that wife who wanted a divorce were spreading rumors or even practicing some form of sorcery against them. Frequent wars for which ordinary citizens were drafted will, even then, have produced their share of post-traumatic stress disorder. For all of this, ancient Mesopotamian physicians had treatments that included ritual and prayer and plant medicines. Among these medicines was *kurkanû* as in the following passages:

SORCERY:

psychological:

potions/snuff:

nuḫurtu, *ḫašû*-thyme, *kasû*, *nīnû*, *urnû*, *tīyatu*, *šibburratu*, 15 grains of Amanus salt, 15 grains of *tarmuš*, 15 grains of *imḫur-lim*, 15 grains of *imḫur-ešra*, 1 shekel of *bīnu*-tamarisk seed, *maštakal*, *uriyānu* (URU.AN.NA) seed, *atāʾišu*, *kurkanû*, and *burāšu*-juniper seed are tested plants to be (mixed) with beer or wine or tavern keeper's beer or milk and used in a potion or dried and used as snuff for anxiety and depression (to avert various types of sorcery associated with legal cases); the anger is supposed to depart, the hot lungs cool and the breath of the person to be sweet to god, king, magnate, and prince and depression to be released from his body; was supposedly come up with by seven sages in their assembly (Leichty, Gs. Sachs, p. 262 [CBS 14161]:4 [AMD 8/2 10.15:4)

1 *qa* of *nuḫurtu*, 1 *qa* of *ḫašû*-thyme, ½ *qa* of *kasû*, 1 *qa* of *nīnû*, 1/3 *qa* of *šumuttu*, 1 *qa* of *tīyatu*, 1/3 *qa* of *ṣaṣumtu*, 15 grains of Amanus salt, [20] grains of *imḫur-lim*, 20 grains of *imḫur-ešra*, [20] grains of *tarmuš*, 1 shekel of *bīnu*-tamarisk seed, 1 shekel of *maštakal*, 1 shekel of *maštakal* seed, 1 shekel of [*atāʾišu*], [1] shekel of *kurkanû*, and 1 shekel of *burāšu*-juniper are tested plants to be (mixed) with beer or wine or tavern keeper's beer or milk and used in a potion or dried and used as snuff for anxiety and depression (to avert various types of sorcery associated with legal cases); the anger is supposed to depart, the hot lungs cool and the breath of the person be sweet to god, king, magnate, and prince; is also used for pleural effusion (BM 4238+lo.e. 1∥BM 42250 r. 4∥BM 43123+ [Finkel, Fs. Lambert 204-205; AMD 8/3 3.11:13]

baths:

sikillu, *mergirānu*, *maštakal*, *ašqulālu*, "sunflower", *imḫur-lim*, *sīḫu*, *argānu*, *barīrātu*, *erēnu*-cedar, *šurmēnu*-cypress, *daprānu*-juniper, *suʾādu*/"sweet reed", *ašāgu*-thorn and male and female *nikiptu*, chopped up at night in a *pursītu*-vessel, baked in the morning in a *tamgussu*-vessel and used in a bath to pacify personal god and goddess, Marduk, Ṣarpanitum, Ellil and Ea; accompanied by a salve (STT 230:27)

salves:

atāʾišu, *kurkanû*, *imḫur-ešra*, *tarmuš* and *nīnû* are used in a salve for *Egalkura* issues, continual worry and anxiety, having financial losses, getting slandered, having troubled dreams in which he sees dead persons due to "hand of mankind" seizure by Marduk; accompanied by a series of amulets with plants and stones in them, an Egalkura stone necklace to calm anger; and a recitation enlisting Marduk's help to gain favor (SpTU 2,22+3,85 ii 43∥AMT 92/1 i 4' [AMD 8/2 3.4,2: 31]

atāʾišu, *kurkanû*, *imḫur-lim*, *bīnu*-tamarisk and *surmēnu*-cypress are poured into *pūru*-oil and sweet oil are used in a salve rubbed in vigorously for *Egalkura* issues (curses, indigestion, bad reputation and slander); accompanied by an amulet with alternating stones and burls of *sikillu*, *pišru* wood, *anḫullu*, *imbû tâmtim* and *tarmuš* threaded on

red-dyed wool worn on the neck after consecration before Venus with juniper censer, libation of beer and recitation (BM 56148+ i 21(Schuster-Brandis, *Steine* pls. 9-27)//SpTU 5,244:22 [AMD 8/3 6.1.1:21])

amulets:

tarmuš and *imḫur-lim* are paired with *ḫulālu*-chalcedony; "snake plant" and *kurkanû* are paired with *šubû*-stone; *maštu* and *ašqulālu* are paired with sparkling obsidian; *imḫur-lim* and *imbû tâmtim* are paired with *baštu*-stone; *elkulla* and "white plant" are paired with *sâbu*-stone; *elikulla* and *erēnu*-cedar are paired with black obsidian; *sīḫu* and *barīrātu* are paired with *mūṣu*-stone; used in a series of amulets for *Egalkura* issues, continual worry and anxiety, having financial losses, getting slandered, having troubled dreams in which he sees dead persons due to "hand of mankind" seizure by Marduk; accompanied by an *Egalkura* stone necklace to calm anger; a salve for the anxiety and a recitation enlisting Marduk's help to gain favor (SpTU 2,22+3,85 ii 23 [AMD 8/2 3.4,2: 11])

ušû-ebony *pišru*-wood, elephant tooth, *taskarinnu*-wood, *mēsu*-wood, *musuakkannu*-wood, […], *ešmarû*, *kurkanû*, *kikkirānu* and *anḫullu* are used in a linen bag amulet for being sick all the time from illnesses that defy diagnosis; this is designed to brighten his darkness, pacify his personal god and goddess, give him a good reputation and let him win his legal cases; accompanied by a potion with [*ḫašû*-thyme(?)], *atāʾišu*, *tarmuš*, *imḫur-lim*, *imḫur-ešra,* [*kurkanû*(?)], and *elikulla* whisked into beer; both are sanctified by an anti-witchcraft ritual (Si 34//Si 745+818//Si 722+725 [AMD 8/2 8.36: 8])

I have included the amulets because they are often used together with salves, potions or fumigants containing the same or similar ingredients. Rubbing against the body, especially when the amulet is wet can also serve to transmit plant medicines through the skin. (for more see Scurlock 2006, 59f.)

Depression is a complex illness. A number of biological pathways are dysregulated in depressed patients. Discovered so far, are monoaminergic activity, immuno-inflammation, oxidative stress, hypothalamus-pituitary-adrenal (HPA) activity and neuro-progression, all of which are affected by curcumin (Lopresti et al. 2015, 38).

In some quarters, depression is seen as a neuropsychiatric disease caused by neuro-inflammation in specific regions of the brain. Curcumin has demonstrated an ability to produce an anti-depressant-like effect in animal models of depression, so the question was: Are we sure that this is due to its neuro-protective effects and if so, by what mechanism does it work its magic? Promising in this regard was the discovery that pro-inflammatory cytokines, interleukins IL-1β and IL-6 and tumor necrosis factor TNF-α seem to be involved in the neuronal damage associated with (stress-induced) major depressive disorder. Of particular interest is that IL-1β is also implicated in Alzheimers (Fan et al. 2019, 1-2).

Rats, including a group that had been injected with 40 mg/kg of curcumin got stressed by putting all of them in solitary confinement. Every day for five weeks, without warning or predictability, one of the following was going to happen: leaving the lights on all night, not feeding them for 24 hours, not giving them anything to drink for 24 hours, making them swim for 5 minutes in cold water, shaking their cages, holding them and not letting them go, making them sleep on wet bedding and pinching their tails for a minute (Fan et al. 2019, 2-3). Specific tests were devised to target IL-1β to see what was happening to it as well as to perform an analysis of the effects of all this on rat brain cells (Fan et al. 2019, 3-4, 4-5).

After 5 weeks of mild torture, the rats were ready to confess whether they still liked sucrose and whether they "despaired" of swimming their way out of danger of drowning as opposed to floating along with just enough effort to keep their heads above water (Fan et al. 2019, 4). The curcumin treated rats showed their happiness by partially regaining their taste

for sugar. Similarly, they did significantly more swimming to avoid drowning than the control rats (Fan et al. 2019, 5).

The other tests revealed that the curcumin succeeded in knocking down IL-1β, thus preventing its over-expression from causing damage to neuronal brain cells in the relevant regions (Fan et al. 2019, 5-9, 13-14). It follows that the positive effects of curcumin on rat sweet tooth and determination to live were produced by its knocking down of IL-1β (Fan et al. 2019, 9-11). And curcumin did this by reversing the effects of IL-1β on the p38MAPK pathway in the area of the brain associated with depression. Over-expression of IL-1β up-regulates the pathway; curcumin prevents this from happening, down-regulating destructive and up-regulating protective proteins (Fan et al. 2019, 11, 12-13, 15).

For whatever reason, clinical trials on 60 and 56 human volunteers, respectively have shown it to be a safe and effective treatment for major depression disorder (Sanmukhani et al. 2014; Lopresti et al. 2014). Interesting to note is that success has also been obtained using a curcumin/saffron mix (Lopresti et al. 2017), comparable to the ancient use of *kurkanû* with other plants including *azupīru* (saffron or safflower) as in the following references:

nuḫurtu, *kurkanû*, *ḫašû*-thyme, and *azupīru* (used in a potion to keep away bad) signs and omens (BAM 431 vi 35')

nuḫurtu, *kurkanû*, *ḫašû*-thyme, and *azupīru* are (mixed) with first quality beer and used in a potion drunk on an empty stomach to keep a person from continually seeing bad signs in his house (LKA 115 r. 7' [Maul, Zukunftsbewältigung 503: 7'; AMD 8/2 11.5: 25'])

Anxiety is another disorder potentially treated with curcumin. Researchers took advantage of the fact that lead poisoning can produce both depression and anxiety to devise an anxious rat experiment to explore the effects of lead on the serotonenergic system in the dorsal raphe nucleus, and the possibility that curcumin might be able to counter this (Benammi et al. 2014, 920-921). The dose of curcumin was 30 mg/kg and it was mixed with olive oil and administered by oral gavage. The lead, for those receiving it, went in by needle and both treatments lasted for three days.

Anxiety testing involved a maze made of black wood elevated 50 cm above the floor. This had two open and two closed arms and a 10cm square center. Each rat was placed in the center facing towards one of the closed arms and left there for five minutes. Anxiety was measured by the amount of time spent in the open area. Test two was a dark light box. This was, obviously, a box with two compartments connected by a door; one of these was open and light and the other closed and dark. The rat was placed in the dark compartment with its back to the door and given 10 minutes to decide how much time to spend in the dark and how much in the light (Benammi et al. 2014, 921-922).

That was it for the mice, quite literally, and their brains got sectioned with special attention paid to the dorsal raphe nucleus (Benammi et al. 2014, 922-923). Anxious, lead-injected, rats spent 40% less time in the open arms of the maze and 27.7 % less time in the dark compartment than controls. In both cases, the lead-injected rats found safety in not staying where they were. The curcumin/olive oil preparation-fed rats spent significantly more time in the open arms of the maze and in the dark compartment than similarly poisoned rats without the curcumin (Benammi et al. 2014, 923). Other studies suggest protective effects of curcumin against anxiety in sleep deprived or immobilized rats (Benammi et al. 2014, 923).

