Contamination of irrigation systems of dental units with Cryptosporidium species in Alexandria, Egypt: a neglected disinfection pitfall

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Purpose: To investigate the contamination of the dental irrigation systems with Cryptosporidium species in Alexandria, Egypt.

Methods: Forty water samples from all 20 working dental irrigation machines in a dental center in Alexandria were included in the study. Water samples were taken from the handpieces of dental irrigation machines in all studied units. After filtration through a membrane filter, water sample residues were stained using modified Ziehl–Neelsen staining and examined microscopically for Cryptosporidium spp.

Results: Cryptosporidium spp. was found as a contaminant in 27.5% of water samples taken from dental irrigation machines.

Conclusion: This indicates a contamination by the public water supplies to which these dental irrigation machines are connected. This disinfection pitfall may pose an infection risk to those seeking dental care.

Keywords: Cryptosporidium, contamination, dental irrigation machines, Alexandria

Introduction
The specific structure of dental units favors the presence of biofilm and microbial contamination of dental unit water lines.1 Dental practices may be associated with the acquisition of a variety of infections; however, great interest has so far been focused on blood-borne agents, such as viruses. Cryptosporidium is an obligatory, intracellular, coccidian parasite that infects the intestinal epithelial cells, causing diarrhea. It is classified as an emerging pathogen by the Centers for Disease Control and Prevention,2 and can cause infection in people, cattle, and other animals.3 Cryptosporidium may be transmitted by direct person-to-person contact, contact with infected animals, or ingestion of contaminated water or food.4 The parasite can complete its life cycle within one host, and is known to be resistant to antiparasitic drugs. Upon infection with Cryptosporidium, immunocompetent individuals may experience a self-limiting, acute, watery diarrhea lasting for about a week; however, the immunocompromised typically develop chronic or persistent diarrhea, leading to wasting and even death.5 Further, chemotherapeutic agents have been shown to have low efficacy in those immunocompromised individuals who are most affected by the disease.6

The resistance of Cryptosporidium spp. to the typical concentrations of chlorine used to disinfect water has made this an important issue.7 The ability of Cryptosporidium oocysts to survive conventional water treatment, and to withstand chlorine disinfection, make control of water-borne infection particularly challenging in developed and developing countries alike.8 Many microbial studies have...
reported the presence of bacteria and biofilm formation in
dental unit water lines. This prompted us to search for the
possible contamination of dental irrigation systems with
Cryptosporidium spp., one of the most commonly known
water-borne parasites.

The availability of simple, inexpensive methods to detect
Cryptosporidium spp. in the hospital environment may pro-
mote regular monitoring for the parasite in resource-limited
countries. Modified Ziehl–Neelsen (MZN) is an inexpensive
and readily available stain in Egypt. In the present study, we
used MZN stain to detect Cryptosporidium spp. in water
samples collected from the dental irrigation systems in a
dental center. Despite its recognition as a risk factor to
patients in dental clinics, contamination of irrigation water in
such clinics has not been given any interest, and no previ-
ously published study has dealt with this topic. Therefore,
the purpose of this preliminary study was to uncover such
potential risk in the clinics of a dental health center in
Alexandria, Egypt.

Materials and methods
The present study was conducted on dental irrigation
machines in a dental center in Alexandria, Egypt, dur-
ing the period from June to August, 2011. Forty 500 mL
water samples were collected from the handpieces of all
20 dental irrigation system machines in the dental center,
using sterile containers. Water samples were then filtered
through sterile 0.45 μm membrane filters (Sartorius Stedim
Biotech, Goettingen, Germany) within 2 hours of collec-
tion. Smears were prepared from the residues collected on
membrane filters, air-dried, and fixed. Duplicate smears
were stained with MZN,9 according to standard pro-
dcedures. The stained smears were then examined under a
light microscope using 1000× magnification. At least, 200
oil immersion fields of the stained smears were examined
for cryptosporidia.

Result
Cryptosporidium spp. was prevalent in 27.5% (11/40) of
water samples collected from the handpieces of dental
machines.

Discussion
Conventional water treatment involving coagulation/
flocculation, sedimentation, filtration, and disinfection
may not be sufficient to clear water contamination with
Cryptosporidium spp.10 Therefore, Cryptosporidium
oocysts may escape water-treatment disinfection procedures.

Recently, 15% of public water coolers have been found
to be contaminated with Cryptosporidium spp., in Alex-
andria11 indicating the contamination of public water
supplies.

To our knowledge, the present study is the first report on
detection of Cryptosporidium spp. in the irrigation systems
of dental units. It was found that 27.5% of water samples
from the handpieces of dental irrigation machines were
contaminated with Cryptosporidium spp. This indicates the
contamination of water supplies of dental units with this
parasite. This is a particularly important finding because the
infectious dose of Cryptosporidium is so low that only a few
oocysts can initiate infection in healthy individuals.12,13

The connection of dental units to public water supplies
necessitates the investigation of these units for possible
contamination. The presence of Cryptosporidium spp. in
the irrigation systems of dental units has clinical implica-
tions as it may be associated with diarrhea in those ingest-
ing water contaminated with oocysts in such units. This is
particularly important if the patients seeking dental care
are immunocompromized or young children. To avoid pos-
sible infection with Cryptosporidium, water should not be
delivered to patients via dental irrigation systems connected
to the public water system. Instead, the use of independent
water supplies and the provision of disinfected water in
dental units are encouraged.

The result of the present study is limited by the fact that
only morphological criteria were evaluated; nevertheless,
this study is very important due to its preliminary nature.
Further large-scale studies to investigate the viability of
Cryptosporidium oocysts besides the molecular detection
and genotyping of Cryptosporidium to the species
and genotype levels in dental unit irrigation systems are
recommended.

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Disclosure
The authors report no conflict of interest in this work.

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