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Environmental Illness May Have Contributed to the Origins of Transylvanian Vampire Myths

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ENVIRONMENTAL ILLNESS MAY HAVE CONTRIBUTED TO THE ORIGINS OF TRANSYLVANIAN VAMPIRE MYTHS

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ABSTRACT

Field and ethnographic data are utilized to illustrate that significant contamination of rural wells with nitrates, bacteria and protozoa both currently and in the past are fertile ground for the development of myths surrounding spirit and blood stealing mythical creatures. The very real problem of methemoglobinemia, an environmentally induced hypoxia, in rural Transylvania is an ideal situation for physiological confirmation of and, perhaps, cultural etiology determination of the myth of vampirism. Ethnographic accounts of vampire and werewolf myths are correlated with the field data.

Since Bram Stoker's 1897 publication of Dracula, the vampire myth has haunted the imagination of the West. The relatively modern literary tale of the stealthy Count Dracula who lies in lifeless stupor by day and preys on the living by night has risen to a level of modern myth itself. Many of the truths that gave life to the tale have been lost in the passing of time and obstructed by the difficulties inherent in peering into the myths and meanings embodied in chronologically and geographically distant cultures (Ramsland 2002, McNally and Florescu 1972). To the Western cultural tradition, the count has become a sexy demigod who, with his rebel "spawn (victims)" live on the fringes of and feed off of acceptable society - a myth which appeals to and informs the anxieties and struggles of Western cultures grappling with Victorian moral restrictions born of Western Christianity and evolving culture "wars" (Ramsland 2002, Miller 1998, Barber 1990). This could not be further from the original meanings of the myths and the historical characters upon which Stoker drew to create his composite character of Count Dracula.

It is known that Stoker had access to a number of important writings that included collected myths from the Transylvania region of modern day Romania, describing vampires and werewolves, which were first published by Emily Gerard in 1888, and historical accounts, maintained in monasteries in Switzerland, which told of Vlad de Tepes de Dracul (1431- 1476) the Prince of Walachia and Moldavia that had briefly united the region (modern day Transylvania) against the Ottoman Empire (Ramsland 2002, Miller 2000, Miller 1997). Tepes won great military victories against the expansionist Turks in 1462, being renowned for his fierceness in battle and the impaling of his enemies (Phillips and Warner 1991). Using these pieces of information and probably being aware of evolving cultural and theatrical interests at the time (Lord Byron had attempted some plays and an unfinished book about the vampire), Stoker penned his now famous work (Ramsland 2002, Phillips and Warner 1991). The two original threads informing his tale, myth and history, he wound together into an entirely new fabric.

Mythologists study the purposes and origins of myth in society. They explore the boundary between folk science, magical explanations, deep cultural meanings and reso-

nant themes that form the mother soil of myth-making. In so doing they have come to understand the multiple origins and purposes of myth to specific cultures (Campbell 1988, Senn 1982). It is known for example that myth serves several major purposes in society today and in the cultures of the past: i) myth helps to explain the mysteries of nature and spirituality, and ii) myth helps to shape the social mores of a group (Campbell 1988, Senn 1982). In accomplishing these things, myth helps guide and explain the experience of living when no other explanations are available, making sense of the mysterious and reinforcing the acceptable. Mythologists note that the need for this kind of guidance is particularly important during times of ambiguity or transition; many myths are repeated and proliferated during times of upheaval and ambiguity either socially or seasonally, for example, at the winter and spring equinox or during times of social upheaval and moral change (Campbell 1988, Senn 1982). In appealing to the enduring archetypes of good, evil and transcendence, they aid cultures and individuals in making these transitions, while strengthening the fabric of social unity and cultural identity.

The historical facts of Vlad de Trepes speak for themselves, but what might have informed the myths of vampires, witches, werewolves and spirits that prey upon the village folk of the Transylvania region? A much entertaining and interesting book written recently by Katherine Ramsland (2002) explores the "science" of how a vampire, based in the Western tradition might be explained through modern scientific means, but stops short of exploring the cultural and environmental influences which might have informed the original myth makers of Transylvania.

