

US company claims traditional knowledge useful against antibiotic resistance as its own “invention”

by Edward Hammond

You may not have heard of Kemin Industries but, as the Iowa, USA-based company likes to tout, there's a significant chance that items you have purchased were made with its products.

With annual revenues of over \$500 million and offices in 90 countries, privately held Kemin sells a range of food and healthcare ingredients, as well as animal feed additives. The company says that well over a billion people are “touched” by its products daily, even though you won't see the company's name on a consumer label. Rather, Kemin's products typically are ingredients in foods and other goods that people buy.

Kemin has recently filed for patent on a “new” animal feed ingredient that the company says reduces the incidence of coccidiosis, a type of disease caused by a variety of species of protozoan intestinal parasites. While humans, pets and livestock contract coccidiosis, in animal production it is the biggest problem in poultry.

Kemin's patent application includes poultry, but also claims use of the “new” additive with any animal.

The problem with Kemin's claim is that it is predatory on traditional knowledge and contains no significant innovation of its own. All three of the natural plant extracts Kemin claims come from trees that have been used for centuries in Asian, South Asian and/or Near Eastern traditional medicine, including use in veterinary preparations for purposes like those claimed in the patent application.

Indeed, written references to veterinary use of one of the plants in China date to the 8th century, according to modern sources. Others have formed part of Indian and Iranian traditional medicine for perhaps as long or longer. Even Western veterinary sources more than 150 years old relate traditional use of at least two of the plants in Asia, South Asia and the Near East, so

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Kemin's "invention" is not new in the Americas or Europe either.

Yet Kemin calls use of the plants to control coccidia infection its own invention, and the international search report of Kemin's patent application uncovers very little relevant traditional knowledge, despite the existence of abundant references. This underscores the weakness of developed-country patent offices when it comes to identifying and preventing biopiracy.

Coccidiosis in poultry

Estimates of the annual global cost of coccidiosis to commercial poultry producers vary between \$750 million and \$1.5 billion.¹ An Indian study placed the cost of coccidiosis for poultry producers in that country at Rs1.14 billion for the year 2003-04.²

Severe coccidia infections in chickens and turkeys, caused by *Eimeria* spp., have debilitating gastrointestinal effects and frequently result in death/culling of infected animals. Less severe cases are common but still problematic. Sub-clinically infected birds may mature poorly, put on less weight and be less valuable at market.

Coccidiosis is spread from bird to bird by contact with infected faeces, an inevitable occurrence in most poultry production. Vaccines and feed additives – including antibiotics – are the main ways to prevent the disease.

Three trees used in traditional medicine

Kemin's patent application (WO2014004761) claims control of coccidiosis with natural plant extracts used as animal feed additives. The patent application claims extracts of three different species, used individually or in combination. The species are *Quercus infectoria*, *Rhus chinensis* and *Terminalia chebula*.

Quercus infectoria, commonly called the Aleppo oak or gall oak in English, is a small tree native to the Near East. It has been cultivated and used in traditional medicine (and for other purposes) there and in Asia and South Asia for centuries. In India and parts of Asia it is called manjakani or majuphal, and one of its primary traditional

medicinal uses is to treat gastrointestinal ailments.

Traditional medicinal use of Aleppo oak is particularly focused on gallic acid and other compounds from the tree's galls, small tumour-like roundish growths (sometimes called "gall nuts") that result from insect activity. Because of their medicinal and other uses (e.g., ink manufacture), for hundreds of years Aleppo oak galls have been traded in international commerce. British Empire officials, in 1871, noted that Aleppo oak galls, used for medicine and other purposes, were a valuable export product from India, Iraq and other countries in Asia and the Near East.³

The anti-infective use of Aleppo oak extracts in humans is extremely widely documented in scientific literature documenting traditional use.⁴ So too is the value of Aleppo oak extract administered internally as an "astringent" to treat gastrointestinal disease in animals, a practice also based in traditional knowledge from the Near East and Asia. This use has been documented in Western scientific literature since at least the 1860s.⁵

Rhus chinensis, or Chinese sumac, is another small tree cultivated for its useful galls. Like Aleppo oak, Chinese sumac galls have extremely well-documented medicinal uses.⁶ Called Chinese galls, *Galla chinensis* or *wu bei zi* (五倍子), the use of Chinese sumac in traditional medicine occurs not only in China itself but also in much of Southeast Asia and South Asia.