As for what is producing the anxiety, fingers have been pointed at the up-regulation of serotonin, which is very puzzling since curcumin seems also to do this (Benammi et al. 2014, 923-924). Indeed, curcumin has been shown to raise not only levels of serotonin but also dopamine and noradrenaline in the hypocampus (Xia et al. 2007). Judging from the general behavior of curcumin, the most likely scenario is that it up-regulates serotonin at high doses and down-regulates it at low ones.

Another study (Wu et al. 2015) proposes an answer for anxiety due to dietary deficiency of docosahexaenoic acid (DHA) that the body struggles to synthesize from Omega-3. Curcumin to the rescue—when curcumin is fed to rats together with a DHA precursor, it increases DHA levels in the hypocampus by a whopping 162% percent at the optimal dosage which was, unsurprisingly to me, the 250ppm rather than the 500ppm also tried. Further tests revealed that the precursor was doing the heavy lifting of DHA production in the liver but with the help of the curcumin, the amount was bumped up and actually made it across the brain-blood barrier. With bump-up, there was a 179% increase, again with the half dose (Wu et al. 2015, 951-953,955-956).

The half dose mystery was elucidated by further *in vitro* study. Liver cells treated with another precursor of DHA and curcumin showed no effect at 10μM of curcumin, you got 132% more DHA synthesized at 20μM and 85% **less** at 40μM (Wu et al. 2015, 956-957). The wisdom of taking a "more the merrier" attitude of all too many studies with inconclusive or even contradictory results could not be more ill advised. It behooves researchers to pay more attention to dosage, especially with the super-concentrated nano-versions.

The ultimate result of this particular study was that the rats become less anxious as measured by the standard elevated maze test (Wu et al. 2015, 951-953). This is serious good news to vegetarians and vegans who are particularly at risk for not getting enough DHA in their diets as well as victims of brain trauma and the modern practice of feeding maize to fish, cattle and battery chickens (Wu et al. 2015, 951,957-959).

Post-traumatic stress disorder is another phychological problem where curcumin may prove of benefit (Monsey et al. 2015, 1278-1279). A group of long suffering rats were literally shocked in a byzantine series of rooms. There was the lit chamber with the grid floor (A) and the dark room with a black floor that smelled of peppermint (B) and the brightly lit room with the grid floor and cedar chips (C) and the lit room with grid floors wrapped in blue pads that smelled of fabric softener (D). The rats were trained in one chamber to associate tones they heard with shocks to their feet, then after various intervals moved to another room where they heard tones but got no shocks. So A and C were shocking experiences and B and D were tones-only zones (Monsey et al. 2015, 1279-1280). The idea was to evoke Pavlovian memories of the fear the rats had experienced in the first and third chambers as reflected by "freezing" behavior—staying absolutely still except for respiration. On the order of 270mg/kg of curcumin mixed into the rat's feed had no effect on the post actual shock reaction but was able to significantly prevent the formation and retention of fear memories. In other words, the rats fed the curcumin recognized that they were not in the shock rooms and ignored the tones, whereas the ones not fed curcumin froze. The curcumin-fed rats also did well on the standard anxiety tests (Monsey et al. 2015, 1280-1286). This curcumin effect, it is suggested, was achieved through down-regulation of the IKK-NF-κB signaling pathway, more usually associated with inflammatory processes. This pathway, it seems, is also involved in the formation of memories and in particular the consolidation and reconsolidation of Pavlovian fear memories. Once burned, twice shy (Monsey et al. 2015, 1286-1287).

Pain

Pain treatment was another important use of *kurkanû*-turmeric in ancient Mesopotamia. There, apart from migraine headaches, reactive arthritis and sore hips/feet, the treatments clump around *sagallu* and *maškādu*, leg pain which may include sciatica, plus what is fairly clearly peripheral neuropathy.

pain:

bandages:

ḫašû, *atāʾišu*, *kurkanû*, *erēnu*-cedar, *šurmēnu*-cypress, *daprānu*-juniper, [“sweet reed”, *asû*-myrtle, *ballukku*-aromatic, *kukru*], *nikiptu*, *burāšu*-juniper, *ṣumlalû*, *labanātu*-incense, *šupuḫru*-cedar oil, *sīḫu*, [*argānu*, *barīrātu*, *maštakal*, *bīnu*-tamarisk], *suḫuššu*-dwarf

palm and *qān šalāli*-reed are crushed together, sifted, decocted and used in a bandage(?) for [*maškadu*(?)] (BAM 406:4')

tarmuš, *kurkanû*, *erēnu*-cedar, […], "sweet reed", *ballukku*-aromatic, *nikiptu*, *burāšu*-juniper, *šimeššalû*-boxwood, *ṣumlalû*, […], […], *sīḫu*, *argānu*, *barīrātu*, […] and GIŠ.NÍG.TUKU are crushed, sifted, boiled over a fire and used in a hip bandage(?) for *sagallu* (BAM 130:2)

salves/rubs/daubs:

kurkanû is ground, mixed with oil and used in a salve for *maškadu* (K 2428+2548+6728 obv. 7')

kurkanû is ground, mixed with oil and used in a salve for *maškadu* (K 2428+ 2548+6728 obv. 10')

kurkanû is crushed, mixed with oil and used in a salve for *maškadu* (BAM 379 ii 10'//CTN 4 195 iii 6')

human skull, *abukatu*, and *kurkanû* are mixed with oil and used in a salve for ghost pain(?) (AMT 97/4:17'[AMD 3 no. 293)

kurkanû, *kamkadu* and *šunû*-chastetree are poured into oil and used in a massage rubbed on the feet with the hands for *maškadu*; accompanied by a recitation (BAM 182:23')

fumigants:

kurkanû and *imḫur-ešra* are crushed and used in fumigant over *eʾru*-tree coals for *sagallu*; preceded by an amulet with *tarmuš*, *imḫur-lim* and *imḫur-ešra* and a salve with *imḫur-lim*; accompanied by a recitation (CT 23 5-14 ii 43')

dried bitumen, […], *imbû tâmtim*, *kurkanû*, *tarmuš*, *imḫur-lim* and *imḫur-ešra* are used in a salve or fumigant for *sagallu*(?) (BAM 122 r. 21')

potions:

tigilû, puquttu, *kazallu* and *kurkanû* are mixed with beer and used in a potion for *sagallu* (BAM 257:11) [See BAM 81:8'-9' and BAM 122 r. 18'-19']

enemas:

šupuḫru-cedar, [*erēnu*-cedar(?)], *šurmēnu*-cypress, "sweet reed", *asû*-myrtle, *ballukku*-aromatic, *šimeššalû*-boxwood, myrrh, […], *kukru*, *ṣumlalû*, *burāšu*-juniper, *suʾādu*, *baluḫḫu*-aromatic, *kurkanû*, *nikiptu*, *sīḫu*, *argānu*, *barīrātu*, *šūšu*-licorice, […], *nīnû*, *kasû*, *ḫašû*, *nuḫurtu*, *urnû*, *tīyatu*, *azupīru*, *šumuttu*-vegetable, *samīdu*, lumps of malt, wheat groats and dates are boiled in beer and used in an enema for needling pain in the right or left side; preceded by a hot bandage with dates, crushed malt, yeast, *ballukku*-aromatic, flax seed, *aktam* and winnowed beerwort and bath with *šunû*-chastetree (BAM 3 iv 40 [Worthington, JMC 7 26])

amulets:

kurkanû root is wrapped in goat hair and used in an amulet for removing *maškadu* (BAM 1 i 36; BAM 423 i 12')

kurkanû is wound into burls with red wool for a band made from male and female spring lamb wool and gazelle tendon threaded with male and female *šû*-stone, carnelian, coral, *ianibu*-stone, *šubû*-stone, *ṣibitu*-stone, *abašmu*-stone, *zalaqqu*-stone, magnetic hematite, *kakkusakku*-stone and sea *biṣṣūru*-shell and used in an amulet bound on the hip socket for *sagallu*; accompanied by a recitation (BAM 124 iv 32//BAM 128 iv 31')

kurkanû is wound into burls on a band made from male and female spring lamb wool and everyday cloth threaded with male and female *šû*-stone, *ayyartu*-coral, carnelian, *ṣibitu*-stone, *ianibu*-stone and *šubû*-stone and used in an amulet bound on the hips for *sagallu* (BAM 354 iii 5)

kurkanû is wound into burls on a band knotted and used in an amulet tied on the thighs and ankles for *sagallu* (BAM 354 iii 6//STT 273 i 17')

[*imḫur-lim*], *imḫur-ešra*, *kurkanû*, […], [*atāʾišu*], *kibrītu*-sulphur and *ruʾtītu*-sulphur are formed into burls on a band made from male and female spring lamb wool threaded with […] stones and used in an amulet(?) for *sagallu*; followed by a ritual and a rub with *šeguššu*-flour (CT 23.5-14 i 4')

procedure lost:

dālilu that lives inside a *biṣṣūru*-shell is ground in oil, (mixed with) *imbû tâmtim*, […] *kurkanû* and […] and used for *sagallu* with thigh muscles so tense he cannot stand or walk (BAM 130:26)

[…], [*imḫur-lim*], *imḫur-ešra*, *tarmuš*, *šūšu*-licorice, […]-tree, *suʾādu* seed, […]. *kurkanû*, *urnû*, *nuṣābu*, […], *ṣaṣumtu*, *kamkadu*, *kamantu*, *bīnu*-tamarisk seed, […] seed, […], *ašāgu*-thorn, *pillû*, […], *šibburratu* and […] are used for sore and swollen hips(?) (BAM 56 obv. 11')

<u>numbness</u>:

fumigants:

kibrītu-sulphur, *kurkanû*, dried bitumen and *imbû tâmtim* are used in a fumigant for numbness (AMT 91/1 r. 2)

[…], *imḫur-lim*, *imḫur-ešra*, "lone plant", *kurkanû*, […], *kibrītu*-sulphur, *imbû tâmtim,* dried bitumen, "human bone", *atāʾišu* and […] are used in a fumigant for numbness (Rm. 265:6')

kibrītu-sulphur, *kurkanû*, dried bitumen and *imbû tâmtim* are (mixed) with oil and used in a salve or fumigant for numbness (AMT 92/4+92/9 iii 2')

kurkanû is wrapped in [goat(?)] wool and worn on the neck in an amulet for removing numbness (BAM 423 i 13'; cf. 422 iii 7; 159 vi 51)

Quite apart from controlling pain by down-regulating inflammatory pathways and up-regulating anti-oxidant ones, as might have been expected (Sun et al., 2018, 131-132, 133-137), turmeric appears to have a few other tricks up its sleeve. A gruesome rat study established that β-elemene from curcuma zedoary has the potential actually to promote neurite outgrowth and axonal regeneration in spinal cord injury, thus promoting motor behavioral recovery (Wang et al. 2018). This is a pretty eloquent argument for using the whole plant, and not just what you think is its "active" ingredient. Not that the "inert" ingredients in our medicines and placebos are actually inert. The lactose "inert filler" in a prescription mefloquine pill came very close to killing me.

To know is that the dosage problem is especially significant in the area of pain treatment. Testing for safety at various dosages for the use of pain relief has revealed that at an unbelievably high dosage of 2600mg/kg of curcumin taken for two years, no rats actually died, winning curcumin a "generally safe" rating from the FDA. What went unnoticed is that the involved rats developed chronic active inflammation, ulcers, hyperplasia of the cecum and stomach, intestinal carcinoma and clitoral gland adenomas. Already at 13 weeks, these conditions were beginning to appear and the rats also had discolored faces (jaundice) (Sun et al., 2018, 130). In short, those rats were in pain and being inflicted with conditions that turmeric is famous for treating. Why? Because at this high dosage, the turmeric was pouring gasoline on the fire of auto-immune inflammatory and oxidative damage. Meanwhile, the researchers were wringing their hands over the low bio-availablity of curcumin (Sun et al., 2018, 130-131,137). Good thing, by the looks of it!

