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# Journal Pre-proof

Scalp Verruca from Barber Clippers: an Epidemiologic Assessment of a Common Fomite

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**Title:** Scalp Verruca from Barber Clippers: an Epidemiologic Assessment of a Common Fomite

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Scalp verruca are relatively common in dermatology, and the causal human papilloma virus (HPV) is ubiquitous in the environment. We noted a significant number of patients who developed numerous scalp verruca following recalled scalp trauma due to short haircuts received on a military base. Scalp verrucae are a particular risk to the military, where males receive frequent haircuts in succession that require firm pressure to ensure uniform length.

An epidemiologic investigation was conducted on 3 local barbershops evaluating their adherence to sanitary practices. The cleaned clippers and guards were sampled with next-generation DNA and RNA whole genome amplification. Several published databases were referenced, including the NCBI reference sequences (RefSeq), the NCBI Taxonomy Database, and sequences from GenBank. The non-human sequences were searched using NCBI's Basic Local Alignment Search Tool (BLAST) software.

The local public health department conducted random no-notice inspections every 6 months and found that the barbers properly performed disinfection using approved commercial solutions between every customer. Despite this, genetic material correlating with HPV types 5, 10, 49, and 92 was recovered. In addition, other nonenveloped pathogens such as merkel cell polyomavirus and rhinovirus were also isolated (see Table 1).

HPV is extremely stable in the environment due to its nonenveloped structure, resistance to heat, desiccation, and ability to viably persist for at least 7 days.<sup>1</sup> It can survive on a variety of surfaces from ultrasound probes to clothing.<sup>2</sup> It is resistant to common disinfectants, remaining infectious despite application of quaternary ammonium compounds (e.g. wipes containing ammonium chlorides),<sup>3</sup> Ethylenediaminetetraacetic acid,<sup>1</sup> 70% and 95% ethanol, 95% isopropanol, 3.4% glutaraldehyde, 0.55% ortho-phthalaldehyde, phenol, and 0.25% peracetic acid-silver. Only 0.525% hypochlorite (1:10 bleach dilution) and 1.2% peracetic acid-silver-based disinfectants have been shown to reduce infectivity by more than 99.99%.<sup>4</sup>

The impact of this inadequacy of cleaning solutions transcends the development of mere cutaneous verrucae. HPV has been implicated as an oncovirus in the development of cutaneous squamous cell carcinoma (SCC), and at least one of the viruses (HPV 5) in this study has been shown to be associated with increased risk for SCC.<sup>5</sup> Merkel cell polyomavirus, an oncovirus implicated in Merkel Cell Carcinoma, was also isolated from the clippers in significant quantity. The isolation of the virus from barbershop equipment has not been documented previously.

It is imperative that future research is conducted to develop safe solutions that adequately disinfect multiple use devices like barbershop clippers to reduce this public health risk. Current alcohol or polyphenolic compounds are shown to be inadequate in our study *in vivo*, as well as *in vitro* analysis published elsewhere.<sup>4</sup> As a result of this study and cited literature, the authors examined the practice in our own office of using commercial disinfectant wipes between patient encounters that rely on quaternary ammonium compounds, and decided to incorporate an approved commercially available 1:10 bleach wipe for surfaces and treatment devices (cryotherapy, cautery, laser distance gauges, etc).

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Tables:

Table 1: Matched genomic data following BLAST analysis. Columns show number of genetic reads attributable to a virus that were identified, the virus name, the average percentage of the genomic match, and the average length of the aligned fragments of DNA.

Total reads	Virus name	Average Identity %	Average Alignment Length
472	Merkel cell polyomavirus	98.8	274.1
63	Human papillomavirus type 10	91.1	219.2
23	Human papillomavirus type 5	95.7	214.5
23	Rhinovirus B14	98.3	184
20	Human polyomavirus 6	98.4	284.8
20	Human papillomavirus type 49	91.1	208.7
6	Human papillomavirus type 92	98.8	238.3
4	Japanese encephalitis virus	98.8	145
2	Human coronavirus 229E	96.6	341
1	Equine infectious anemia virus	100	217