The forests of Transylvania are dense and wild to this day, filled with game and sprawled across a beautiful and rugged terrain of mountains, valleys and streams. The hiker, hunter or scientist who explores these misty and remote forest areas can easily see how tales of prowling spirits and were-creatures persist into modern times in small, rural villages. But perhaps, in the not so distant past when settled agriculture gave rise to the use of the village well and the challenge of environmental illness cast its shadow on the village inhabitants, the vampire began to take shape.

This paper seeks to expand on this exploration and proposes one possible explanation for a portion of what might have informed the villagers of Transylvania as they spun their original, mythic tales. Is it possible that environmentally induced illness, in particular methemoglobinemia (MHG) could have informed or at the very least, reinforced some of the vampiric tales?

MHG is a chemically induced hypoxia (Kross and Ayebo 1991). It is a dysfunction of the hemoglobin molecule due to the influence of Nitrite (NO_2^-) ion. Nitrate (NO_3^-), which is found in human and animal waste and in chemical fertilizers, is converted to the biologically active nitrite ion due the presence of bacteria in the gut (Brunning-Fann and Kaneene 1993). Nitrite then interacts with the iron in hemoglobin to render it incapable of adequately binding with oxygen (Brunning-Fann and Kaneene 1993, Cortas and Wakid 1991). Thus, a hypoxia develops wherein the tissues are not adequately oxygenated. Methemoglobin reductase, an enzyme found in the blood, works to reverse this in the healthy individual if the nitrate exposure does not overwhelm the enzyme, but this enzyme system is not as effective in infants and young children, compounding the problem and increasing the child's risk of prolonged or overwhelming hypoxia (Bearer 1995,

Dean etal. 1992,Cortas and Wakid 1991). Without provision of methylene blue intraveniously or supplementation with large doses of vitamin C, the risk of a terminal hypoxia is real (Cortas and Wakid 1991). Clinical symptoms begin to appear in the form of dizziness, lethargy and cyanosis (blue appearance as if drained of blood) when the methemoglobin fraction in the blood reaches 20 percent as determined by whole blood oxiometry (Kross and Ayebo 1991). When the level reaches 65-70 percent death is common (Kross and Ayebo 1991). The nitrates will not be noticeable in the water by taste, color or odor, and the boiling of water to purify it, while killing bacteria and protozoa, will only further concentrate the nitrate (Zeman etal. 2002).

Methods

This work draws on two major lines of methodological inquiry. The first being field visits, sampling and measurement of village yard, well and water quality parameters, spanning the years 1997 to 2002, and the second being analysis of myths, ethnographic accounts and personal interviews with co-author, Dr. Ioan Seuleanu. Dr. Seuleanu is an expert in Transylvanian myth and the head of Transylvanian Folklore at Babes-Boyai Univeristy, Cluj Napoca.

Field measurements

Rural farming villages and wells (n=80) were visited three separate times during the period 1997-2001. Wells monitored in 1997 for nitrates and bacteria were again monitored in 2001 for protozoa, *Crytopsoridium sp. and Giardia sp.*, and bacteria. Water samples were drawn from wells by the typical method each villager used to remove water either with a bucket or with a crank or lever-arm and a bucket. The presence of nitrates in the water samples where analyzed through the cadmium reduction method with colorimetric analysis (APHA method 4500) (Clesceri et al. 1998). Bacteria were cultured, plated and counted using the most probable number method, MPN (APHA methods 9215, 9221B, E, and 9230 B) (Clesceri etal. 1998). Protozoa were analyzed by concentration, elution and immunoassay with an epiflouresing tag and analyzed using an Epifluorescing microscope (IDEXX, Filta-Max and Hydrofluor methods) (Bauer etal. 2003). Thirty of the wells were located through Sanitary Police (local public health) as having been used by an infant with a medically confirmed case of MHG in 1997 (Zeman etal. 2002). The remaining wells were chosen for representation of wells having been associated with a case of MHG, for example, not having been associated with a case of MHG from within the same villages and having the same basic physical characteristics and condition of yard. During the field visits, the conditions of the yard and well were documented, including distances between the well and major variables having influence on possible well contamination, including pit latrines, animals, compost and human/animal waste piles and neighbors' latrines (ECETOC 1988).