Plants like *kurkanû*-turmeric work homeopathically, with small amounts curing what large amounts actually cause (viz. inflammatory and oxidative damage). So, you do yourself no favors by giving huge doses to patients. Moreover, the amount you administer should be adjusted in accordance with the weight of individual patients, as it is invariably for the laboratory animals. The problem here is related to the fact that *kurkanû*-turmeric works by

manipulating the body's own bio-chemistry which is itself a delicate balance of too much and too little.

Taking oxidative damage as an example, the body produces oxygen free radicals, which are essential to its survival, but to make sure they don't work too well or too long, there are anti-oxidants to balance them out. Two examples of natural anti-oxidants produced by the body are bilirubin and uric acid. The right amount of these organic chemicals and all is well, but too much bilirubin and you have jaundice; too much uric acid and you have gout caused by the uric acid crystals those macrophages love to eat (en.wikipedia.org/wiki/radical_[Chemistry]).

This warning applies also to the pharmaceutical company's designer drugs. Duloxetine, used for neuropathic pain and depression, is known to drive patients to suicide. A set of cases at KU MedCenter described in Letters to the Editors of the *Journal of Clinical Psychopharmacology* 2008 Feb;28(1) reveals that trouble arises when a patient uses the product on top of another, similar, medication or rapidly increases the dosage beyond a certain threshold. It is hard not to think that here, too, we have a case of too much or too little.

Similarly, one reason for the opioid crisis is that this imitation opium, which was supposed to be oh so much better than the original, in addition to being even more addictive than opium, can actually cause hyperalgesia (increased responsiveness to noxious stimulus) (Sun et al., 2018, 133). In other words, that stubbed toe feels like it is broken when it isn't. It is thus somewhat reassuring to learn that it is possible to moderate overly powerful painkillers such as opiods and morphine by using curcumin with them. The result is to tamp down the addictive properties and reverse the hyperalgesia (Sun et al., 2018, 133). But maybe we should also be worrying more about too much of a good thing, especially for treatments on the long haul, and more inclined to tailor dosages to an actual patient's weight which is, at least in America, by no means uniform.

Now for the really good news. The usefulness of turmeric for a wide variety of types of even pathological (chronic) pain is completely confirmed by modern bio-medical research (Sun et al. 2018). In human trials involving arthritis patients, curcuma domestica managed to hold its own against ibuprofen and without the latter's side effects of abdominal pain and distension (Sun et al. 2018, 136). Ancient Mesopotamian physicians often used combinations of plants—one of these combinations for arthritic pain includes *kurkanû*-turmeric and *asnû* ("Dilmun dates" = Tamar Hindi in Arabic = *Tamarindis indica* as in the following. These two plants synergize and have been shown to alleviate pain and improve knee joint mobility (Rao et al. 2019).

anal suppositories:

rikibti arkabi, *nīnû*, *baluḫḫu*-aromatic resin, *asnû*, *kurkanû* and salt are used in a particulary potent acorn-shaped suppository for cases where the patient's hips hurt him before he reaches the age where this would be expected, his shins sting him, and his knees give him a gnawing pain due to his having had DÚR.GIG when he was a child (reactive arthritis) (AMT 43/1+ [BAM 7 pl. 15] i 6)

Another study on experimental bone loss in rat jaws tested using 75 and 150 mg/kg of curcumin (Akpinar et al. 2018) confirms that curcumin is not simply taking away the pain of rheumatoid arthritis. Indeed, it acts to prevent the associated bone loss by down-regulating IL-1β and increasing the proportion of osteoblasts to osteoclasts. A further study detected interference with the differentiation and function of the osteoclasts via manipulation of the NF-κB signal pathway at concentrations that did not harm other cells (Yang et al. 2019). And clever germacrone synthesized from turmeric rhizome could do all these things at once, simultaneously decreasing the levels of TNF-α and IFN-γ and increasing the levels of IL-4 in

the affected joints. How did it know to do this? Quite simply the CIA mice (with collagen induced arthritis) had abnormally elevated levels of TNF-α and IFN-γ and abnormally reduced levels of IL-4 in their serum and synovial tissues (Wang et al. 2019, 562). And all this at 20mg/kg delivered orally! (Wang et al. 2019, 561).

But what about *kurkanû*-turmeric for headaches and, in particular, "hand of ghost" headaches, what we call migraine, as in the following references?

fumigants:

atāʾišu, *kibrītu*-sulphur, *kurkanû* and male and female *nikiptu* are crushed finely, mixed with *erēnu*-cedar resin and used in a fumigant for the head (BAM 156:45‖BAM 480 iv 19‖BAM 9:12 [Worthington, JMC 5 14: 220'])

[…], *baluḫḫu*-aromatic and *kurkanû* are used in a fumigant for the head (BAM 480 iv 15 [Worthington, JMC 5 13: 216'])

[*kibrītu*-sulphur], *ruʾtītu*-sulphur, *agargarītu*-sulphur, *kurkanû*, *ašlu*-rush, stag horn, […] *ṭūru*-aromatic, *nīnû*, *baluḫḫu*-aromatic resin, *atāʾišu*, *nikiptu*, *kukru*, […] and *šaršarru*-red clay are used in a fumigant for "hand of ghost" (BAM 472:10' [AMD 3 no. 286])

[…], a skinned wild *pizallurtu*-gecko, *ašāgu*-thorn, […], *kurkanû* and gazelle dung are used as a fumigant for "hand of ghost" directed into the nostrils (BAM 469:8' [AMD 3 no. 247])

Here, what is desired is the down–regulation of COX2 and a return to a normal balance with COX1. As we shall see later, high doses of curcumin actually up-regulate COX2. However, a recent study (Abdolahi et al. epub 2019) using actual migraine sufferers combined high dose nano-curcumin with ω-3 with happy results, for the fairly obvious reason that the last thing you want is the combined force of two down-regulators on the system creating a spike and dangerously low levels of something your body needs. If your medicines are pulling in opposite directions, you have a better chance of coming out with the happy balance you actually want and, sure enough, the patients reported fewer and less severe headaches. Interestingly, without exception, the headache treatments with *kurkanû*-turmeric of which I am aware use the ancient Mesopotamian equivalent of nano-curcumin, namely fumigation, and alongside the sulphur often used to concentrate turmeric extracts. Never fear, the late period texts that give actual dosages measure them in carats.

Ancient Mesopotamians also used *kurkanû*-turmeric in what can only be described as nervine tonics as in the following references.

enemas:

enema no. 1: *erēnu*-cedar, *šupuḫru*-cedar, *šurmēnu*-cypress, *daprānu*-juniper, […], *šimeššalû*, myrrh, *kanaktu*-aromatic, *ṭūru*-aromatic, […], *ṣumlalû*, *burāšu*-juniper, […], "sweet reed", *baluḫḫu*-aromatic, […], *abukatu* and "white plant"

enema no. 2: flax seed, *aktam*, *azallû*, *šammi buʾšāni*, *sīḫu*, *argānu*, *barīrātu*, *aprušu*, white alum, black alum, alum, *uḫḫulu qarnānu* and winnowed wheat groats

enema no. 3: malt lumps, *kasû*, *saḫlû*, *šumuttu*-vegetable or "life plant", *nīnû*, *urnû*, *azupīru* or *azupīrānu*, (*samīdu*), *zibû*, *ḫašû*, *nuḫurtu*, *sibbirru, tīyatu*, *kamkadu*, "life plant" or [*šumuttu*-vegetable], "fox grape", *ṣaṣuntu*, *šunû*-tree, "sunflower", *tarmuš*, *imḫur-lim*, *imḫur-ešra*, *atāʾišu*, *kurkanû*, *šammi aší* seed, *kirbān eqli*, *asnû* and salt; all plants are boiled in undiluted beer, groat water and undiluted vinegar, filtered and allowed to cool; 1/2 *qa* of oil is poured onto it; used in an enema for the great lotion for [burning of *ṣētu*, *šibiṭ šārí*], *šimmatu* (numbness), *rimūtu* (paralysis), *šaššaṭu* (tetany), "hand of ghost" (pain), ["hand of curse", DÚR.GIG] or *kal* GIG (BAM 168:15‖BAM 413 r. 7'‖BAM 52:34‖UET 4.153:11‖BAM 53:3)

erēnu-cedar. *šurmēnu*-cypress, *daprānu*-juniper, *asû*-myrtle, *ballukku*-aromatic, *ṭūru*-aromatic, *šupuḫru*-cedar, "sweet reed", *ṣumlalû*, *nikiptu*, *suʾādu*, *kanaktu*, […]-aromatic,

abukatu resin, *atāʾišu*, *kurkanû*, […], sheep kidney fat, date rind, and *asû*-myrtle oil are used in a sedative; followed by another sedative (BAM 40:10‖AMT 98/2:6')

Similarly, in modern medicine, curcumin has been tested for neuroprotective properties in such diseases as Alexander disease, Alzheimer's disease, ischemia stroke, traumatic brain injury, spinal cord injury, peripheral nerve injury, diabetic peripheral neuropathy, and Parkinson's disease (Forouzanfar et al. 2019). Benefits seem to come from curcumin's ability to keep mitochondria up and running (Bagheri et al. 2020).

Lungs

Ancient Mesopotamian texts specifically mention respiratory distress as one of the conditions to be treated with *kurkanû*-turmeric, alongside thick sputum, pain in the breast and shoulders and just "sick lungs".

"hand of ghost" (respiratory distress):

fumigants:

human skull, *abukatu*-aromatic and *kurkanû* are ground like groats, mixed with ox fat and used in a fumigant for ghost shortness of breath (BAM 469 r. 22‖BAM 471 iv 6' [AMD 3 no. 280])

phlegm:

potions:

[…], first quality beer, "sweet reed", *asû*-myrtle or myrrh, *šurmēnu*-cypress, *kikkirānu*, *kurkanû* and […] are boiled together; honey and pressed-out oil are poured on; used in a potion for thick sputum in the lungs; the patient is expected to vomit (BAM 555 ii 16)

[…], "sweet reed", *ballukku*-aromatic, *šurmēnu*-cypress, *burāšu*-juniper, *kurkanû*, *baluḫḫu*-aromatic, *baluḫḫu*-aromatic resin, *nuḫurtu*, *kikkirānu*, *elikulla* seed, *šibburratu*, […], *buṭnu* and *ḫašānu* are chopped together; green malt mash is made; it and [*titapu*-preparation made with] emmer are baked in an oven, taken out and allowed to cool; the plant mixture is mixed with the green malt mash and *titapu*-preparation made with emmer, decanted into a bowl, set aside for three days; [honey] and pressed-out oil are poured on; first quality beer is poured on, decanted into an *adagurru*-vessel; used in a potion drunk on an empty stomach for thick sputum in the lungs; the illness is expected to have a remission (BAM 555 ii 18)

pain:

potions:

erēnu-cedar, *šurmēnu*-cypress, *daprānu*-juniper, *asû*-myrtle, *šimeššalû*-boxwood, […], *šupuḫru*-cedar, *suʾādu*, *baluḫḫu*-aromatic, *kukru*, *tarmuš*, […], *ḫabigalbat*, *samīdu*, *zibû*, *šunḫu*, *antaḫšum*-vegetable and *kurkanû* are ground in equal quantities; "life plant", *errû*, *uriyānu* and […] are crushed and sifted; mixed with beer or […] and used in a potion drunk on an empty stomach for hurting breast and shoulders (BAM 217:27)

miscellaneous lung problems:

bandages:

