

Herpesvirus infection in falcons in the UAE

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Forbes *et al.* (2000) recently reported falcon herpesvirus infection in 2 raptors in the UK. The authors brought these cases to veterinarians' attention because in 18 years only 3 cases of this infection had been reported in the UK. The Central Veterinary Research Laboratory in Dubai, UAE, has observed a remarkable increase of herpesvirus infection in hunting falcons since 1999 (Table 1).

Table 1: Herpesvirus isolated from falcons in the UAE over the last decade (1990-2000)

Year	Species	Numbers
90	-	0
91	-	0
92	Gyr	1
93	Gyr	1
94	Saker	1
95	Gyr	1
96	Gyr	1
97	Gyr 2 Peregrine 1	3
98	Gyr-hybrid	1
99	Gyr-hybrid 5 Unknown 1	6
2000	Gyr 5 Gyr-hybrid 1	6
Total		21

Gierse (2000) described in his thesis that 16 falcons (0.51 %) of 3157 falcons tested at CVRL died from herpesvirus infection. Herpesvirus infection in the UAE was highest in Gyrfalcons (5 of 310 = 1.61 %) followed by Gyrfalcon hybrids (6 of 472 = 1.27 %), Saker falcons (2 of 1052 = 0.19%) and Peregrine falcons (1 of 625 = 0.16 %). It is

believed that the increase of this disease in falcons in the UAE runs parallel with the increase of Gyrfalcons and Gyr hybrids used for falconry (Gierse, 2000). Johannknecht *et al.* (2000) have recently shown that herpesvirus isolates from pigeons were indistinguishable from falcon herpesvirus isolates. Gierse (2000) reported that herpesvirus was only isolated from pigeons, not from houbaras, stone curlews or quails tested at CVRL.

Wernery *et al.* (1999) have established an attenuated falcon herpes vaccine which has been used in kestrels. The authors are currently performing a similar herpes vaccine trial on Gyr hybrids, the results of which will be published later.

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A historical introduction to a common falcon foot disease

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The social status of falconry being the sport of kings in the Orient and Occident between the 8th and 19th century generated an interest in the falcon and its medical problems that has continued until today. One focus of medical attention during the past 1200 years has been diverse clinical picture of bumblefoot. The first hints of this raptor foot disease can be traced back to the Arabian-Persian region - home to the leading scholastic centres of the Medieval Orient (KRAENNER 1925; TJERNELD 1945; MÖLLER and VIRÉ 1988). The medical findings entered the West European Medieval literature by translations of the original manuscripts or their transcriptions (MODUS 1379/1975; LATHAM 1615/1976) as "..... until the 18th century the European hunting literature can be compared

to a chart-house as author after author is relying on previously published works of authors before his time" (LINDNER 1955). In this context the falcon foot disease bumblefoot can be traced back to the 8th century AD via historical tractates (AL GITRIF 8th cent., acc. to MÖLLER and VIRÉ 1988). Extracts from these tractates can still be found in commentaries and texts of the European hunting literature until the 19th century (HAMMER-PURGSTALL 1840; CZAPALLA 1936; SWAEN 1937; LINDNER 1962a, 1962b; TURBERVILLE 1575/1969; HANDS 1975; GESNER 1669/1981). The doctors of the Middle Ages and the early modern times used to name well-known diseases in terms of their own time, but without further definitions. This may indicate a general knowledge of these diseases and their different forms at that time which were named in prescription collections "by their symptoms" (VON DEN DRIESCH 1983) and can be traced back on the falconers' observation.