Mythological/Ethnographical Inquiries

Interviews with Dr. Seuleanu were conducted with the assistance of a technically and scientifically fluent interpreter. Further, Dr. Seuleanu is somewhat conversant in English. In addition, a variety of collected works of folklore and one quite valuable ethnographic

survey of the Transylvania region, originally collected by Dr. Harry Senn, was consulted to derive information concerning Romanian folklore (Phillips and Warner 1991, Senn 1982, MackKenzie 1977). The ethnographic collection of folk myth by Dr. Senn contained a detailed set of appendices documenting folk myth reports, including the town of origin and the number of reports originating from the area. The data were gathered in 1977 from villages of 500-1,000 population with a total of 110 inhabitants reporting. These data were used in conjunction with other research, previously conducted, establishing the incidence rate of MHG in three counties of the Transylvania region to further hypothesize concerning the connection between the development of folk myths and environmental illnesses (Ayebo etal. 1997). The consulted works were published in English.

Data Analysis

All collected data were analyzed using SAS-JMP version 4.0. Data were first characterized by descriptive statistical analysis and frequency distribution. Major factors with suspected impact on the level of nitrates in village wells were further analyzed using univariate tests, (ANOVA and logistic fit analysis) depending on data type. Finally, all significant univariate variables were analyzed using the standard least squares whole model test in order to determine how well the variables as a whole predicted nitrate level of wells and which variables were most significant in that regard.

Results

Field Measurements

Field measurements indicate that rural village wells exist today in much the same manner they would have in the 1800s, and even earlier as determined by archeological findings (Dolukhanov 1996). Anthropologists have established that as early as 6000 BC farming communities existed throughout central and Eastern Europe, and that settlements consisted of hamlets of 25 houses tightly clustered together (Dolukhanov 1996). This is the same basic village layout that is found today, although presently many villages have much higher population densities. The typical village well is an uncovered well with lever arm action and an attached bucket for extracting water, often vegetation can be observed growing within the well (Figure 1 and 2). The well is about eight meters deep, easily within the zone of surface water saturation and has about a four-meter drop to the water surface (Table 1). Neighbors, the pit latrine, animals, compost piles and manure piles are common components of the village yard (Table 1). Shallow wells such as this, in close proximity to other humans, animals and their waste products, where horticulture agriculture is practiced and compost and manure are applied to a family garden, tend to be highly susceptible to chemical and biological contamination. This research clearly bears that out as the potable water supply of the majority of village dwellers provides many opportunities for exposure to significant levels of nitrates, bacteria and protozoa. The unfortunate occurrence of MHG cases in children and an association with high nitrate levels of the well is also born out by this research ($p = 0.0001$) as is a significant association between the yard conditions previously described and the level of nitrate in the well (Table 2) (Zeman et al. 2002). Overall, the presence of pit latrines, animals, ani-

mal and human waste and compost applications to the garden is highly predictive of high nitrate levels in this sample (R2 0.83, adj R2. 0.61, p=0.0002) with the presence of animals, pit latrine and barn manure piles, and compost use on the garden being the most significant factors associated with high nitrate levels (Table 3). Bacteria contamination with potentially infectious mesophilic organisms, and animal/human coliforms is also present with fecal *Streptococcus* counts averaging 146/100ml of water tested (Table 1). Cysts of the infectious protozoa *Cryptosporidium* and *Giardia* were found in significant portions of the water tested and *both* organisms were found in 26 percent of all wells sampled (Table 1).