[*kukru*, *burāšu*-juniper, *ṣumlalû*], *ṭūru*-aromatic, myrrh, *baluḫḫu*-aromatic resin, [*abukatu*] resin, [*baluḫḫu*-aromatic, *atāʾišu* and *kurkanû*] are ground, mixed with bitumen and *isqūqu*-flour and used [to bandage] (chest and back) as far as the kidneys for lung problems (BAM 36:4')

potions:

buṭnu, *ḫašânu*, *kikkirānu*(?), *kurkanû*, […] and *šabḫa* are plants for the lungs for the cold season (BAM 431 v 34')

ḫaltappanu, *kurkanû*, *ḫašânu*, *kukru*, *aktam* seed, *ḫašû*, *šammi buʾšāni*, "white plant" and *buṭnānu* are used for the lungs (pharmacist's preparation(?)) (BAM 431 v 37')

[1] shekel of *erēnu*-cedar, 1 shekel of *šurmēnu*-cypress, 1 1/2 shekel of *daprānu*-juniper, [x] shekels of *asû*-myrtle, 2 shekels of *nikiptu*, [x] shekels of *šimeššalû*-boxwood, [x] shekels of *suʾādu*, 3 shekels *ballukku*-aromatic, 5 shekels of "sweet reed", [x] shekels of myrrh, 1/2 shekel of *ṭūru*-aromatic, 1/5 shekel of *baluḫḫu*-aromatic, [x] shekels of *buṭnānu*, 2 shekels of *ḫašânu*, [x] shekels of *kurkanû* and 10 shekels of *kikkirānu* with 1 *qa* of *kasû*, 1 *qa* of honey, […], x *qa* of filtered green malt-mash, 6 *qa* of *titapu*-preparation, […] and x grains of groats made from […] are left for seven days in beerwort; when it has cooked, opened and used in a *tariḫu* potion drunk on an empty stomach for "sick lungs"; secret of kingship (BAM 42:18)

potions or regimen:

5 shekels of *erēnu*-cedar, 5 shekels of *šurmēnu*-cypress, 3 shekels of *šimeššalû*, 5 shekels of "sweet reed", 3 [shekels] of *ballukku*-aromatic, 2 shekels of *suʾādu*, 3 shekels of *buṭnānu*, 5 shekels of *ḫašânu*, 3 shekels of *kurkanû* and 10 shekels of *kikkirānu* are chopped together, crushed with a pestle, sifted, reground by dragging a basalt grinding stone over it, sifted through a fine linen cloth; a *qa* of the resulting groats are washed with water, baked in an oven, cooled with cold baked *kasû* juice, rebaked in an oven and allowed to cool; the groats and the aromatic mixture are mixed with 7 *qa* of green malt-mash and beer bread while the patient waits; if it is a man with "sick" lungs, he eats it on an empty stomach; it is decanted; pressed-out oil is poured on it and it is eaten and washed down with sweet wine; this is a *saḫunu* to be used (only) for a man or for the king; secret of kingship (BAM 42:4//BAM 556 ii 62')

aspiration treatments:

1 shekel of *erēnu*-cedar, 1 shekel of *šurmēnu*-cypress, 1 1/2 shekels of *daprānu*-juniper, 1 shekel of *asû*-myrtle, ([1 shekel of *baluḫḫu*-aromatic]), 5 shekels of "sweet reed", 3 shekels of *ballukku*-aromatic, 1 shekel of *suʾādu*, 1 of *šimeššalû*-boxwood, 2 shekels of *nikiptu*, 1 1/2 shekels of myrrh, 1/2 shekel of *ṭūru*-aromatic, 1/4 shekel of *baluḫḫu*-aromatic resin, 1 shekel of *buṭnānu*, 3 shekels of *ḫašânu*, 2 shekels of *kurkanû* and 10 shekels of *qulquliānu* are chopped together, crushed and sifted; *titapu* preparation made with oil and emmer is baked in an oven, taken out and allowed to cool and crushed with a pestle; green malt mash, the *titapu* preparation and the dry ingredients are mixed together, boiled, ground and set aside for three days; when it has cooked, pressed-out oil and beer are whisked together and poured on; drunk through a straw on an empty stomach for "sick lungs", thick sputum in the lungs, *suʾālu*-cough or cold season or any problem of the lungs; *tariḫu* made with winnowed beerwort (= green malt mash mixed with *titapu* preparation); secret of kingship (Heeßel and al-Rawi, Iraq 65.229 iv 33)

1 shekel of *erēnu*-cedar, 2 shekel of *šurmēnu*-cypress, 1 1/2 shekels of *daprānu*-juniper, 2 shekels of *asû*-myrtle, 2 shekels of *ballukku*-aromatic, 2 shekels of *šimeššalû*-boxwood, 4 shekels of "sweet reed", 2 shekels of *nikiptu*, 2 shekels of *suʾādu*, 1/2 shekel of myrrh, 1/2 shekel of *ṭūru*-aromatic, 1/4 shekel of *baluḫḫu*-aromatic resin, 2 shekels of *buṭnānu*, 2 shekels of *ḫašânu*, 2 shekels of *kurkanû*, and 10 shekels of *qulquliānu* are chopped together, mixed with raisins which have been washed twice in water, collected in a *karpatu*-vessel; undiluted sweet wine is poured on top; set out for seven days or until moistened and used in a potion drunk through a sweet reed straw on an empty stomach for sick lungs or thick sputum in the lungs or *suʾālu*-cough; *tariḫu* potion; secret of kingship (BM 78963:29)

<u>pulmonary edema</u>:

aspiration treatments:

[1] 1/2 shekels of *erēnu*-cedar, 1 1/2 shekels of *šurmēnu*-cypress, 1 1/2 or 2 shekels of *daprānu*-juniper, 2 shekels of *asû*-myrtle, (3 shekels *ballukku*-aromatic), 1 1/2 shekels of *šimeššalû*-boxwood, 5 shekels of "sweet reed", (3 shekels *ballukku*-aromatic), (2

shekels of *suʾādu*), 1 1/2 or 2 shekels of *nikiptu*, (2 shekels of *suʾādu*), 1/2 shekel of myrrh, 1/2 shekel of *ṭūru*-aromatic, 1/5 shekel of *baluḫḫu*-aromatic (resin), 2 shekels of *buṭnānu*, 2 shekels of *ḫašânu*, 3 shekels of *kurkanû* and 10 shekels of *kikkirānu* or *qulquliānu* are chopped, mixed with [1 *sūtu*] of raisins which have been washed three times in drawn wine, collected in a *karpatu*-vessel; red or strong wine is poured on top; set out for five days or until decocted and used in a potion drunk through a sweet reed straw on an empty stomach in the cold season for waterlogged lungs; also good for waterlogged kidneys and for "wind"; to be used (only) for a man; *tariḫu* potion; secret of kingship (BAM 42:29⁄⁄BAM 44:37')

Included in this category will have been cases of asthma. Curcumin in small doses is anti-inflammatory, so it can serve as a bronchodilator as well as reducing inflammation and over-production of mucus. Researchers discovered that the liposomal formulation was successful in down-regulating IL-6, IL-8, IL-1β and TNF-α via NF-κB and STAT3 signaling pathways. Unsurprisingly to me, the truly tiny dose of 1μg/mL worked better than the 5μg/mL (Ng et al. 2018, 54). Another study that simply administered the curcumin in aerosol form to rats (Chauhan et al. 2018) used 5 mg/kg as their selected dosage, when 2.5 mg/kg essentially did nothing (Chauhan et al. 2018, 30,32). Once again, results were quite promising. Nitrite levels were down 21%, the elevated ROS levels responsible for airway smooth muscle contraction and excess mucus production, down 35%. COX2 levels were back to normal, the ERK, p38 and JNK signalling pathways were un-up-regulated and TNF-α was down by 46%. With one exception, namely lypooxygenase LOX5, curcumin performed as well or better than the currently used drug for asthma (Chauhan et al. 2018, 32-34).

Heart

Besides being a bronchodilator, *kurkanû*-turmeric also helps to serve as a vasodilator and preventer of fibrosis in the aorta (Li et al. 2019, 5). Heart conditions treated in ancient Mesopotamia with *kurkanû*-turmeric essentially involve a crushing sensation in the chest.

fumigants:

copulating *pizalluru*-geckos from the steppe, *burāšu*-juniper, *bīnu*-tamarisk, *kurkanû*, *atāʾišu*, *kibrītu*-sulphur, shell-duck droppings, wood shoots and *kamūn bīni* are used in a fumigant for chest pain (*ḫūṣ hepi libbi*) (TCL 6 34 iii 4)

kurkanû, *atāʾišu*, *kibrītu*-sulphur, and *uḫḫulu qarnānu* are used in a fumigant over coals for chest pain (*ḫūṣ hepi libbi*) (TCL 6 34 iii 6)

copulating *pizalluru*-geckos from the steppe are dried and used with *burāšu*-juniper and "old human bone" in a fumigant over *uḫḫulu qarnānu*; *kurkanû* and *atāʾišu* are used in a fumigant over *uḫḫulu qarnānu*; *kibrītu*-sulphur, a lizard and a male shell-duck are used in a fumigant over *uḫḫulu qarnānu*; boat (fig?!) shoots and *kamūn bīni* are used in a fumigant; *kibrītu*-sulphur and *atāʾišu* are used in a fumigant for chest pain (*ḫūṣ hepi libbi*) not to come back and bother the patient (BAM 445:28 [AMD 8/1 7.7: 65])

amulets:

wild *kurkanû*, *erēnu*-cedar and *mūṣu*-stone are used in an amulet for chest pain (*ḫūṣ hepi libbi*) (BAM 311: 17')

A common cause of chest pain in a semi-arid environment will have been heat stress. Prolonged hot weather can induce chronic stress, leading to cardiovascular failure, neurological impairment, renal failure and, ultimately, death (Chen et al. 2020, 1-2).

Researchers got some mice into serious hot water to test curcumin's ability to attenuate this form of stress, comparing the results of 50mg/kg, 100mg/kg and 200mg/kg dosages of curcumin administered orally for four weeks to the results with aspirin, heat alone and control. They had a mini-bathtub heated up to 41 degrees Centigrade and with just enough

water to immerse the adult male mice without drowning them. Measurement of blood pressure and heart pressure were taken in a minimally invasive manner using a bag and net tail cuff; temperature, by contrast, required a rectal thermometer. After 20 minutes in the bath, the mice were "sacrificed" for science and the heart tissues prepared and examined (Chen et al. 2020, 2-4). As hoped, the increase in angiotensin II (Ang II) was mitigated by the curcumin, which performed better than the aspirin (16.9% reduction) even at the lowest dose of 50mg/kg (26.9% reduction) rising up to 35.1% reduction at the highest dose tried (Chen et al. 2020, 5). This is good news indeed, since aspirin has long been known to alleviate pain and to prevent heart attacks (Chen et al. 2020, 6).

