Introduction

Three-dimensional (3D) movies are becoming more popular than ever, despite being a technology discovered in the 1920s. Recent improvements in digital filming technology guarantee high quality and satisfaction of spectators in terms of 3D vision, comfort, and safety. While it is known that the strong sensorial exercise that is induced by the vision of a 3D movie can evoke comfort and safety, it is known that the strong sensorial exercise that is induced by the vision of a 3D movie can evoke comfort and safety.

Microbiological safety of glasses dispensed at 3D movie theatres

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Recent popularity of three-dimensional movies raised some concern about microbiological safety of glasses dispensed into movie theatres. In this study, we analysed the level of microbiological contamination on them before and after use and between theatres adopting manual and automatic sanitation systems. The manual sanitation system was more effective in reducing the total mesophilic count levels compared with the automatic system ($P < 0.05$), but no differences were found for coagulase-positive staphylococci levels ($P = 0.22$). No differences were found for mould and yeast between before and after levels ($P = 0.21$) and between sanitation systems ($P = 0.44$). We conclude that more evidences are needed to support microbiological risk evaluation.

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visual discomfort, and visual symptoms are common in sensitive viewers, no evidence is reported about microbiological safety of 3D glasses.

The polarized glasses create a 3D effect and are given to the spectators at the movie theatre entrance. Usually the glasses are reusable and are cleaned with cold disinfecting systems between uses. Automatic washing systems are also available for washable glasses.

In 2010, an Italian nationwide newspaper reported the case of a 3-year-old girl who acquired eye irritation after wearing stereo glasses in a movie theatre. The National Health Council (recommendation 12 486 of 17/03/2010) expressed a precautionary advice forbidding the use of non-disposable glasses among children aged <6 years. The Italian Ministry of Health recommended to movie theatre managers to adopt, whenever feasible, disposable 3D glasses and to use the correct sanitization procedures for reusable glasses to prevent eye infections among moviegoers (DGPREV Recommendation 0035648-P-06/08/2010). Recently, a new precautionary note was issued by the Italian Ministry of Health together with the Italian Ministry of Economic Development stressing the communication strategy towards consumers, especially if suffering from eye infections (Prot. n.0132093 of 01/08/2013).

The aim of this study was to assess the level of microbiological contamination in reusable 3D glasses. Comparisons of levels of common microbiological indicators were carried out before and after the use by moviegoers and between movie theatres that adopt different sanitation systems.

**Methods**

In October–November 2010, a cross-sectional study was conducted on three cinemas located in Rome. From each cinema, we collected 10 pairs of 3D glasses after the sanitization phase and before the distribution to the moviegoers (’before use’) and 20 just after use at the end of the movie (’after use’). We collected 90 3D glasses. Two cinemas were using automatic washing systems, and one was using a manual sanitization system as described below.

The automated system uses sodium hypochlorite (1 min at 70°C) followed by a rinse with Clear Dry, and then drying and packaging in single hermetically closed bag. In the manual system, the cinema personnel wipes 3D glasses with anti-bacterial towels soaked in isopropyl alcohol according to European Directive 76/768/EEC and package them into single open bags containing new wet wipes that allow the customers to repeat the cleaning/disinfection before its use.

All 3D glasses were collected in sterile bags and transported to the laboratory in cooler boxes. Glasses were sampled using sterile swab according to the standard swab method. Neutralizer containing peptone water and 5 g/L of sodium thiosulphate was used to rinse the surface of the glasses.

One milliliter peptone water samples and its decimal dilution (from $10^{-1}$ to $10^{-6}$) were analysed in duplicate for the recovery of total mesophilic count (TMC), total coliform, coagulase-positive Staphylococci (COpS), mould and yeast according to ISO standard techniques. All microbiological indicator levels are expressed as colony-forming unit per millilitre. TMC was chosen according to American Public Health Association (APHA) standards; the other indicators are those most commonly used to assess microbiological contamination of surfaces from human and environmental microorganisms.

Differences in mean levels of the microbiological indicators were assessed through a two-way ANOVA (or F-test) using time (before vs. after use) and sanitization (manual vs. automatic) as factors. Prior to this analysis, data were log-transformed to meet normality and homoscedasticity.

Measured levels of TMC were compared with the quality cutoffs proposed by APHA (1970) (good TMC < 25 UFC/24 cm²; satisfactory TMC ≥ 25, ≤ 50 UFC/24 cm², unsatisfactory TMC > 50 UFC/24 cm²).