TABLE 1: CHARACTERISTICS OF WELLS

CHARACTERISTIC	PERCENT	MEAN (RANGE)	SD
Physical Characteristics of Wells and Use			
Use well (n=80)	0.64	--	--
Well depth (n=55)	--	8.5m (2-32)	5.1m
Depth to water (n=53)	--	4m (1-10)	2m
Age of Well (n=35)	--	35yr (6-100)	18yr
Well covered (n=72)	0.39	--	--
Presence of pit latrine and barn sludge (n=72)	0.71	--	--
Presence of compost piles (n=72)	0.63	--	--
Presence of neighbors latrines (n=72)	0.68	--	--
Presence of animals and animal walkways (n=72)	0.72	--	--

CHARACTERISTIC	PERCENT	MEAN (RANGE)	SD
Chemical, Bacterial and Protozoan Contaminants			
Cryptosporidium @ 38% recovery (n=69)	0.39	3cysts/l (0-84)	10cysts/l
Giardia @ 44% recovery (n=69)	0.43	2cysts/l (0-36)	5cysts/l
Cryptosporidium and Giardia (n=69)	0.26	--	--
Aerobic mesophilic organisms/ ml (n=70/52)	0.70	$2.16x10^5$ ($0-3.13x10^6$)	$6.55x10^5$
Total Coliforms/ 100ml (n=70/44)	0.61	$5.9x10^3$ ($0-9.06x10^4$)	$1.71x10^4$

TABLE 1 CONTINUED

Fecal Coliforms/ 100ml (n=70/42)	0.53	638 (0-1.61x10^4)	2.5x10^3
Fecal ***Streptococcus***/ 100ml (n=70/45)	0.53	146 (0-1.1x10^3)	292
Nitrate Lvl. as NO3--N (n=77)	--	105mg/l (0-118^5)	189mg/l

TABLE 2: SIGNIFICANT UNIVARIATE RELATIONSHIPS

CHARACTERISTIC	TEST	RATIO/CHISQUARE	P-VALUE
Nitrate level in well (higher) and:			
MHG case (y/n) (n=77)	ANOVA	27.1	0.0001
Water source (well) (n=77)	" "	3.7	0.029
Well depth (meters) (n=71)	Log. fit	19.4	0.0002
Well covered (y/n) (n=70)	" "	18.2	0.0001
Presence of pit latrine (y/n) (n= 71)	" "	9.8	0.044
Pit latrine 8-10 meters from well (y/n) (n= 71)	" "	20.4	0.0004
Neighbor has pit latrine (y/n) (n=71)	" "	5.9	0.05
Neighbor pit latrine 8-10 meters from well (y/n) (n=70)	" "	6.07	0.05
Presence of animals and animal walkways (y/n) (n=71)	" "	18.9	<0.0001
Animals and animal walkways 8-10 meters from well (y/n) (n=71)	" "	21.4	0.0003
Presence of pit latrine and barn manure piles (y/n) (n=71)	" "	16.4	0.0009
Use of manure on garden (y/n) (n=71)	" "	14.2	0.0273

TABLE 2 CONTIUNED			
Presence of compost piles (y/n) (n=71)	" "	15.8	0.0004
Poor well casing (y/n) (n=56)	" "	6.83	0.0089
Lack of well-head grouting (y/n) (n=70)	" "	25.1	<0.0001
Likelihood of surface infiltration (y/n) (n=70)	" "	33.6	<0.0001

Information for this table taken from, *Were-Wolf and Vampire in Romania*, Dr. Harry Senn, 1982, Columbia University Press, Appendix E.

Figure 1: Typical open, lever-arm well

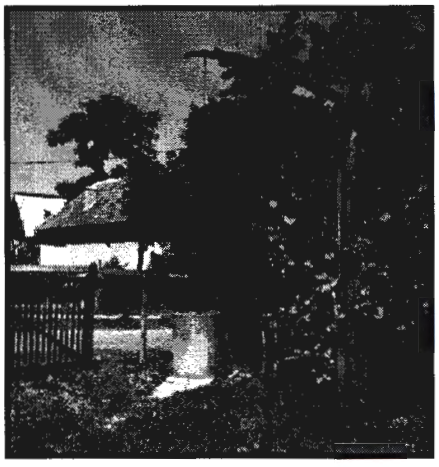

Figure 2: Plant growth within well

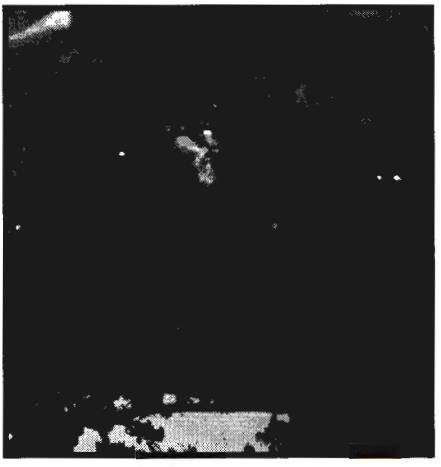

TABLE 3: STANDARD LEAST SQUARES WHOLE MODEL TEST: (TEST RAN ON ALL SIGNIFICANT UNIVARIATE FINDINGS, SIGNIFICANT FACTORS ONLY PRESENTED)