It is good to know that turmeric (in small doses) is generally protective of internal organs, so the heart as well as the lungs, liver and kidneys. Curcumin seems to be very good at counteracting poisons (Hosseini and Hosseinzadeh 2018), a suspected significant subset of ancient Mesopotamian references to *kišpu*-sorcery, for which *kurkanû*-turmeric is used as a treatment. One of our *kurkanû*-turmeric references appears to be a case of a patient fed a cardio-toxic poison

potions/snuff:

tarmuš, *imḫur-lim*, *imḫur-ešra*, *sikillu*, *elkulla*, *baluḫḫu*-aromatic, *aktam*, *atāʾišu*, "swamp apple", *lapat armanni*, alum, *imbû tâmtim*, *nuḫurtu*, *tīyatu*, *ḫašû*-thyme, *urnû*, *samīdu*, *šibburratu*, *azupīru*, *nīnû*, *šumuttu*, *baltu*-thorn sprouts, *ašāgu*-thorn sprouts, *qan šalāli* sprouts, *bīnu*-tamarisk, *bīnu*-tamarisk seed, *maštakal*, *maštakal* seed, *burāšu*-juniper, *burāšu*-juniper seed, KÙ.PAD salt, Amanus salt, dates, *ḫaluppu* seed, *suʾādu*, *kurkanû* and *kasû* are (mixed) with beer or wine or water or oil or *ḫīqu*-beer and used in a potion or used in a snuff for loss of appetite, depression, chest pain, tense limbs, cramped tongue, bitten lips, ringing ears, numb hands, gnawing pain in the knees and shins, protruding epigastrium, impotence, chills, weight changes, drooling, shortness of breath, trouble sleeping and sluggishness due to *kišpu* (BAM 59: 9⁄⁄BAM 430 iv 23'⁄⁄BAM 431 iv 18 [AMD 8/1 7.10.3.1:18; 7.10.4: 17]⁄⁄BAM 438: [25])

tarmuš, *imḫur-lim*, *imḫur-ešra*, *maštakal*(?), *sikillu*, *elkulla*, *imbû tâmtim*, *lapat armanni*, *ḫaluppu* seed, *urnû*, *ḫašû*-thyme, *šibburratu*, *nuḫurtu*, […], "swamp apple" and […] are used in potions and a bath for chest pain, tense limbs, cramped tongue, bitten tongue, ringing ears, numb hands, gnawing pain in the knees and shins, protruding epigastrium, impotence, chills, weight changes, drooling, [shortness of breath, trouble sleeping and sluggishness] due to *kišpu* in food, drink or oil (BAM 445: 10-25 [AMD 8/1 7.7: 47-69])

Studies have shown that turmeric either alone or with other drugs is a promising adjunct to cancer treatment, preventing otherwise irreversible damage to the heart produced by the drugs employed for this purpose (Li et al. 2019, § 3.4). Of little relevance to ancient Mesopotamians, but of supreme importance to moderns the world over, turmeric can help protect hearts from damage due to an estrogenic compound used to make polycarbonate plastic and epoxy resins that humans and animals pick up from the food we eat, the beverages we drink and, to a lesser extent, the air we breathe (Valokola et al. 2019).

Gastrointestinal Tract (GI)

The GI tract uses of turmeric by the ancient Mesopotamian physician for ulcers (*tugānu*) and ulcerative colitis (DÚR.GIG) have actually made it to clinical trial (Khonche et al. 2016; Singla et al. 2014). This is perhaps unsurprising for a plant famous for its anti-inflammatory properties, to test which innumerable rats have had their stomachs sacrificed (Rajagopal et al. 2018).

ulcers/obstruction:

potions:

aktam, *imḫur-lim*, *imḫur-ešra*, *tarmuš*, *atāišu*, *kalbānu*, *kurkanû*, *zibû*, "white plant", myrrh, alum, *šīpu*-orpiment, *šaršarru*-red clay, *ininnu*-barley and *abukatu* resin are ground together, (mixed) with beer and pressed-out oil and used in a potion drunk on an empty stomach for *tugānu* (STT 96:17)

procedure lost:

"sweet reed", […], *kukru*, *burāšu*-juniper, […], *atāʾišu*, *tarmuš*, [*imḫur-lim*], *imḫur-ešra*, *ṣiburu*, […], *kurkanû*, *kikkirānu*, *ḫašânu* and *ari*[…] are crushed together and used to prevent the prolongation of A.GA.ZI (BAM 74 iii 6)

DÚR.GIG (includes ulcerative colitis)

salves/rubs/daubs:

saḫlû, *nīnû*, *kurkanû*, *errû*, *abukatu* resin and *kibrītu*-sulphur are mixed with sheep fat and used to firmly rub the anus for DÚR.GIG; preceded by an acorn-shaped anal suppository with *saḫlû*, *nīnû*, *kukru*, *burāšu*-juniper, *uḫḫulu qarnānu*, one bulb *šūmu*-garlic, *upinzir*-insect and dates (BAM 96 ii 12)

fumigants:

[*burāšu*-juniper], *kukru*, *kikkirānu*, *ballukku*-aromatic, *atāʾišu*, *kurkanû*, [*asû*-myrtle], […]. *saḫlû*, *kasû*, *uḫḫulu qarnānu*, *abukatu* resin, *baluḫḫu*-aromatic resin […], salt, gazelle droppings and myrrh are used in a fumigant for DÚR.GIG (BAM 104:26)

kukru, *burāšu*-juniper, *atāʾišu*, *kibrītu*-sulphur, *nīnû*, *ṭūru*-aromatic, *baluḫḫu*-aromatic resin and *kurkanû* are ground together and placed in a *kirru*-vessel over *ašāgu*-thorn coals and used in a fumigant that the patient sits over until his abdominal wall is lubricated and the sweat rolls off for DÚR.GIG; the patient is to be kept out of the wind, rain and heat of the day (BM 103386 r. 10 [Heeßel, AMD 14: 322])

potions:

tarmuš, *imḫur-lim*, *imḫur-ešra*, *ḫaluppu*-tree seed, *allanu*-oak, *ḫašû* and *kurkanû* are mixed with wine and used in a potion for DÚR.GIG (BAM 164:24)

ḫaluppu-tree seed, *lišān kalbi*, *tarmuš*, *kamkadu*, *ḫašû* and *kurkanû* are used in a potion for DÚR.GIG (BAM 430 v 15'//BAM 431 v 9')

enemas:

erēnu-cedar, *šurmēnu*-cypress, *daprānu*-juniper, *asû*-myrtle, *ballukku*-aromatic, "sweet reed" or *šimeššalû*-boxwood, *ṣumlalû*, *tarmuš*, *imḫur-lim*, *imḫur-ešra*, *kurkanû* and *suʾādu* in equal proportions are chopped together; *burāšu*-juniper infusion is sprinkled on; left out overnight, boiled and filtered; 10 shekels of honey and 1/3 *qa* of pressed-out oil are poured on; used in an enema for wind groaning and butting into the anus, diarrhea, stinging limbs, limp arms and wasting of the flesh due to DÚR.GIG, "hand of curse"; the patient is expected to have a bowel movement; accompanied by a fumigation with *burāšu*-juniper and *atāʾišu* (BAM 168:34)

anal suppositories:

[…], *saḫlû*, *kurkanû*, *nuḫurtu*, datepalm fibre, dates, *ballukku*-aromatic, *kukru*, *burāšu*-juniper, *rikibti arkabi*, […], *abukatu* resin and *ṭūru*-aromatic are mixed with sheep fat and wax and used in an acorn-shaped anal suppository for DÚR.GIG (BAM 104:29)

One reason that ulcerative colitis is so serious is that the patient can develop colorectal cancer. The culprit here are the NF-κB and STAT3 signaling pathways (Wu et al. 2020, 228) but, never fear, curcumin's ability to decrease the expression of TNF-α, NF-κB, IL-6, COX-2, NOS, and IFN-γ can save the day (Wu et al. 2020, 230) and this despite or, dare I say it, because, of its low bioavailablity when taken by mouth. So in spite of, to them distressingly,

low blood levels of curcumin in their patients, the curcumin has been doing its anti-oxidant job in clinical trials to the shock and surprise of researchers (Wu et al. 2020, 231).

Liver

Ancient Mesopotamian treatments for the liver concentrate on jaundice as in the following references:

kurkanû is ground, (mixed) with beer and used in a potion for *amuriqānu*-jaundice (BAM 578 iii 10)

kurkanû is ground, (mixed) with beer and used in a potion for jaundice (*aḫḫazu*); preceded and followed by other potions (BAM 578 iv 36)

wild *kurkanû* is ground, (mixed) with beer and used in a potion for liver problems (BAM 92 iii 5)

On the high dosage end of the coin, its pro-oxidative properties will have made *kurkanû* a very effective treatment for jaundice (by removing excess anti-oxidant bilurubin from the bloodstream). Indeed, a clinical trial of liver cirrhosis patients revealed a significant decrease in serum levels of bilirubin after three months of treatment in the curcumin group (Nouri-Vaskeh et al. 2020, 3-4).

Pancreas

Pancreatitis[8] is another syndrome treated with *kurkanû*-turmeric in ancient texts. The symptoms are clear enough from the first reference in the sequence of treatments for the same condition in BAM 434 and parallels and from the cited BAM 238 reference. Ancient physicians classed all of these cases under the broad rubric of *kišpu* (sorcery).

potions:

tarmuš root, *imḫur-lim* root, *imḫur-ešra* root, *sikillu*, *tullal*, *ardadillu*, *ardadillu* seed, *šakirû*, *lišān kalbi*, *nuḫurtu*, *tīyatu*, *urnû* leaf, *ḫašû*-thyme, sea foam, *nīnû*, *ruʾtītu*-sulphur, *bukānu*/*pišru*-wood, "swamp apple", *urânu*, *kurkanû*, *ašqulālu*, *atāʾišu* and *azallû* are ground together, (mixed) with beer and used in a potion for pancreatitis: mucus in the epigastrium (vomiting on an empty stomach), burning sensation in the epigastrium, reduced appetite, and tense flesh (erythematous skin nodules) due to *kišpu* in his food or drink (BAM 434 iv 8′//BAM 190: 31 [AMD 8/1 7.10.1,1: 98'"])

maštakal, *tarmuš*, *imḫur-lim*, *imḫur-ešra*, *sikillu*, *pišru*-wood *urânu*, "lone plant", "swamp apple", *kurkanû*, *azallû*, *nīnû*, *šakirû*, *lišān kalbi*, *ḫašû*-thyme, *nuḫurtu*, *tīyatu*, *urnû*, *šibburratu*, sea foam, *ruʾtītu*-sulphur, *ardadillu* and *ardadillu* seed are used for *kišpu* (BAM 434 iv 13 [AMD 8/1 7.10.1,1: 103'"])

nuḫurtu, *tīyatu*, *aktam*, *kurkanû*, *šibburratu*, *urnû*, *azallû*, *šumuttu*, *maštakal*, *nikiptu*, *karān šēlibi*, Emesallim salt, *bīnu*-tamarisk and *nīnû* are (mixed) with wine or beer and used in a potion for *kišpu* (BAM 434 iv 20 [AMD 8/1 7.10.1,1: 110'"])

tarmuš, *imḫur-lim*, *imḫur-ešra*, *ḫašû*-thyme, *atāʾišu*, *kasû*, *nuḫurtu*, *tīyatu*, *aktam*, *kurkanû*, *šibburratu*, *urnû*, *azallû*, *šumuttu*, *maštakal*, *nikiptu*, *karān-šelibi*, Emesallim salt, *bīnu*-tamarisk and *nīnû* are (mixed) with beer and used in a potion for *kišpu* (BAM 434 iv 44 [AMD 8/1 7.10.1,1: 134'"])

tarmuš, *imḫur-lim*, *imḫur-ešra*, *ḫašû*-thyme, *atāʾišu*, *urnû*, *šibburratu*, *nīnû*, *kurkanû*, 4 grains of *azallû*, *kasû*, *maštakal*, *lišān kalbi* and Amanus salt are (mixed) with wine or beer and used in a potion for *kišpu* (BAM 434 iv 74 [AMD 8/1 7.10.1,1: 164'"])

