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In 2014 I sent an emailed Christmas greeting of myself to an academic who specializes on African topics. His response was to ask me to send a copy of my doctoral thesis on medicinal plants of Trinidad and Tobago to an African scientist working on the Ebola crisis.

The current outbreak of Ebola started in 2012 with the deaths of 5000 great apes in the Democratic Republic of the Congo (and deforestation in Guinea), and the fight against Ebola should include veterinarians who know about indigenous knowledge.

The colonial attitude towards indigenous medical beliefs was to denigrate them as superstition and primitive. Nicholas King, Associate Professor in McGill's Department of the Social Studies of Medicine, wrote that the replacement of indigenous knowledge with Western science was part of the justification of colonialism as a humanitarian endeavour.

Indigenous knowledge can be used immediately in emergencies, while help from abroad takes longer and a vaccine will take at least a year. The *Toronto Star* reported on January 9, 2015 that the commercial rights to the Canadian Ebola vaccine developed at the National Microbiology Laboratory in Winnipeg were sold by the Public Health Agency of Canada in 2010 to an American middleman for $205,000, who in turn reaps the $50 million in commercial rights offered by Merck. Testing the experimental vaccine on humans was paid for by the Canadian Department of National Defence. The middleman NewLink Genetics in Iowa did little to develop the vaccine. The Canadian Government donated 800 vials of the experimental vaccine to the World Health Organization (WHO) in August, 2014, and it took two more months for the vials to arrive at the WHO headquarters in Geneva. According to the Centres for Disease Control and Prevention (CDC) there were 13 042 Ebola infections and 8259 deaths in Guinea, Liberia and Sierra Leone while all this was taking place. From week 13 to week 40 of the 2014 epidemic infections increased by 7000. The 2014 outbreak was more deadly than the 1976 Ebola outbreak.

Merck's $50 million offer should be seen in context. The total funding for health care in Sierra Leone in 2007 was US $31 million of which US $22 million came from aid agencies. A *BMJ* editorial published on September 27, 2014 reports that Liberia has 0.1 physicians, 1.7 nurses and midwives, and eight hospital beds for every 10,000 people. There are also the transportation costs of sending Western doctors to treat Ebola and isolation costs when they return. And there are unforeseen costs like the closure of the thirty-year-old Ohio Bridal Shop visited by the Ebola-infected Texas nurse Amber Vinson.

Vaccinations are not always effective. In British Columbia the 2014/15 flu shot did not give complete

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protection against the influenza A (H3N2) strain which was the most common because H3N2 had changed (i.e. it antigenically drifted). American adults over 18 received only 12–14 % protection in 2014 according to a CDC study on seasonal influenza vaccine effectiveness. A 2014 Cochrane Review suggests that some *Echinacea* products reduce the risk of catching a cold by 10–20 %.

The influenza treatment Tamiflu has a controversial history. The editor of the *BMJ* wrote in February 2007 that drug companies were not given incentives to test the cheaper drug amantadine for avian flu; and that opinion leaders were paid by pharmaceutical companies to promote Tamiflu for the expected avian flu pandemic. *CNN Money* of October 31, 2005 reported that Defense Secretary Donald Rumsfeld served as the chairman of Gilead Research (which owns the rights to Tamiflu) from 1997 to 2001 and that he held stock valued between $5 million and $25 million. During the preparation for the avian flu pandemic and the stockpiling of Tamiflu, Gilead's stock price increased from $35 to $47 which made Rumsfeld about $1 million richer since the Pentagon ordered $58 million treatment doses of Tamiflu for US troops in 2005. Former US Secretary of State George Shultz, who was on Gilead's board, sold Gilead stock worth $7 million in 2005. A review by the Cochrane Collaboration in April 2014 claimed that the billions spent on stockpiling Tamiflu were wasted.

It is appropriate for UN agencies to work with reputable companies for reasons of efficiency. It is understandable that UN agencies would want a standardized product (vaccine) that was easily developed, packaged, stored and sold. However viruses change making vaccines ineffective. For example *The Lancet*'s Ebola Response Centre discussion board has claims that people infected with 2014 virus have different symptoms from previous outbreaks.

The absence of indigenous knowledge was noted at the 5th Infection Control African Network Conference (ICAN) held in Zimbabwe in early November 2014. Sifelani Tsiko reported on the Conference in *The Herald* and quoted Professor Shaheen Mehtar of the University or Stellenbosch saying that "Africa should have paid more attention on local indigenous knowledge systems and used outside help to enhance the capacity of local community public health systems." Yet she as chairperson of ICAN did not invite any healers or traditional tribal heads to give conference presentations as far as I can tell from the ICAN website.

Researchers Oyero and Egunyomi at Nigeria's University of Ibadan reviewed the antiviral activity of African medicinal plants. Another review was published by Jassim and Naji of Zayad Complex for Herbal Research and Traditional Medicine in Adu Dhabi. An advanced search of PubMeD and ScienceDirect reveals that a mixture of three Asian medicinal plants *Angelica gigas*, *Panax ginseng* and *Rhus verniciflua* was useful against inflammatory diseases according to Korean scientists H.S. Choi and coauthors. The Royal Museum for Central Africa in Belgium hosts a Medicinal Plants Database called Prelude. They included my thesis in their database although few of the plants that I described were of African origin. A search for Ebola in the Prelude database gives five results *Artemisia herba-alba*, *Helichrysum nudifolium* and *Helichrysum odoratissimum*, *Hypoxis hemerocallidea* and *Vernonia senegalensis*; all from a paper about plants used for diabetes in South Africa. A search for haemorrhagic fever yields 14 results including *Bidens pilosa* and *Momordica foetida* that I discussed in my thesis for other uses. I could not find any supporting studies for these two plants against haemorrhagic fever. A search for antiviral in the Prelude database gives 77 matches from *Acacia nilotica* to *Zygophyllum album*. Two potentially useful plants are not in the database: *Sutherlandia frutescens* has immune modulating as well as anti-inflammatory activities according to Faleschini and coauthors; *Picralima nitida* has multiple activities. Dr. Maurice Iwu claimed in a *BBC* interview (August 5, 1999) that a compound in *Garcinia kola* stopped the replication of the Ebola virus, but no further studies were done as a *BBC trending* note (August 6, 2014) reveals. $50 million, used wisely, would generate useful medicinal plant research or pay for research into alternatives like Cyanovirin-N from the cyanobacterium *Nostoc ellipsosporum.*

Compliance with ethical standards

Conflict of interest Cheryl Lans declares that she has no conflict of interest.

Human and animal rights This comment does not contain any studies with human or animal subjects.

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