CHARACTERISTIC	RSQUARE(ADJ.)	ESTIMATE	P-VALUE
Whole model fit:			
All significant univariate findings (n=67)	0.83(0.61)	--	0.0002
Nitrate level in well (higher) and:			
Presence of animals and animal walkways (y/n) (n=67)	--	-448.3	0.0025
Presence of pit latrine and barn manure piles (y/n) (n=67)	--	521.7	0.03
Presence of compost piles (y/n) (n=67)	--	386.9	0.0005

Mythological/Ethnographical

Relatively few collections of Romanian folk myth exist in English outside of Romania and even fewer that focus specifically on vampire myths in the Transylvania region (Spariosu 1994, MacKenzie 1977). The most useful for purposes of this work is Senn's 1982 publication. By utilizing the appendices of Dr. Senn's ethnographic work, the authors were able to construct an anecdotal table that, while in no way definitive, is intriguing (Table 4). Dr. Senn collected 196 different accounts of vampire and werewolf legends from the Transylvania region of Romania. In these reports seven distinct counties were represented. When these counties were examined from the perspective of known high or low reports of MHG, the clear majority of myths came from counties known to have higher rather than lower incidence rates of MHG (0.73 vs. 0.27 respectively). A study conducted in 1990-1994 documented incident rates ranging from 24-363/100,000 (Ayebo etal. 1997) in Transylvanian counties known to have regular reports of MHG cases. It is also interesting to note that many of the reported myths note that both the winter and spring equinoxes are particularly dangerous times of the year in regard to the activities of these mythological creatures. It is well known that nitrate levels in shallow well water tend to be higher with the spring melt and that risks for diarrheal disease also increase during this time. An analysis of these mythological reports clearly does not link the vampire myth with the historical figure of Vlad Tepes. These are entirely different entities in the Romanian culture.

TABLE 4: ETHNOGRAPHIC REPORTS OF VAMPIRE AND WERE-WOLF MYTHS BY COUNTY, TRANSYLVANIA REGION

County	Number of Reports (n=196)	Known high/low prevalence of MHG
Bistrita	32	H
Sibu	65	H
Bihor	47	H
Total reports in region 144 (0.73)		
Botosani	10	L
Iasi	3	L
Neamt	31	L
Suceava	8	L
Total reports in region 52 (0.27)		

DISCUSSION

It is clear from the information presented that the likelihood of significant contamination of rural wells has existed since nomadic peoples first settled down to a horticultural lifestyle based on raising domesticated plants and animals. It is also clear that the presence of nitrate in rural village water is strongly associated with MHG.

It is not likely that a connection between a particular myth and it origins can ever be conclusively proven. Nor is it the intent of the authors to reduce the poetry, cultural value and mystery of the mechanisms of human myth and symbolism to the bare bones of a

scientific explanation. But the possibilities that myths of this nature were originally developed to explain what could not otherwise be explained cannot be completely ignored. Further, it must be kept in mind that what are myths to us today were trusted explanations of the workings of the world and spirit world in earlier times. Once a myth establishes itself it expands within a cultural group to fulfill many additional social, spiritual roles. This is borne out by the way in which vampire myth and the historical figure of Vlad Tepes combined to provide the West with its modern vampire.

It is also more than unfortunate that the vampire of MHG still plagues the children of rural Transylvania. Current estimates place the case fatality rate of MHG in Transylvania at three percent. It is the challenge of modern environmental/public health to continue to raise awareness of this issue and to encourage the public health education process and political will needed to finally eliminate it.

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