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For the attention of Mrs Karen Pengelly.

# Report on the effect of applications of Chlor-Clean solutions to the BabyBay Cot materials manufactured by NSA.

## Background

Department of Health guidelines recommend the use of chlorine products at a strength of 1,000 ppm (0.1%) available chlorine for environmental disinfection of surfaces likely to be contaminated with *Clostridium difficile*, MRSA, VRE, *Acinetobacter*, and other potentially harmful micro-organisms.[1 & 2] It is common belief amongst Health Care Workers, probably based on previous experience with alcohol wipes or phenolic disinfectants, that such chlorine solutions have a detrimental effect on the many of the items of equipment used in health care. However previous studies conducted by this author have shown that there are very few surfaces that are, in fact, damaged by chlorine solutions provided the surfaces are properly sealed and water resistant.

## Objective of the Study

This study has been instigated to determine what effects repeated applications of chlorine solutions have on the wooden frame and castors of the BabyBay cots.

## Materials and Methods

A sample frame and castor were provided by NSA, who are the UK distributors for the BabyBay cots. The wooden frame is sealed with a polyurethane varnish and the castors consist of composite materials mounted on a metal spindle and base.

The chlorine solutions used were made up using Chlor-Clean tablets, as used in many hospitals throughout the UK and supplied by Guest Medical Ltd of Larkfield, Kent ME20 6SW. The Chlor-Clean solution, when correctly made up gives effective chlorine disinfection together with cleaning action provided by a special chlorine-compatible surfactant.

The sample materials were divided into three sections. The first section was treated with ordinary local tap water as a control, the second with a 1,000 ppm (0.1%) Chlor-Clean solution and the third with a 10,000 ppm (1%) Chlor-Clean solution. Both the Chlor-Clean solutions were made up freshly every day in ordinary tap water and maintained at a temperature between 18 and 22°C.

Six applications of each of the solutions (including the plain tap water) were made at regular intervals to the samples each working day for a total of 55 days between 5th September 2011 and 21st October 2011. In total therefore, each sample received 330 applications.

The solutions were applied to the frame and castor with a 'rubbing' motion and then left to dry without any wiping off or rinsing in order to replicate the cleaning action and method used by Health Care Workers performing disinfection practices such as 'Terminal Cleans' or 'Isolation Cleans'. The frame and castor were carefully observed with a 14x jeweller's loupe at regular intervals throughout the period of testing for signs of chemical or physical deterioration. The parts of the frame treated with plain tap water were also examined in the same way each time for comparative purposes.

### Results:

No detrimental effect or signs of any chemical deterioration have been detected on the frame following the trial period. The metal components of the frame and castor base did show some deterioration due to corrosion after about 200 applications. This did not appear to extend to the anodized screw heads.

Some minor white marking was observed on the frame treated with the stronger (10,000 ppm) solution. Previous experience has shown this can happen with the strong solution and is attributed to some calcium being deposited from 'hard' tap water by the chlorine. This was confirmed in this case by the application of a dilute lime-scale remover solution to the marks, which disappeared immediately. These marks are surface deposits only and have no detrimental effect in the integrity of the polyurethane coating or the effectiveness of the chlorine disinfection.

In areas of very hard water (for example, many parts of Leicestershire and areas near the Chiltern Hills) this effect may be expected to be more obvious and may be misinterpreted by Health Care Workers as damage. Care should be taken however in trying to remove the marks as undiluted solutions of lime-scale remover will have an adverse effect on polyurethane impregnated materials. A dilute solution of EDTA (ethylene diamine tetra acetic acid) may be a more appropriate treatment, however the manufacturers of the frame should perform extensive testing with this chemical themselves as it has not been possible to include such investigations as part of this study.

## Discussion:

In general NHS use, Chlor-Clean at the 1,000 ppm strength would be applied to cot frames only when the cot had been occupied by a patient who had a specific infection, and then usually only when the patient ceased to occupy the cot (i.e. to disinfect the mattress and frame before the next patient takes up residence; this process is usually called a 'Terminal Clean'). Only in exceptional cases would the frame be disinfected during patient occupation.

For non-infected cases the frame, mattress cover, etc., would normally be cleaned with detergent wipes or neutral detergent solutions only – i.e. no disinfection would be required. It is generally only for very exceptional cases, for example serious outbreaks of infection and then only for a short period of time (a few weeks at the most) that patient associated equipment of this nature would be disinfected with chlorine solutions on a daily basis. However local policies on this matter can vary.

The 330 applications of the total study could, therefore, represent a theoretical daily cleaning regime over a period of approximately one year; however, taking the previous paragraph into consideration, in practise it is more likely to represent actual applications of chlorine solutions to the materials over at least three to four times that length of time.

Chlor-Clean is not intended to be used at the 10,000 ppm strength. This concentration of chlorine is recommended by the Department of Health for spills of blood and blood-stained body fluids.[3] This strength of solution would be applied directly to the spill area then mopped up quickly afterwards. The area would then be cleaned with detergent and water or wipes, so that the stronger chlorine solution would only have a minimal contact time with surfaces.

The study using the stronger 10,000 ppm solution was performed to observe the likely effect of chlorine build-up on the frame and castor over an extended period of time – basically to test it to destruction. The 330 applications of the ten-times-stronger-than-normal solution would therefore donate the amount of chlorine chemical equivalent to daily applications of the 1,000 ppm solution over approximately 9 years.

As expected, the metal components of the frame and the metal base of the castor were eventually attacked by the chlorine but this was not noticeable until after about 200 applications of the stronger solution, approximately equivalent to 5 years of daily applications. This could be avoided by the use of stainless steel components (including the screws) or instructing health care personnel to rinse the Chlor-Clean solution off those metal parts with tap water about 15 to 20 minutes after application and drying carefully afterwards. In practice the latter alternative is unlikely to happen.

It is recommended that health care personnel using the cots should keep a close watch on the integrity of the varnished wood. The frame is likely to be subjected to knocks and scratches during its use and if the varnish loses its ability to resist aqueous solutions, such as detergent and water and/or chlorine solutions, damage to the wood will result.

The overall conclusion of this study is that Chlor-Clean solutions used carefully at the correct concentration of 1,000 ppm available chlorine applied to this wooden frame and castor will have no detrimental effect over many years of service, provided that the integrity of the sealing material/varnish on the wood remains intact.

Roger Wakeford-Brown
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26 October 2011

**References:**


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2. *Clostridium difficile* Infection: How to deal with the problem. Published jointly by the Department of Health and the Health Protection Agency, January 2009. Available from DoH Publications.

3. Guidance for Clinical Health Care Workers: protection against infection by blood-borne viruses. Published by the Department of Health, 1998. Available at www.open.gov.uk/doh/chcguid1