1 *qa* of *nuḫurtu*, 1 *qa* of *ḫašû*-thyme, ½ *qa* of *kasû*, 1 *qa* of *nīnû*, 1/3 *qa* of *šumuttu*, 1 *qa* of *tīyatu*, 1/3 *qa* of *ṣaṣumtu*, 15 grains of Amanus salt, [20] grains of *imḫur-lim*, 20 grains of *imḫur-ešra*, [20] grains of *tarmuš*, 1 shekel of *bīnu*-tamarisk seed, 1 shekel of

[8] This corrects Scurlock and Andersen 2005, 357-358 where Andersen thought it was an allergy and Scurlock neglected to check it out herself.

maštakal, 1 shekel of *maštakal* seed, 1 shekel of [*atāʾišu*], [1] shekel of *kurkanû*, and 1 shekel of *burāšu*-juniper are tested plants to be (mixed) with beer or wine or tavern keeper's beer or milk and used in a potion or dried and used as snuff for continual phlegm, bouts of sweating, mucus (in the epigastrium) or continual production of liquid from the lungs (pleural effusion) and phlegm continually coming from mouth and tongue due to repeated acts of *kišpu*; is also used for anxiety and depression (BM 4238+lo.e. 1⁄⁄BM 42250 r. 4⁄⁄BM 43123+ [Finkel, Fs. Lambert 204-205; AMD 8/3 3.11:13]

Here, the most obvious beneficial effects will have been the result of its analgesic properties and ability to up or down regulate the production of pancreatic secretions by acting as a lipase inhibitor (Yoshioka et al. 2019) or by preventing this inhibition, depending on the dosage. The former usage is for diet pills, the latter will literally prevent the pancreas from eating itself as a result of excess production of proteolytic enzymes (Harrison 11th ed, 1372-1377).

Urinary Tract

The uses of *kurkanû*-turmeric for the urinary tract focus on partially blocked tubes, so constriction of the urethra and difficulty in passing kidney stones.

constriction of the urethra:

potions:

"lone plant" seed, "fox grape" seed, *dadānu*-thorn seed, […], *šammi buʾšāni*, *kurkanû*, *buṭnu*-terebinth, […], white alum, myrrh and […] resin are used in a potion(?) for constriction of the urethra (AMT 31/1+59/1 [= BAM 7 pl. 1-2] i 44)

kalû-paste, […], *kurkanû*, a fragment of ostrich egg shell, *šimru*, *lišān kalbi*, *imḫur-lim*, [*imḫur-ešra*], […], *erkulla*, *elikulla*, "lone plant", *ḫarmunu* and *šammi buʾšāni* are used in a potion drunk before he sets foot on the ground in the mornimg for continually hurting shoulders, continual tiredness, continual forgetfulness, bad dreams, hair standing on end, incessant vomiting and inability to sleep day or night due to constriction of the urethra; accompanied by a recitation (AMT 31/1+59/1 [= BAM 7 pl. 1-2] i 6)

tarmuš, *imḫur-lim*, *imḫur-ešra*, *ṣarbatu*-poplar resin, *atāʾišu*, *ḫašû*, *ṣiburu*, *kurkanû*, *šammi buʾšāni*, "canebrake plant", *šumuttu*-vegetable, š*agabigalzu*, wild *tigilû*, *nuṣābu*, *kirbān eqli*, "fox grape", *sikillu*, *ankinūtu*, wildflowers, "daughter of the field", *elkulla*, *elikulla*, *bīnu*-tamarisk, "lone plant" seed, *šunû*-tree seed, *šimru* root, *puquttu*-thorn seed, *ušû*-tree seed, *šibburratu*, myrrh, *kukru*, *arzallu*, [*ṣumlalû*(?)], *lišān kalbi* seed, *qutru* seed, *šuqdānu*, *allankaniš*-oak, *ḫazalluna*, *baluḫḫu*-aromatic resin, $BURU_5$.ENSI A.$ŠAG_4$.GA-insect and a fragment of ostrich egg shell are ground together, mixed with undiluted wine or […] and used in a potion(?) for constriction of the urethra (AMT 31/1+59/1 [BAM 7 pl. 1-2] i 36)

[…], [2] shekels of *tarmuš*, 2 shekels of *imḫur-lim*, 2 shekels of *imḫur-ešra*, [2] shekels of "lone plant", 1 shekel of […] seed, 2 shekels of […], 2 shekels of […], 2 shekels of […], 2 shekels of *kurkanû*, [2 shekels] of *nuṣābu*, 2 shekels of *arariânu*, 2 shekels of […], [2 shekels] of *samānu*, 2 shekels of […], 2 shekels of […], 2 shekels of *paṭrānu*(?), […], 2 shekels of *errû*, 1 shekel of "white plant", 2 shekels of […], 2 shekels of […]-stone, 1 shekel of *tigilû*, […] [2] shekels of […], 1 shekel of *šammi buʾšāni*, 2 shekels of […], […], 1 shekel of *šūšu*-licorice, 2 shekels of […], […], […], 2 shekels of […], […], 1 shekel of […], […], 2 shekels of […], 2 shekels of […], […], 2 shekels of *ṣumlalû*, 2 shekels of […], 1 shekel of […], 2 shekels of fragments of ostrich egg shell, […], [2 shekels] of *nīnû*, 2 shekels of […], […], [2 shekels] of *imbû tâmtim*, […], 2 shekels of *mūṣu*-stone, 2 shekels of [magnetic hematite, 2 shekels of white] *anzaḫḫu*-frit, 2 shekels of black *anzaḫḫu*-frit, 2 shekels of pumice, 2 shekels of stones of *ḫarūbu*-carob pods, 2

shekels of […], 2 shekels of *biṣṣūr atāne*-shell, 2 shekels of sea *biṣṣūru*-shell, 2 shekels of [*pallišu*-plant] stone, 2 shekels of *sāpinu*-plant stone, 2 shekels of *zalaqqu*-stone, 2 shekels of *ḫallūru*-chick peas, 2 shekels of [*kakku*-lentils], 2 shekels of *kiššēnu*-beans, 2 shekels of *šammi buʾšāni*, 2 shekels of *uḫḫulu qarnānu*, 2 shekels of […], 2 shekels of *kanaktu*-aromatic, 2 shekels of *abukatu* resin, 2 shekels of *zibû*, 1/2 shekel of […], 1/2 shekel of KÙ.PAD-salt, 1/2 shekel of Amanus-salt and 1/2 shekel of [*buḫru*]-salt are crushed, sifted, and used in a potion(?) for constriction of the urethra; accompanied by a ritual and recitations (K 6493+6811+Bu 91 5-9,52 [BAM 7 pl. 11-12] obv. 12')

stones:

potions:

kurkanû is mixed with wine and used in a potion to make concentrated stones fall out; it is expected to diminish in size (BAM 380:57÷BAM 381 iv 12)

2 shekels of [… 2 shekels of … 2 shekels of …], 2 shekels of [… 2 shekels of … 2 shekels of …], 2 shekels of [… 2 shekels of … 2 shekels of …], 2 shekels of *kurkanû*, [2 shekels of … 2 shekels of …], 2 shekels of *mergirānu*, 2 shekels of [… 2 shekels of …], 2 shekels of *samānu*, 2 shekels of [… 2 shekels of …], 2 shekels of *puquttu*-thorn, 2 shekels of *azallû*, [2 shekels of …], 2 shekels of "fox grape", 2 shekels of raisins, [2 shekels of *lišān kalbi*], 2 shekels of wild *tigilû*, 2 shekels of *errû*, [2 shekels of …], 2 shekels of *šammi buʾšāni*, 2 shekels of *aktam*, [2 shekels of *tīyatu*], 2 shekels of male *pillû* root, 2 shekels of *lipšaḫ*, [2 shekels of *kukru*], 2 shekels of *burāšu*-juniper, 2 shekels of *ṣumlalû*, [2 shekels of *šimeššalû*-boxwood], 2 shekels of *abukatu* resin, 2 shekels of *suʾādu*, [2 shekels of myrrh], 2 shekels of male *nikiptu*, 2 shekels of female *nikiptu*, [2 shekels of …], 2 shekels of *nuḫurtu*, 2 shekels of *urnû*, [2 shekels of …], 2 shekels of *azupīru*, 2 shekels of *šumuttu*, [2 shekels of …], 2 shekels of *samīdu*, 2 shekels of *zibû*, [2 shekels of …], 2 shekels of *nitku*-frit, 2 shekels of […]-stone, [2 shekels of …], 2 shekels of *ḫallūru*-chick peas, 2 shekels of *kakku*-lentils, [2 shekels of *kiššēnu*-beans], 2 shekels of *ḫurātu*-madder, 2 shekels of *nurmû*-pomegranate, 2 [shekels of …], 2 shekels of *eʾru*-tree seed, [2 shekels of …], [2 shekels of …], 2 shekels of *šunʾu*, [2 shekels of …], [2 shekels of …], 2 shekels of *imbû tâmtim*, [2 shekels] of sea [*biṣṣūru*-shell, 2 [shekels of *misis tâmti*], 2 shekels of [sea] "tablet reed", [2 shekels] of *biṣṣūr atāne*-shell, 2 shekels of [*karaš tâmtim*], 2 shekels of [*kalû*-clay], [2 shekels] of *mūṣu*-stone, 2 shekels of *kalgukku*-clay, 2 shekels of [*zalaqqu*-stone], [2 shekels] of *anzaḫḫu*-frit, 2 shekels of black *anzaḫḫu*-frit, 2 shekels of magnetic hematite, 2 shekels of *pallišu*-plant [stone], 2 shekels of *sāpinu*-plant stone, 2 shekels of *alluḫaru*-[alum], 2 shekels of qitmu-alum, 2 shekels of alum, 2 shekels of stones of *ḫarūbu*-carob pods, 2 shekels of pumice, 2 shekels of fragments of ostrich egg shell, 2 shekels of KÙ.PAD-salt, 2 [shekels] of Amanus-salt and 2 shekels of *buḫru*-salt; alternatively 1/2 shekel each of the salts are plants for constriction of the urethra with hurting kidney region, […] or retention of urine; the plants are crushed with a lead *esittu*-pestle and the stones mill ground with a grind stone; plants and stones are sifted and mixed together, left out overnight in a porous *pursītu*-vessel, mixed with beer or first quality *kurunnu* beer or wine and used in a potion for constriction of the urethra due to stones; accompanied by a recitation and ritual; the stone is expected to fall out (AMT 58/3+K 2960+AMT 62/1 [BAM 7 pl. 6-8] i 6)

This use, too, has been studied for the obvious reason that one of the culprits in renal obstruction (that damages the kidneys) is our old friend tumor necrosis factor TNF-α. This has a Jekyll and Hyde personality. Dr. Jekyll is represented by receptor TNFR1 whose activation leads to the recruitment of its very own death domain protein (TRADD). If this protein links up with the right other proteins, you get a TRADD-RIP-TRAF complex that gets

things moving in a cell defensive direction. Mr. Hyde is receptor TNFR2 which hijacks TRADD and pairs it up with FADD which, if unchecked, brings about tubulointerstitial fibrosis and apoptotic renal tubular cell death (Hashem et al. 2016, 478). Needless to say, what you really want in this case is make sure that you have more TNFR1 activity going on than TNFR2 activity, and curcumin can do precisely that (Hashem et al. 2016, 484).