Causes:

In the historical manuscripts the possible bumblefoot causes have been related to species as swollen feet and podagra can be found "specially in sacres more than in any others. For they be of their owne nature very heauie hawkes and haue grosse feete." (TURBERVILLE 1575/1969; WOLFF 1584, acc. to CZAPALLA 1936; D'ARCUSIA 1617/1980). The bird's age as well as to an extensive training load (TURBERVILLE 1575/1969; LATHAM 1615/1976) played their part in the development of bumblefoot. Skin abrasions caused by too tight jesses (D'ARCUSIA 1617/1980; LASCELLES 1892/1986; KRAENNER 1925; TJERNELD 1945) and bating of falcons tethered on blocks (LATHAM 1615/1976; GAH-I-SHAUKATI, acc. to HARCOURT 1968; LASCELLES 1892/1986; TJERNELD 1945) were highlighted as specific problems of husbandry.

Furthermore injuries caused by thorns and prey are mentioned as bumblefoot causes (TURBERVILLE 1575/1969; MIRZA 1868, acc. to PHILLOTT 1968). HAMMER-PURGSTALL (1840) notices a connection between parasite burden and the development of bumblefoot - observations that were reiterated with regard to tissue migration of *Serratospiculum* by BRÜLL (1937/1993).

Bumblefoot Symptoms:

Swollen feet

The first reference to the symptom "swollen feet" dates back to the 8th century AD and can be found in the manuscript of AL GITRIF (8. cent., acc. to MÖLLER and VIRÉ 1988). MIRZA (1868, acc. to PHILLOTT 1968) relates this clinical picture with a more precise symptomatic description to the Arabic terms "Mikhak" as well as "Hafa" for swollen feet caused by bruises without signs of discoloration being still in use today. DEMETRIUS (13. cent., acc. to KRAENNER 1925) regards harsh snow and rough jesses as the cause of swollen feet whereas in the Occident this medical term was introduced in falcon medicine by King MODUS (1379/1975). TURBERVILLE (1575/1969) introduced the term "swollen feet" for the first time as a unique clinical picture and stated that exogenous pathogenic causes included extensive hunting and training as well as old or newly acquired injuries caused by prey and thorns. In addition to ill humours, LATHAM (1615/1976) regarded excessive hunting and exercise usage of the falcons and the influence of cold weather ("taking cold"), swelling and abrasions originating in injuries as major causes of swollen feet.

Warts, holes and furuncles

MOAMIN (1240/41, acc. to TJERNELD 1945) postulates that warts ("veruche"), furuncles and holes contribute to a swelling of the foot sole as soon as the wart starts bleeding. This reaction is provoked by manning and jumping of the falcon.

Fluids in the feet

MOAMIN (1240/41, acc. to TJERNELD 1945) regards pedal swelling as sign of bodily fluids ("emorosites") in the avian foot thus manifesting the idea of the humoral theory formulated by the hippocratic doctors and completed by Galen (VON DEN DRIESCH 1989; SCHAEFFER 1985).

Eschar (scab) and inflamed feet

"*Contra porros in pedibus*", i.e. scab as medical foot problem in falcons has been historically mentioned for the first time by ADELARDUS. No explanation was given on appearance and localisation. He also referred to an inflammation of the falcon feet only as a term when mentioning "si pedes inflammaverint" (ADELARDUS ca. 1250, acc. to SWAEN 1937).



Tumour on the feet

The term "tumour on the falcon feet" (Germ.: "Geschwulst an den Falkenfüßen") has been used for the first time in falcon medicine by King MODUS (1379/1975) as headline of a drug prescription. HAMMER-PURGSTALL (1840) is the first to mention the symptoms of a foot tumour. When characterising this illness as swelling and soreness of the feet from where 'yellow water' (Germ.: "gelbes

Wasser") runs down. In addition to increased foot shaking the bird becomes unable to hold anything (HAMMER-PURGSTALL 1840).

Pin

TURBERVILLE (1575/1969) clearly defined the pin as a foot disease that grows into the falcon's foot pads similar to sharp nails. Consequently the falcon is unable to catch its prey, feed itself or stand on its perch. LATHAM (1615/1976) links the pin development to bating of nervous and tethered falcons during their moulting period leading to foot abrasions and bruises. Resulting inactivity by falcons afraid of further pain and abrasions lead to the desiccation of the bleeding wounds.