**Results**

Results of microbiological indicators of collected samples are reported in Table 1. Mean TMC and COpS levels differed between before and after the use (Table 1, respectively $P<0.01$ and $P<0.04$), which was lower, as expected, before use. The manual sanitization system was more effective in reducing the TMC levels compared with the automatic system (Table 1, $P<0.05$), but no differences were found for COpS levels (Table 1, $P=0.22$). No differences between before and after levels (Table 1, $P=0.21$) and between sanitization systems ($P=0.44$) were found for mould and yeast.

**Discussion**

Besides the day-to-day interaction of people, the major source and transmission of community-acquired infections are through frequently touched surfaces (fomites). Fomites in a movie theatre include doors and armrests of chairs, toilet seats and faucets, sinks and the dispensed 3D glasses, among others. As other common fomites, 3D glasses may represent a potential community infectious source of pathogens such as some strains of methicillin-resistant Staphilococcus aureus that can persist up to 7 months on environmental surfaces. The potential danger of contamination comes from some moviegoers having conjunctivitis or skin infection. While potentially dangerous, all COpS are ubiquitous in the environment and would be found in many non-sterile cinema surfaces, but their presence does not necessarily lead to infection.

To evaluate our results from the public health point of view we can compare the measured levels with the APHA criteria applied to general surfaces. Before the use, only 10% of samples were in the insufficient quality class in the movie theatre with automatic

<table>
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<tr>
<th>Microbiological indicator</th>
<th>Sanitization system</th>
<th>F-test statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Automatic</td>
<td>Manual</td>
</tr>
<tr>
<td>Total mesophilic count</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before</td>
<td>5.5 (12.6)</td>
<td>4.9 (4.4)</td>
</tr>
<tr>
<td>After</td>
<td>39.7 (66.4)</td>
<td>34.2 (24.1)</td>
</tr>
<tr>
<td>Coagulase-positive Staphylococci</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before</td>
<td>0.3 (0.6)</td>
<td>2.5 (6.3)</td>
</tr>
<tr>
<td>After</td>
<td>4.1 (12)</td>
<td>4.6 (12)</td>
</tr>
<tr>
<td>Mould and yeast</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before</td>
<td>1.0 (2.7)</td>
<td>1.4 (1.5)</td>
</tr>
<tr>
<td>After</td>
<td>1.3 (2.3)</td>
<td>0.7 (1.4)</td>
</tr>
<tr>
<td>Total coliform</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
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<tr>
<td>After</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
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</tbody>
</table>
sanitization, and none in the movie theatre with manual sanitization. After the use, 20% of the samples were in the insufficient class in the cinemas with automatic sanitization system and 20% in the movie theatre with manual sanitization system. It should also be remarked that the TMC and COps levels reported in our study are quite low and similar to the levels found on other hand-touch surfaces of public use.9,10

Among the microbiological indicators in this study, TMC was the most suggestive, showing differences between, before and after sanitization. More evidences on a larger sample of 3D glasses are needed to support microbiological risk evaluation to prevent false emergencies in public health.

Conflicts of interest: None declared.

Key points
- 3D movie glasses microbiological safety; manual vs. automatic sanitization systems for glasses; type of contamination in 3D movie glasses
- A 3D movie can evoke visual discomfort, and visual symptoms are common in sensitive viewers.
- No evidence is reported about microbiological safety of 3D glasses.
- Total mesophilic count, coagulase-positive staphylococci and mould and yeast levels reported in our study on the 3D glasses after and before the use are quite low.

References
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Short Report

Birth year distribution in reported hepatitis C cases in Switzerland

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Data of the national hepatitis C virus (HCV) notification system and the Swiss hepatitis C cohort study have been analysed for birth year distribution. Persons born between 1955 and 1974 are disproportionately affected by HCV, accounting for 61% of all reported infections. Over the course of the reporting period from 1988 to 2012, the majority of affected persons were born in the mid-60s and a sharply increasing proportion between 1975 and 1984 (from 0.6 to 19.5%). To enhance the so far insufficient HCV detection rates in Switzerland, additional testing strategies such as birth cohort screening must be further evaluated and discussed.

Introduction

Hepatitis C is a contagious liver disease caused by the hepatitis C virus (HCV). Chronic hepatitis C is a major cause of morbidity and mortality.1 In Switzerland, the estimated prevalence of hepatitis C is 0.8–1.8%.7 Although hepatitis C is a curable disease, treatment uptake rates are low (8%).3 In view of these factors and potentially fatal consequences of the disease, Switzerland faces a major public health threat: an epidemic of chronic hepatitis infections.4

New better tolerated HCV medication have the potential to cure the majority of those infected. To use this potential and to address the public health problem, one of the first steps is improving on detection rates. Detecting an infection early, followed by assessing the public health problem, one of the first steps is improving on detection rates.