Yet another set of rats got to suffer for science. Surgery under anesthesia produced the desired constriction (the left ureter was sutured with a tiny silk thread in two places). Thirty days later, after happily munching chow with or without turmeric powder added, the rats were "sacrificed" and their kidneys examined. High creatinine levels in the sutured rats indicated significant damage to the kidneys, an effect significantly improved by the 5% w/w dose of turmeric powder in the lucky rats who got curried chow (Hashem et al. 2016, 479, 480-484).

Gynecology

Testing for specifically women problems, particularly ones that have anything to do with sex, is and probably will always remain in its infancy. It does not follow that we have absolutely no clue why ancient Mesopotamian physicians used *kurkanû*-turmeric for infertility.

salves:

wild *kurkanû*, *nabrūqu*, *kukru* and […] are mixed with […] oil and used in a salve for infertility (BAM 244: 31)

wild [*kurkanû*] and *ḫarmunu* are ground, (mixed) with oil and used in a [salve] for infertility (BAM 244: 37)

potions:

kurkanû and *nabrūqu* are ground, (mixed) with wine and used in a potion for infertility (BAM 244: 33)

The most famous recitation for pregnant women in ancient Mesopotmia is the Cow of Sîn, in which an imaginary cow is helped to give birth quickly with a direct analogy drawn to the woman who hopes soon to deliver her baby.

Dairy cows, even in the modern world sometimes have difficulty in giving birth or, more precisely, in managing to get the placenta out with the calf. For dairy farmers this is potentially a devastating problem, since if the placenta is not out in the first 24 hours, the cow is going to have difficulty getting pregnant, and cows do not give milk unless they are pregnant. This infertility is partly, but not entirely, due to uterine infection, the bovine equivalent of human puerperal fever.

Traditional healers in China have, probably for millennia, used an herbal powder containing turmeric and licorice, a plant used by ancient Mesopotamian physicians to treat uterine atony and puerperal fever in humans, to successfully treat cows with retained placenta, and it still works today (Huang et al. 2018). It is probably not too daring to suggest that the rather odd Cow of Sin recitation is due to a spill-over into gynecology from ancient Mesopotamian veterinary practices.

Regardless of how the use will have been discovered, the effectiveness of *kurkanû* for treating female infertility may be indirectly confirmed by modern science. The most common cause, even today, of this problem is polycystic ovarian syndrome (Heshmati et al. 2020, 77). What this consists of is essentially a negative feedback loop between excess estrogen and excess androgen due to FSH deficiency and LH excess (Harrison, 11th ed. 1828). The standard treatment is with anti-androgens such as clomiphene-citrate. As an anti-androgen, when taken in the appropriate dose, *kurkanû* ought to allow affected women to ovulate and to become pregnant. There is a certain irony in this situation, since the same anti-androgenic properties that can be harnessed to further female fertility may also one day provide a safe and

reversible form of male birth control (Mishra et al. 2018, 109). What is good for the goose is not necessarily good for the gander.

Fungal Infections

In addition to everything else it does, turmeric in the alcoholic extracts commonly used in ancient Mesopotamia can handle not only common bacterial pathogens including Staphylococcus aureus and microbes such as Streptococcus pneumoniae but even fungal infections (Irshad et al. 2018, 2689, 2691-2692).

Among the diseases caused by fungi are the numerous cases of ringworm (*kurāru*) and mycetoma (*muruṣ kabbarti*) mentioned in cuneiform texts treated, in some cases, with *kurkanû*-turmeric by the ancient physician.

ringworm**:**

bandages:

šunû-tree seed, *pillû* seed, *qutru* seed, *kamantu*, *uriyānu* leaves, […], *rušruššu*, *ṣaṣumtu*, *kurkanû*, *tigilû*, *mirišmara* and *kalbānu* are dried, crushed, sifted, mixed with first quality beer and vinegar and used to bandage the head for three days for ringworm (*kurāru*), preceded by plastering the head with urine, washing it with *uḫḫulu qarnānu* infusion (liquid soap) and *kasû* juice, and shaving (BAM 156:36) [Aššur version]

šunû-tree seed, *pillû* seed, flax seed, *kamantu*, *uriyānu* leaves, […], [*rušruššu*, *ṣaṣumtu*], *kurkanû*, *saggilatu*, *mirišmara* leaves [and *kalbānu*] are dried, crushed, sifted, made into a dough with *kasû* juice, redried, crushed, sifted, mixed with first quality beer and vinegar and used to bandage the head for three days for ringworm (*kurāru*), preceded by shaving, rubbing with "stinking oil", plastering the head with […] root, *kumāḫu* root, riverbank mud, *tarmuš*, *qutrātu* seed and […] mixed with cow urine, washing with beer, and […] it with *kasû*-juice; on the fourth day, after the bandage has been taken off, the head is washed with hot urine (BAM 494 iii 33') [Nineveh version]

ballukku, seed of compacted(?) […], reed blades, *talupadi* seed, the […-]*zini* from the left thigh of a ewe that has given birth to twins, [the skull] of a suckling goat that has not bitten grass or taken barley that you have roasted in *a nemsītu*-vessel, [x]*baltu* of salt, *šarmadu*(?), *karān šēlibi* and *ḫaṭṭi rēʾî* seed that you have roasted, *lišān kalbi* seed, *kurkanû*, *egemgiru*-ginger and […] are ground together, mixed, formed into a dough with *kasû* juice that has been heated and allowed to cool and used in a fifteen day bandage for ringworm (*kurāru*) on the eyebrows; preceded by a daub with *kamkadu*; followed by a three-day daub with "white plant" (BAM 515 ii 41)

mycetoma*:*

bandages:

[…], *kukru*, *atāʾišu* and *kurkanû* are decocted in a *tamgussu*-vessel and used in a [bandage] for *muruṣ kabbarti* (AMT 100/3 + 32/2 + 15/3 i 17)

In parts of India, mycetoma and the bacteria that colonize the infected foot all too often result in amputation. Fungi do their dirty work by releasing toxins that manipulate the body's systems in ways that are highly damaging to internal organs in addition to causing neuro-inflammation. Where curcumin comes in is to reverse the effects produced by the toxin. So, for example, in rats poisoned with aflatoxin (produced by Aspergillus sp.) curcumin was able to lower serum urea, creatinine, uric acid and MDA at a low dose of 200mg/kg (in rats), thus protecting the kidneys from damage. Curcumin has also protected lucky rats from damage to the liver, heart and lungs and from neuro-inflammatory effects produced by fungi (Hosseini and Hosseinzadeh 2018, 411-413). As for the fungal cells themselves, curcumin inhibits the release of hydrogen ion and decreases the level of cellular ergosterol thus decreasing the secretion of proteinase. If it keeps this up long enough, the cell

membrane breaks, the fungi, so to speak, spill out their guts and die (Abouali et al. 2019, 3921).

Snakebite

A more familiar toxin is the venom released by snakes into their bites, yet another condition which *kurkanû*-turmeric was used to treat.

salves:

šakirû, *lišān kalbi*, *kamūnu*-cumin, *urbatu*-rush, *imḫur-lim*, *elpetu*-rush and *kurkanû* are mixed with oil and used in a salve for snakebite (Scheil, RA 15.76:13)

Cobra venom is particularly dangerous because it prevents normal muscle contraction, which can be fatal if the respiratory muscles are involved. What the venom does is to block neuro-muscular transmission by irreversibly inhibiting acetylcholine from binding to its receptor (Daduang et al. 2005, 321). Studies have mostly been conducted in Thailand, which has its own varieties of turmeric. However it is possible to suppose similar benefits from more standard varieties (Lattman et al. 2010, 261).

What we are seeing in these experiments is snake venom being used to paralyze artificially stimulated rat phrenic nerve hemi-diaphragms in vitro, an effect antagonized by the turmeric extract (Lattman et al. 2010, 257-259). The statement that the extract worked better in a dose-dependent manner up to 32µg/ml (Lattman et al. 2010, 259) allows for a guess as to what will be happening with curcumin. At this dosage, curcumin is anti-inflammatory and anti-oxidant and anti-excito-toxic.

Viruses

Viral diseases attacking the lungs and liver such as Haemophilus influenzae and Hepatitis B are included in the potential victims of curcumin (Sornpet et al. 2017). Ancient Mesopotamians also suffered from viral exanthems which they treated with *kurkanû* as in the following references:

bandages:

[…], *kurkanû*(?) (and) *saḫlû* are massaged into a cloth and used in a bandage for white *bubuʾtu*-blisters on the body due to hand of Šamaš (BAM 584 ii 31')

fumigants:

ṭūru-aromatic, *baluḫḫu*-aromatic resin and *kurkanû* are thrown onto coals and used as a fumigant directed into the mouth and nostrils for *ašu* (pox diseases); afterwards pressed out oil is blown into the nostrils via a reed pipe (BAM 3 i 37‖BAM 494 ii 29‖BAM 497 ii 14' [Worthington, JMC 7 20])

The battle with viral pathogens is won the same way you win with battle with cancer. At high doses such as those provided by nano particles, curcumin is, as we have seen, an efficient killer of cancer cells, by manipulating genetic makeup and preventing them from moving to and entering their victims. These processes are particularly devastating to viruses, since they do not reproduce by themselves. Instead, virions attach themselves to body cells, which they invade. Next, they hijack the cell's transcription and proliferation systems, in part by suppressing interferon IFN-β mRNA so that the victim reproduces the virus (vRNA) rather than itself. Once the damage is done, the virions detach themselves and move on to new victims (Saikia et al. 2019, 107). Turmeric does its helpful work as usual by manipulating the body's own defense systems; in this case by up-regulating TNF-α to be joined for the first 24 hours by interferon IFN-β mRNA which the virus has been suppressing, and down-regulating IL-6 and IL-10 which the virus has been up-regulating to its own advantage (Sornpet et al. 2017, 873-875).

Bacteria

Curcumin treatments for mouth infections have reached the clinical trial stage. (Singh et al. 2018; Pulikkotil et al. 2015).

potions:

tarmuš and *kurkanû* are ground, mixed(?) with oil and beer and used in a potion(?) for yellow spotted teeth and mouth infection (*ṣibit pî*)(?) administered after the patient has been made to vomit with a feather; preceded by a rub with […], *emesallim*-salt, *nīnû*, *saḫlû* and *burāšu*-juniper and a rinse with water, honey, oil and first quality beer; to be used when a plaster has not worked (BAM 543 i 29)

For bacteria, the targets for genetic damage to be (hopefully) caused by curcumin are somewhat different than for viruses. Bacteria normally flush out potentially damaging substances with efflux pumps. The way that they become drug-resistant is by up-regulation of this system, essentially giving themselves diarrhea, so that antibiotics get excreted before they can do any damage. High dose nano-curcumin down-regulates the system so that, as with humans who cannot excrete, they die (Takrami et al. 2019).

Here again, a word of warning is in order. In fighting pathogens, there is always a problem with damaged DNA in the cells you are supposed to be protecting (how do you think your plant took out the bacteria?). Researchers assaying a purified and concentrated form of curcumin discovered that 5 µl worked well in renaturing this damaged DNA, but higher than this, there was a decrease in effectiveness until at 15µl DNA in the cells to be protected was actually being permanently damaged (Irshad et al. 2018, 2693). Other studies confirm that, although high doses are very good at killing pathogens, they are also very good at damaging the DNA of healthy cells (Irshad et al. 2018, 2693-2695).