Corn

HAMMER-PURGSTALL (1840) introduced the term "Leichdorn" (Engl.: "corn") into German falcon medicine without further precise definition. It is used until today. In the Orient GAH-I-SHAUKATI (acc. to HARCOURT 1968) used the term "corn" at the same time also without further clarifications. In contrast LASCELLES (1892/1986) defines "corn" as small tumours occurring in different areas of the foot. They slowly find their way to the surface and consist of a hard, up to hazelnut-sized nucleus. After reaching the foot surface these tumours burst open and release a nucleus of hardened pus.

Therapeutic methods

They comprise herbal tinctures, ointments, dressings and plasters. Additionally steam therapy, cauterisation and early methods of surgery at the avian foot are used. Remedies with exclusively ineffective content as well as prescription ingredients that can neither be defined nor are heard of today will not be considered below.

General conditions of husbandry

During convalescence from falcon foot diseases LASCELLES (1892/1986) favours a padded perch or a turf hill, whereas MIRZA (1868, acc. to PHILLOTT 1968) advises to keep the falcon on a rough stone or rock instead of a bar. In addition LASCELLES (1892/1986) recommends to dress the bird in very soft and loose jesses, whereas D'ARCUSIA (1617/1980) and GAH-I-SHAUKATI (acc. to HARCOURT 1968) propose to take them off completely. The falcon shall not hunt (HAMMER-PURGSTALL 1840) and be kept quiet (D'ARCUSIA 1617/1980, LASCELLES 1892/1986). GAH-I-SHAUKATI (acc. to HARCOURT 1968) recommends to lock living prey in the chamber to feed the falcon as well as to stimulate the bird's urge to chase its food. In contrast HAMMER-PURGSTALL (1840) favours the feeding of sparrows, pigeons or chicken meat with nut-oil as soon as the foot disease "nail" (Germ.: "Nagel") occurs. According to MIRZA (1868, acc. to PHILLOTT 1968) the falcon suffering from "Hafa" shall be carried daily on the fist as well as trained on the lure in order to increase its condition and circulation. Emperor FRIEDRICH II of Hohenstauffen (acc. to WILLEMSSEN 1991) recommends the cutting of the claws when taming the falcon.

Steam therapy and foot bath

Steam therapy may be used for foot weaknesses, podagra and foot tumours as it helps to soften tissue hardening and simplifies the penetration of medical ingredients through the skin. Dried clover (HAMMER-PURGSTALL 1840), the milk of a black goat (GAH-I-SHAUKATI, acc. to HARCOURT 1968) or a mixture of horse-radish, *Foenum Graecum*, camomile, melilots and parsley (HAMMER-PURGSTALL 1840) are supposed to be boiled in a pot above the fire. That pot shall then be covered with a cloth or a sieve where the falcon is put onto with his ill feet. It must sit there until the skin is softened. Following the two-hour steam therapy HAMMER-PURGSTALL (1840) continues in case of podagra with anointing the ill falcon foot with honey until the tumour is softened. Then the tumour is cupped until blood and yellow water run out. During steam therapy HAMMER-PURGSTALL (1840) recommends feeding the patient with wild sparrows in nut-oil, pigeon meat in almond-oil or warm herbs with anise. In case of "swollen feet with black spots" GAH-I-SHAUKATI (acc. to HARCOURT 1968) bathes the falcon in a mixture of flour-sized old ground bricks having been soaked in vinegar for 24 hours. According to MIRZA (1868, acc. to PHILLOTT 1968) the disease "Hafa" can be cured with a thirty minute, lukewarm foot-bath of camel urine and crushed green isphagul.

