



Treatment of human and livestock helminth infections in a mobile pastoralist setting at Lake Chad: Attitudes to health and analysis of active pharmaceutical ingredients of locally available anthelmintic drugs



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ABSTRACT

Mobile pastoralists face challenges in accessing quality health care and medication for managing human and animal diseases. We determined livestock disease priorities, health seeking behaviour of people bearing helminthiasis and – placing particular emphasis on trematode infections – treatment strategies and outcome satisfaction among mobile pastoralists of four ethnic groups in the Lake Chad area using focus group discussions. People suffering from schistosomiasis were interviewed about symptoms, health seeking behaviour and their satisfaction with respect to the provided treatment. Anthelmintic drugs for human and veterinary use obtained from various health care structures were analysed for active pharmaceutical ingredients (API) and quantity, using high pressure liquid chromatography-UV and liquid chromatography combined with tandem mass spectrometry. Most people suffering from schistosomiasis sought treatment at health care centres. Yet, they also consulted informal providers without medical training. Regarding animal health, self-mediated therapy was common to manage suspected livestock fascioliasis. Self-reported treatment satisfaction for human schistosomiasis and trematodiasis treatment outcome in livestock were low. Mobile pastoralists perceived the purchased drugs to be of low quality. Among 33 products locally sold as anthelmintic drugs for human or veterinary use, 27 contained albendazole or mebendazole, varying between 91% and 159% of the labelled amount. Six products were sold loosely with incomplete information and their API could not be identified. No counterfeit anthelmintic drugs were detected. None of the samples contained praziquantel or triclabendazole, the drugs of choice against schistosomiasis and fascioliasis, respectively. The perceived unsatisfactory treatment outcomes in humans and animals infected with trematodes are most likely due to empiric diagnosis and the resulting use of inadequate therapy for human schistosomiasis and the lack of efficacious drugs against livestock fascioliasis.

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1. Introduction

Parasitic worm infections cause a considerable burden in humans and livestock, particularly in tropical and sub-tropical regions of the world (Hotez et al., 2014; Karagiannis-Voules et al., 2015; Torgerson et al., 2015). In humans, soil-transmitted helminths (*Ascaris lumbricoides*, hookworm and *Trichuris trichiura*)

and *Schistosoma* spp. infections are widespread, mainly in settings where open defecation is common (Grimes et al., 2014; Strunz et al., 2014). Various intestinal helminths (e.g. *Haemonchus* spp., *Trichostrongylus* spp., *Ancylostoma* spp., *Trichuris* spp. and *Strongyloides* spp.) parasitise ruminant livestock (Zinsstag et al., 1998). Of zoonotic importance are *Echinococcus* spp., *Taenia* spp. and the trematode species *Fasciola hepatica* and *F. gigantica*, which may accidentally infect humans (Fürst et al., 2012; Garcia et al., 2007). Livestock might also suffer from infection with the blood fluke *Schistosoma bovis* (Moné et al., 1999).

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Fig. 1. Drugs for human and veterinary use on display in a village market in the Lake Chad area in May 2014 (photo: Helena Greter).

Low-intensity infections may remain undiagnosed, explained by the absence or unspecific symptoms, coupled with insensitive diagnostic methods (Becker et al., 2015; Bergquist et al., 2009). Yet, chronic intestinal helminth infections can cause considerable morbidity (Hotez et al., 2014). Parasitic infections not only compromise health, but also cause economic losses due to reduced productivity of livestock, weight loss and higher rates of abortion (Charlier et al., 2014). Hence, helminthiasis have a double negative impact on populations which depend on livestock, such as settled livestock breeders and mobile pastoralists (Bechir et al., 2011; Charlier et al., 2014).

Safe and efficacious drugs are available for most intestinal helminth infections (Panic et al., 2014). Regarding human health, the global strategy for the control of major helminthiasis is built around preventive chemotherapy, which is the periodic deworming of at-risk populations coordinated by the World Health Organization (WHO). For example, 600 million tablets of albendazole and mebendazole are donated yearly to deworm school-aged children. Schistosomiasis is on the WHO agenda for elimination as a public health problem by 2025 (WHO, 2013), and praziquantel is the drug of choice (Doenhoff et al., 2008; WHO, 2002). The aforementioned drugs are also used in veterinary medicine (Mehlhorn, 2008). For fascioliasis in livestock and humans, triclabendazole is the recommended treatment (Keiser et al., 2005; Villegas et al., 2012).

In grassland ecosystems such as the Sahelian belt of Africa, mobile pastoralism is a highly adapted lifestyle that largely depends on livestock and allows maintaining human populations on only marginally productive land. Mobility is key, driven by the constant search for water and appropriate pasture (Krättli and Schareika, 2010). Camels, cattle, goats and sheep provide milk and meat for consumption and trade and are often referred to as “a bank on four legs” by the pastoralists. Hence, animal health is crucial, since the health of the people is directly dependent on healthy and productive animals (Bechir et al., 2012). However, to date, access to health care is often limited for rural populations in low- and middle-income countries, particularly for marginalised and mobile populations (Obrist et al., 2007; Sheik-Mohamed and Velema, 1999; Sy et al., 2010; Wiese et al., 2004; Zinsstag et al.,

2006). In resource-constrained settings, health systems often lack adequate governmental funding and sufficient qualified personnel. Consequently, health posts in rural areas are sparse and a single health post may represent the only official health provider for more than 10,000 people. Additionally, health centres in rural areas are characterised by a lack of basic infrastructure, clean water and sufficient space for inpatients. Shortages in life saving medications are common. With regard to veterinary health, the situation is comparable and governmental veterinary services infrequently cover vaccination services (Schelling et al., 2007). In Chad, the private sector stepped in to fill the gap and developed business-oriented health services. An informal market for drugs has evolved and medical products are available in city and village markets and from street vendors (Videau, 2006), as shown in Fig. 1. However, sales persons are untrained, thus a purchase from these sources is not accompanied by any kind of guidance on the treatment. The origin and quality of the sold drugs are often unknown since these products might be imported into Chad via unofficial routes, presumably without maintaining quality guidelines of the pharmaceuticals, such as storage temperature. This practice has established in the 1990s in Chad and – despite its non-authorized status – continues to build inroads, since purchase from these sources is relatively straightforward and inexpensive (Djimouko and Mbaïro, 2014). In the Lake Chad area, *doctor choukou* (i.e. unqualified sales persons who offer drugs for human and veterinary use and services such as infusions and injections) travel from camp to camp to serve the needs of the mobile pastoralists. Since *doctor choukou* lack medical training, the drugs and treatments provided by them might cause harm in humans and animals (Djimouko and Mbaïro, 2014; Gauthier and Wane, 2011; Hampshire, 2002; Schelling, 2002; Wiese, 2000).

The aim of the current study was to elucidate mobile pastoralists' perception of schistosomiasis, livestock disease priorities and access to, and common practice of, treatment of human and animal helminth infections on the south-eastern shores of Lake Chad. Additionally, medications locally sold as anthelmintic drugs for human or veterinary use were purchased and tested for the presence and quantity of active pharmaceutical ingredients (API) as a measure for anthelmintic drug quality.

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