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Plant and natural product based homemade remedies manufactured and used by farmers of six central Swiss cantons to treat livestock

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ABSTRACT

The use of medicinal plants and other natural multicomponent remedies might be one measure to reduce the use of antibiotics in livestock. Ethnoveterinary research has the potential to identify promising natural remedies. The knowledge about remedies for livestock was collected from farmers in six central Swiss cantons, Glarus, Obwalden, Nidwalden, Schwyz, Zug and Uri.

Between February and April 2013 49 interviews with 63 farmers (25 females and 38 males, aged 24–74) were conducted. We collected information on the manufacturing of 370 homemade remedies. Of these, 114 contained no plants, 26 contained a mixture of two to five plants, and 230 contained one plant species (defined as homemade single-herbal remedy report (HSHR)). These 230 HSHRs represented 68 plant species belonging to 35 different botanical families. Thirteen species were reported for the first time for ethnoveterinary use in Switzerland. *Matricaria recutita*, *Calendula officinalis*, *Urtica dioica* and *Coffea* were the most frequently used ingredients of HSHR. A total of 278 use reports (UR) were described for the 230 HSHR, (233 UR for treating cattle). Treatment of skin disorders (QD), gastrointestinal diseases and metabolic dysfunction (QA) were the most frequently mentioned uses for these remedies. Fewer uses were linked to treatments of the respiratory system (QR), the genito-urinary (QG) and musculo-skeletal systems (QM). In the categorie QA the most UR were described for *Matricaria recutita*, *Linum usitatissimum*, and *Camellia sinensis. Quercus robur* was mainly used to treat diarrhoea in calfs, *Coffea* Arabica to treat general gastrointestinal troubles, colic, abdominal pain or diarrhoea, and *Arthemisia absinthium* to treat general gastro-intestinal disorders, diarrhoea or lack of appetite. For four orally administered plant species (*Artemisia absinthium*, *Avena sativa*, *Citrus x limon*, *Quercus robur*) daily oral doses were determined for the first time (median: 0.03, 6.16, 0.01 and 0.58 g dry plant equivalent per $kg^{0.75}$). In the category QD the most often described plant species were *Calendula officinalis*, *Matricaria recutita*, *Picea abies*, *Sanicula europaea* and *Senecio ovatus*. For the latter two plant species we determined for the first time an ethnoveterinary based concentration in the finished product (median: 0.13 and 0.39 g dry plant equivalent per 100 g finished product).

Medicinal plants are known, and used by farmers of central Switzerland mostly for treatment of skin and gastrointestinal diseases. According to recent pharmaceutical and human clinical research several plant species documented in this ethnoveterinary study are worth to be further investigated in clinical trials with livestock.

Abbreviations: CPS, central part of Switzerland; DEC, drug equivalent concentration in the finished product; GS, general strengthening; HSHR, homemade single-herbal remedy report; HRWP, homemade remedy reports without plants; LCH, List A from Swiss veterinary drug regulation, 2014; LEU, European regulation 37/2010, 2010; MNPS, mid-northern part of Switzerland (Schmid et al., 2012); NEPS, east-northern part of Switzerland (Disler et al., 2014); nc-HSHR, non-commercial homemade single-herbal remedy report; QA, gastrointestinal diseases and metabolic dysfunction; QD, skin disorders; QG, genito urinary system and sex hormones; QM, the musculo-skeletal system; QR, respiratory system; UR, use report

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1. Introduction

The knowledge and practices related to the use of medicinal plants for the treatment of human and animal diseases has been transmitted across many generations in different cultures worldwide. In recent years, the traditional uses of numerous medicinal plants has been corroborated by scientific evidence.

However, the knowledge about homemade herbal remedies, and its transmission from generation to generation is disappearing "because of the adoption (at least in part) of a so-called modern culture" like in Western Europe (Akerreta et al., 2010). Treatments with homemade remedies that are mainly based on plants and other natural products are being replaced by modern pharmaceuticals (Pieroni et al., 2004). Over the last 90 years more than 300 registered commercial veterinary herbal medicinal products disappeared from the Swiss market (Klarer et al., 2012) due to tighter regulatory standards and low profit margins. Today, the Swiss compendium of veterinary drugs contains only two veterinary herbal medicinal products ("Stullmisan®" and "Reinigungstrank Natürlich") for livestock (Tierarzneimittelkompendium der Schweiz, 2015). In contrast to this lack of registered herbal veterinary products, the Swiss regulation for organic agriculture explicitly requires complementary medicine, namely phytotherapy and homeopathy as first line measure to treat livestock diseases (Swiss organic farming regulation, 2013). Thus, organic farmers are in a conflicting situation. Validated phytotherapy and registered products are not available for treatment of livestock, while the regulation requires their use.