Powder

Not only in the Orient but also in the Occident powders are applied externally against podagra as well as inflamed and swollen foot pads. In the Dankus tractate (ca. 1490-1510, acc. to GERDESSEN 1956) a powder mixed of immortelles and roses is spread on the inflamed and swollen footpads until they heal. GAH-I-SHAUKATI (acc. to HARCOURT 1968) treats inflamed footpads by using a powder of ground lime and ginger for three days. In the case of podagra the tractate MOAMIN (1240/41, acc. to TJERNELD 1945) recommends rubbing a mixture of powdered lime and the white of an egg on the ill foot, whereas D'ARCUSIA (1617/1980) puts the falcon on a bag filled with pulverised plantain and salt.

Liquid drug preparations

LASCELLES (1892/1986) treats the early stage of "corn" with a tincture that has been mixed of brandy, vinegar and parsley being applied on the falcon foot for three days with the help of a small sponge. In contrast to this HAMMER-PURGSTALL (1840) treats "corn" with a tincture of night-shade and amaranth mixed with pulverised lime and orange juice. Apart from a reduction of the food by one third D'ARCUSIA (1617/1980) tries to cure the swollen feet with the help of a strong vinegar and plantain water mixture. GAH-I-SHAUKATI (acc. to HARCOURT 1968) needs the "blood of a young black hen" for the tincture against the swelling of the foot pads with black spots. This tincture will be mixed with onion juice, the juice of white peas, the white of egg and gum arabic in addition to the hen blood which is poured on the affected falcon foot. WOLFF (1584, acc. to CZAPALLA 1936) describes a treatment for swollen feet made of eggs, bacon, ox marrow, sugar, saffron, vinegar and rose-water. This tincture is anointed on the foot already preconditioned with wall-rue. In cases of footpad inflammation in falcons GAH-I-SHAUKATI (acc. to HARCOURT 1968) uses a mixture of human urine, carbonate of soda, salt, turmeric and *Rottlera Tinctoria*.

Ointments

One of the major therapies can be seen in ointments of vegetable and animal ingredients that are heated and melted over the fire. The preservation of these cremes is done in closed pots made of glass, wood or clay. One of the most famous medieval oriental ointments is the panacea "Byzantine Cream" consisting of dried milk, goose-fat, egg yolk, white wax, vinegar and incense (AL GITRIF 8th cent., acc. to MÖLLER and VIRÉ 1988). In the Medieval Occident a wide-spread and often copied ointment preparation against podagra was made of butter, olive-oil and aloe. This mixture is applied on the falcon foot four times daily for three days. Additionally the avian patient has to sit in the sun and eat cat meat (GESNER 1669/1981; DANKUS ca. 1490-1510, acc. to GERDESSEN 1956; DANKUS, acc. to TILANDER 1963; ALBERTUS MAGNUS, acc. to LINDNER 1962a). In the Orient saffron, the white of egg and blood are used apart from clarified goat butter and aloe for producing an ointment against this disease. If this ointment seems to fail AL

GITRIF (8th cent., acc. to MÖLLER and VIRÉ 1988) then proposes to add to its ingredients the blood of a black, fat and fleshy hen of the same year (Germ.: "schwarzen, feisten Huhns vom selben Jahr"). On top of it Arabian box thorn juice has to be spread. Furthermore AL GITRIF (8th cent., acc. to MÖLLER and VIRÉ 1988) smears a cream that is based on goose grease, egg yolk, coarse meal, male incense and white wax, on the foot swellings caused by fractures and dislocations.