As with Aleppo oak, traditional veterinary use of Chinese sumac is well documented. In Sik-kim (India), it is used to treat gastrointestinal problems in cattle,⁷ and particularly presaging Kemin's claim, Chinese ethno-veterinary references – some possibly dating to the 8th century – note the use of Chinese sumac galls as an intestinal anti-parasitic in both livestock and birds.⁸

Terminalia chebula is the third tree in Kemin's patent application. It is native from South Asia eastward to Vietnam. Its English common name, black myrobalan, is less frequently used than its Hindi name, haritaki. Like the other two trees cited in Kemin's patent application, haritaki extracts have been extensively documented in

traditional medicine, and the tree's fruit, leaf and other components contain similar compounds as Aleppo oak and Chinese sumac.

Haritaki is an ingredient in tryphalia, an Ayurvedic medicine used in South Asia and in Iran. Unsurprisingly, traditional use of haritaki extends to veterinary medicine, where it is used against diarrhoea and as an intestinal anti-infective.⁹ Numerous veterinary treatments for intestinal problems that include haritaki can be found for sale on the internet.

A dubious assertion of invention and predatory patent claim

Thus, each of the three plant extracts that Kemin Industries claims as its "invention" is not only already widely documented as being used to treat human gastrointestinal disease in traditional medicine, but this centuries-old documented use extends to animals.

At present, Kemin's claim has been presented to the US, Australian, Canadian, Japanese and European patent offices. The international patent search, performed by the US Patent and Trademark Office, questions some of the patent application's claims – a move Kemin's lawyers are fighting. Thus, the outcome of Kemin's application remains to be seen, and may vary from country to country.

Remarkably, the primary grounds on which the international search report questions Kemin's claims are not the amply documented traditional medicinal and veterinary use of extracts from the three trees. Rather, the search report mainly raises a 2007 article¹⁰ from Korean and US researchers on controlling coccidia in chickens by feeding them green tea. The tea, like Aleppo oak, Chinese sumac and haritaki, contains high amounts of tannins and gallic acid-like compounds. The search report cites one reference to Malaysian traditional knowledge, but failed to include numerous other relevant and easily located references.

The failure to find and cite traditional knowledge described in literally hundreds of years of publications reflects a shoddy literature search by the US patent office and is wholly unacceptable. The international search report even concludes that the patent application's second

claim, for controlling coccidiosis in any animal with plants "selected from the group consisting of *Quercus infectoria*, *Rhus chinensis* and *Terminalia chebula*," is a novel claim, when in fact that is clearly not the case.

Interestingly, the feed additives typically used to control coccidiosis in poultry include ionophore antibiotics, which are considered a possible source of growing antibiotic resistance problems that pose a serious global human health challenge. The fact that traditional knowledge about these three trees and their use in animal health may enable feed formulations that reduce the use of antibiotic drugs clearly shows the contemporary value of traditional medicinal knowledge.

But that traditional knowledge, and its application to intensive poultry farming, is clearly not an "invention" of Kemin Industries of Iowa, USA, whose attempt to misappropriate the innovations of others should be entirely rejected.

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Endnotes

1. IFAH (2014). Coccidiosis in Poultry – Fact Sheet. 24 November.
2. Bera AK et al. (2010). Evaluation of Economic Losses Due to Coccidiosis in Poultry Industry in India. *Agricultural Economic Research Review*. Jan-Jun. 91-96.
3. Balfour E (1871). *Cyclopedia of India and of Eastern and Southern Asia, Commercial, Industrial and Scientific*. Scottish and Foster Presses. Madras. 249.

4. Medicinal studies on Aleppo oak are too numerous to cite. A starting point could be a PUBMED search on *Quercus infectoria* at URL: <http://www.ncbi.nlm.nih.gov/pubmed/?term=quercus+infectoria>
5. Tuson RV (1869). *A Pharmacopeia, including the outlines of Materia Medica and Therapeutics for the use of Practitioners and Students of Veterinary Medicine*. John Churchill and Sons. London. 104-05.
6. Like Aleppo oak, Chinese sumac has been the subject of numerous studies of anti-infective properties. A recent review article summarizes many of them: Djakpo O and W Yao (2010). *Rhus chinensis* and *Galla chinensis* – folklore to modern evidence: review. *Phytotherapy Research* 24:1739-47.
7. Sharma TP et al. (2012). Documentation of ethno-veterinary practices in Sikkim, India. *Pleione* 6(2):353-58.
8. Xie H and V Preast (2011). *Xie's Chinese Veterinary Herbology*. Wiley-Blackwell. Ames, Iowa.
9. Wynn S and B Fougere (2007). *Veterinary Herbal Medicine*. Mosby Elsevier. St. Louis (USA). 81.
10. Jang SI et al. (2007). Anticoccidial effect of green tea-based diets against *Eimeria maxima*. *Veterinary Parasitology* 144(1-2):172-75.