Depressing but true is the fact that the pharma-giants are already busy at work making patentable, genetically-modified, superpowerful versions of curcumin that promise to be the next generation of drug disasters, only these will not just kill you; they will destroy your DNA while they are at it. This is the rationalist new, new, new, the absence of which, for Eckart Frahm, denies for ancient Mesopotamia the possibility of science without the scare quotes.[9]

As exciting as making things explode might be, it would probably make more sense to take advantage, where possible, of the less dramatic tricks up turmeric's sleeve. So, for example, treatment of urethritis might shift focus from combatting the bacterial or microbial cause, although turmeric can do that also, to correcting the mess that chronic infections can make of the body's defensive systems, so downregulating the production of leukocytic discharge, as we see it doing in the following examples:

tarmuš, “white plant”, *kurkanû* and "lone plant" seed are ground, mixed with strong wine and used in a potion for discharge (*mūṣu*) (BAM 161 v 12)

[*tarmuš*, “white plant”], *kurkanû* and “lone plant” are ground together, mixed with first quality beer and used in a potion drunk on an empty stomach for discharge (*mūṣu*) (AMT 66/7 iii 8)

kurkanû (is) a plant for (stopping) flow from the penis (nR2_{2a} i 6)[10]

[9] “Later, starting in the sixth century BCE, when outside kings began to rule over Mesopotamia, Babylonian scholars became more and more focused on demonstrating to the newcomers who now governed them the superiority of their ancient scribal and cultural traditions, which further disincentivized attempts to move beyond them”(Frahm, 2018: 118,125). He freely admits that Babylonian doctors did a far better job than Hippocratic ones, the latter in some cases essentially murdering their patients (p. 122) but what Greek doctors did was still science, and what ancient Mesopotamians did was not, nor was it even more advanced without the scare quotes. “It is better to die of physic than be cured by magic.” We have here the summa of Western rationalism, whose fruitless search for absolute certainty makes a religion out of science, with sometimes horrific results. (Allen 2000)

[10] Uruanna, Aššurbanipal’s *nishu* recension of Tablet 2.

kurkanû (is) a plant for (stopping) continual flow from the penis ($nR2_{2a}$ i 7)
kurkanû root (is) a plant for purifying flow from the penis ($N2_{2a}$ iii 9[11]; $nR2_{2a}$ i 23)

Wounds

You would think that Ancient Greek physician would know what to do with a wound, and up to a point, they did. What to put on it had already long been discovered by the old wives who are the foundation of every culture's medicine. However, whenever theory kicked in, there was bound to be trouble. So Hippocratic physicians noticed that round sores took longer to heal than square ones. Theoretically, they believed, the problem lay in the impossibility of a circle ever completely closing. The solution? You carved round ulcers square with a knife (Majno 1975 154-156).

Ancient Mesopotamians were less knife-happy and had a secret weapon for wounds that would not heal that was unknown even to Hellenic old wives. One of the uses of *kurkanû*-turmeric that is attested from ancient Mesopotamia is for *samānu* (lit: "red-like"), a term that refers to reddening and other symptoms of soft-tissue inflammation and infection.

bandages:

[…], *ḫašû*-thyme(?), *atāʾišu*(?), *kurkanû*, *erēnu*-cedar, *šurmēnu*-cypress, *daprānu*-juniper, […], *nikiptu, burāšu*-juniper, *ṣumlalû*, aromatics, *šupuḫru*-cedar oil, *sīḫu*-wormwood, […], dwarf palm and *qān šalālu*-reed are crushed together, sifted, decocted as a decoction and used in a [bandage] for inflammation(?) (BAM 406:4')

salves:

kurkanû is ground, (mixed) with oil and used as a salve for *samānu* (NIM.NIM) (BAM 1 ii 16)

("dust from the damp course of an old house" = turmeric) is (mixed) with [oil and used as a salve] for *samānu* (BM 38583:6')

[…] and *kurkanû* is ground, (mixed) with oil and used in a [salve] for inflammation(?) (BAM 406:3')

Turmeric, as we know from modern experiments, is a potent anti-bacterial agent. But this is by no means all that it does. The healing of a wound is a multi-stage process (Majno 1975 2-6). First order of business is to fill in the hole ASAP with fibrin, a cheap (from the body's perspective) and soft but tough connective tissue that is ideal for filling in spaces—like that slash in your arm. Next step is acute inflammation, which sounds awful but is the body's way of cleaning up all that is in the wound that shouldn't be there, like spilled blood, foreign tissue and bacteria. This mess is literally eaten up by various types of white blood cells released by the body. These are visible as pus which, if white, means that the cells are sacrificing their little lives to good purpose and are winning the battle with bacteria. If the pus becomes colored or stinks this is not, as ancient Mesopotamians knew, a good sign. We know that this is because the bacteria are getting the upper hand; if the Mesopotamians had had microscopes and could see the bacteria, they would have agreed.

Even if all goes well and the defenders win the day, there are still processes at work that can go wrong. As soon as the cleanup is finished, the fibrin needs to be dissolved and fibroblasts and other cells need to migrate to the wound and stay there (Madhyastha et al. 2010, 59). Once in place, the fibroblasts kick in by multiplying and filling the gap assisted by new blood vessels which grow into the region of repair. This complex is known as granulation tissue which, if all goes as it should, contracts, pulling the margins of the wound together in a process that ultimately results in a scar.

But some wounds, particularly those of diabetics, simply refuse to heal. What has happened in this situation is that healing never got beyond the inflammation stage (Sidhu et

[11] Uruanna, fragment of one of the several copies of the Later Niniveh version of Tablet 2.

al. 1999, 363-364). The essential process of fibrinolysis (dissolution of the fibrin) is aided, and cell migration, proliferation and adhesion is promoted by urokinase plasminogen activator (uPA) which is, in turn, regulated by two of the MAPK signal pathways (JNK and p38) that are favorite targets for upregulation or inhibition by curcumin, the fraction of turmeric that makes it yellow (Madhyastha et al. 2010, 59, 65). Under normal circumstances, the fibrin is supposed to be dissolved by plasmin produced by uPA. Fibrin is connective tissue, so plasmin has the ability to loosen cells from their basement membranes and allow them to travel unimpeded to a new location (Madhyastha et al. 2010, 59-60). Not only that, but uPA can trigger intra-cellular signaling systems, as well as ensuring that the resulting crowd sticks to the wound and is fruitful and multiplies (Madhyastha et al. 2010, 65). But sometimes, all this does not happen.

Researchers devised a test using well-plates containing mini-wounds to see whether treatment with curcumin could persuade fibroblasts to migrate and pitch their tents where needed. And, indeed it did. How? By upregulating uPA, a dose of 20μM of curcumin producing a fourfold increase in uPA protein (Madhyastha et al. 2010, 61,63,65). And how did it do that? By upregulating both the JNK and p38 MAPK signal pathways that themselves regulate the relevant gene expression (Madhyastha et al. 2010, 61,65).

Here, the issue of dosage became important. Researchers have long been aware that different doses of curcumin can have quite opposite effects. High doses (50μM) and up kill cells with 60μM and up killing 50% of them, although up to 40μM is still safe (Madhyastha et al. 2010, 61). Doses of 10-30μM are not only safe but have significant anti-oxidant properties (i.e. are cell protective and anti-inflammatory) with 30 providing a whopping 70% reduction in ROS [reactive oxygen species] (Madhyastha et al. 2010, 61).

If, then, you want uPA to produce plasmin to dissolve your fibrin and give your cells their marching orders, you need to be careful with your dosage. Up to 40μM, fibrinolysis is chugging along swimmingly, at 50μM, nothing much is happening, because the cells you want to keep are getting killed off by your medicine (Madhyastha et al. 2010, 63), that is, of course, unless you want them killed off, as for example to prevent pathological scar formation in the later stages of wound healing (Madhyastha et al. 2010, 65).

The job is not, of course, done until granulation tissue has been formed and, here too, curcumin to the rescue. In vitro and in vivo experiments have confirmed its benefits for the formation of granulation tissue and the growth of blood vessels in the wound as well as the arrival of normal skin cells to help form the scar (Madhyastha et al. 2010, 65; cf. Sidhu et al. 1999, 365-367, 370-372).

Last, but by no means least, curcumin stimulates the maturation and cross-linking of collagen, thus accelerating the rate of wound contraction (Madhyastha et al. 2010, 65; cf. Sidhu et al. 1999, 367). The desired effect of curcumin has been confirmed by in vivo experiments with wounded rats' backs (Yen et al. 2018, 605-617). The wounds in question closed up in 12 days due to increased production of alpha smooth muscle actin (alpha-SMA) that gives collagen its contractility (Yen et al. 2018, 608; cf. Sidhu et al. 1999, 36, 372).

Of course, you would not wish the wound to close up over blood, disease or bacteria, so the system is designed so that closure will not begin until the pro-inflammatory cytokines released by the white blood cells have done their work. A number of these cytokines, including TNF-α (tumor necrosis factor-alpha) ensure this by suppressing α-SMA and collagen production (Yen et al. 2018, 612-613). This is fine, but only if the inflammatory genie returns to its bottle, which it sometimes fails to do. Clever curcumin upregulates TNF-α at the beginning of the healing process, when it is needed for cleanup, thus ensuring victory over bacteria, and then downregulates it when collagen and α-SMA are needed to close up the wound (Yen et al. 2018, 612-616). It manages this by manipulation of the NF-κB signal pathway (Yen et al. 2018, 608-612).

Also involved is a similar process whereby cyclooxygenase-2 (COX-2) is first enhanced and then allowed to return to its normal skin balance with COX-1. This process, obviously, happens naturally in a spontaneously healing wound. What turmeric does is to speed up the process (cf. Sidhu et al. 1999, 372-373) and ensure that the cycle goes through to completion (Meizarini et al. 2018, 25-26,28).

Researchers have, to my knowledge, not yet suggested how turmeric manages to change course in midstream in this way, but there is an obvious answer to this conundrum. As we have noticed, a high dose of curcumin is pro-inflammatory, a low dose anti-inflammatory. So, if you begin your experiment with a high dose (but not too high!), you will be upregulating TNF-α. However, as the process continues, the dose of curcumin will be gradually used up and, when you reach a low dose level of curcumin in the system, TNF-α will automatically be downregulated, more α-SMA and collagen will be produced, and the wound will begin to close. For humans, it would perhaps be wise to progressively scale down the dose, as is sometimes done in Ayurivedic medicine.

At the end of the day, then, curcumin has the potential to solve all problems associated with the healing of wounds. This healing power involves rebalancing the body's own, out of kilter, systems, the very thing ancient Greek physicians were trying, and failing, to accomplish. And this includes our wound that will not close, and without the need for the ancient Greek physician's dirty knife.

In sum, we have seen that ancient Assyrians and Babylonians used turmeric to treat a wide number of different diseases and syndromes, sometimes alone and many times in harness with other medicines. We have seen that modern lab tests and if we are lucky cinical trials have confirmed the effectiveness of turmeric for these illnesses. Due to assyriogical inability to translate many of plants used with turmeric, it is impossible at the moment to know what part the other ingredients in a treatment my have played. What is perfectly clear is that ancient Mesopotamian physicians use of turmeric was rational.

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