In the 13th century ADELARDUS (ca. 1250, acc. to SWAEN 1937) recommends a different ointment. Ash-tree, fruit-tree and sloe-tree barks are cooked together with young acorns. After becoming cool this brew is mixed with old soap and rubbed on the feet and perches of the falcon. DANKUS (ca. 1490-1510, acc. to GERDESSEN, 1956) feeds butter and linseed-oil together with mice as dietary therapy against podagra. In Byzantium DEMETRIUS (13th cent., acc. to KRAENNER 1925) treats this disease with a remedy of liquid pitch, yellow wax and crushed centaury. Dankus (ca. 1490-1510, acc. to GERDESSEN 1956) treats swollen feet with the help of an ointment made of melted butter and cotton whereas DEMETRIUS (13th cent., acc. to KRAENNER 1925) uses wax, chicken grease and juice of the balsam-bush as ointment ingredients. In King MODUS's (1379/1975) book a mixture of Armenian soil (*Bolus orientalis*) and *Terra sigillata* soaked in rose-oil is described as cure for swollen feet. Another effective medicine against this particular foot disease in the Middle Ages seemed to be a cream composition of soft soap, freshly baked white bread, Armenian soil (*Bolus orientalis*), chicken grease and white wine. TURBERVILLE (1575/1969) recommends an ointment made of vinegar, rose-water and the white of egg which is also the basis for another formula with *Terra sigillata*, acacia powder and the juice of night-shades. DEMETRIUS (13th cent., acc. to KRAENNER 1925) mixes a salve made of acacia juice, ammonia salt, aloe, sea-leek, strong glue, drop incense and Celtic hellebore which should cure falcon's foot gout. In his opinion another highly effective remedy is the cream mixture of gall-apples, genuine myrrh, acacia and wine vinegar. In King Modus' piece of work a composition of rosemary ashes, rancid rose-oil and chicken grease is described. This mixture should be rubbed on the foot tumour (MODUS 1379/1975).

Foenum Graecum = *Trigonella foenum graecum*
= Fenugreek (HUNNIUS 1993)

Melilotes = *Melilotus officinalis* = Common melilot (HUNNIUS 1993)

Honey contains amongst others enzymes and inhibins which have a bacteriostatic effect (HUNNIUS 1993).

Isphagul = *Plantago Ispaghula Roxb* = *Plantago ovata* (DRAGENDORFF 1967) = *Indian Plantago* (HEILPFLANZEN 1997)

There are white or purple and yellow immortelles.
white or purple immortelles = *Antennaria dioica*
yellow immortelles = *Helichrysum arenarium*
(HUNNIUS 1993)

The term "plantain" is not defined precisely in the historical manuscripts. Whether it is ribwort/plantain = *Plantago lanceolata*, plantain = *Plantago maior* or another *Plantago sp.*, cannot be said beyond doubt.

Amaranthus spinosus and *Amaranthus sp.* (DRAGENDORFF 1967) belong to the *Amaranthaceae* (HUNNIUS 1993).

Arabian gum = *Gummi arabicum* is created naturally or after cutting the bark of *Acacia senegal* as well as *Acacia karroo*, because it is understood that cellulose is gumming due to bacteria (HUNNIUS 1993).

Rottlera tinctoria = *Mallotus philippinensis* (HUNNIUS 1993) = Kamala (PAHLOW 1993). Hairs and glands of these fruits growing on this Asian tree species are used (DRAGENDORFF 1967).

Dried milk is produced by steaming of water out of the milk. The left over substance is to be dried on a spread out cloth (MÖLLER and VIRÉ 1988).

Under the term "white wax" candle wax (MÖLLER and VIRÉ 1988) or bee wax being treated with bleaching agents (peroxide, chrome acid) or adsorbents (coal) is to be understood (HUNNIUS 1993).

Male incense is gained from *Boswellia carteri* and is regarded as one of the best incense qualities (MÖLLER and VIRÉ 1988).

Fluid pitch is a synonym for tar that has been gained by dry distillation of beech wood (*Fagus sylvaticus*) and is called beech tar (*Pix fagi*). Moreover there exist other kinds of tar (HUNNIUS 1993).

Under yellow wax bee wax is to be understood (HUNNIUS 1993).

Armenian Soil (*Bolus orientalis*) is an iron containing clay with anti-toxic qualities (MÖLLER and VIRÉ 1988).

Terra sigillata are stamped clay tablets similar to Armenian Soil (HUNNIUS 1993).

Gall-nuts are proliferations at the branches of the gall-oak (*Quercus infectoria*) caused by the stitches and egg-laying of the gall-wasp (*Andricus gallae tinctoria*) (HUNNIUS 1993).

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