On the other hand, 61 t of antibiotics have been sold in Switzerland for livestock in 2011 (Büttner et al., 2011). In Switzerland about 30% of all piglets and 8% of all fattening pigs are under antibiotic treatment (Müntener et al., 2013). The problem of antibiotic resistance is known since decades (FAO/OIE/WHO, 2004), but has been exacerbated in recent years (Groot and van't Hooft, 2016). The growing concern in human and veterinary medicine lead to the "Global Action Plan on Antimicrobial Resistance" (WHO, 2015). Monitoring of antibiotic resistance in bovine enteritis (caused by *Escherichia coli*) showed that in up to 72% of the infections the pathogen was resistant to one or the other antibiotic (German Federal Office of Consumer Protection and Food Safety, 2011). In contrast, it is more difficult for bacteria to develop resistance against multi-component and less specific agents than against common "mono-substances" like antibiotics. Thus, multi-component preparations, such as plant extracts including essential oils are likely to play an important role in future antimicrobial strategies (Solorzano-Santos and Miranda-Novales, 2012).

Ethnoveterinary research, defined as "the systematic investigation and application of folk veterinary knowledge, theory and practice" (McCorkle, 1986) is a good approach for identifying promising medicinal plants and natural products for veterinary use. In recent years, ethnoveterinary research has been conducted mainly in Africa, Asia and Central America (Pieroni et al., 2004). In Europe ethnoveterinary studies have been carried out mainly in various parts of the Mediterranean region (Blanco et al., 1999; Uncini Manganelli et al., 2001; Scherrer et al., 2005; Pieroni et al., 2006; Bonet and Valles, 2007; Akerreta et al., 2010; Benitez et al., 2012; Mayer et al., 2014) and Austria (Vogl-Lukasser et al., 2006; Rudolph, 2008; Grabowski, 2010; Schunko and Vogl, 2010). In Switzerland data are available from Aargau, Zürich, Schaffhausen (Schmid et al., 2012), Thurgau, St. Gallen, Appenzell Innerrhoden, Appenzell Ausserrhoden (Disler et al., 2014), Graubünden (Klarer et al., 2013; Joos, 2010).

The aim of our study was to collect knowledge about manufacturing, uses and administration of homemade remedies in six cantons of central Switzerland, namely Obwalden, Nidwalden, Uri, Schwyz, Zug and Glarus. The findings were analysed against a background of other European ethnoveterinary studies, recent pharmaceutical literature, as well as human and veterinary clinical research and veterinary drug regulations.

2. Material and methods

The methods used in this study have been described in previous publications in more detail (Disler et al., 2014; Schmid et al., 2012).

2.1. Survey area

The study area was located in the central part of Switzerland, bordering the study sites of previous Swiss ethnoveterinary studies (Joos, 2010; Disler et al., 2014; Klarer et al., 2013; Schmid et al., 2012). It covered an area of 3,501 km^2 (Bundesamt für Statistik, 2013) and was situated between 46°31′–47°15′ North and 8°02′–9°15′ East. The study area included six of 26 Swiss cantons, namely Nidwalden, Obwalden Zug, Schwyz, Glarus and Uri, with a total of 410,000 inhabitants (Bundesamt für Statistik, 2013). The altitude of the study area was between 388 and 3630 m above sea level (Swiss map, 2013). At 771 m above sea level the mean annual temperature was 8 °C. The average annual precipitation recorded on several locations was 1630 mm (MeteoSchweiz, 2013). A total of 4526 farms were counted in the year 2011; among these, 594 (13%) were organic farms. In the research area 3555 out of 4526 (90%) farmers kept cattle (Schweizer Bauernverband, 2013).

2.2. Selected farms and dialogue partners

Several strategies were used to identify dialogue partners, as described in previous studies (Schmid et al., 2012; Disler et al., 2014):

(a) We collaborated with the cantonal organic farmer associations. They invited all members by letter to take part in the study. Furthermore, the project was presented personally at some of their general assemblies.
(b) Newspaper articles with the same content as the letters were published in different local newspapers.
(c) Further dialogue partners were found through the organic dairy research network of the Research Institute of Organic Agriculture (FiBL).

A total of 37 farms were identified at that stage. Based on the recommendations of these dialogue partners (snow ball sampling; Bernard, 2006) we increased the number to 49 farms (Fig. 1). At each of these farms at least one person provided at least one report on the use of a homemade remedy.

Out of these 49 farms, 35 (73%) were organic and 14 non-organic (27%). Fifteen farms (31%) were located in Schwyz, 13 (27%) in Glarus, eight (16%) in Obwalden, five (10%) in Zug, four (8%) in Nidwalden, and four (8%) in Uri.

Between one and three dialogue partners per farm participated in the interviews. In total 63 dialogue partners were interviewed from February to April 2013, including 25 females and 38 males between the age of 24 and 87 (mean 54±12).

2.3. Interview process

Before starting the interview, the dialog partners were asked to give a written agreement for recording the interview (by OLYMPUS WS 200S Digital Voice Recorder, Olympus Imaging Europa GmbH, Hamburg, Germany). The recorded interviews were not transcribed but used for cross checks in case of inconsistencies or