Hygiene and the use of robotic animals in hospitals: a review of the literature

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Abstract. The aim of this study is to synthesize the existing literature on hospital hygiene and robotic animals to provide researchers and professionals that use robotic animals in this environment with tools and guidelines. The conducted literature review leads to the conclusion that cleaning procedures reported in the included studies and hygienic guidelines cannot be applied to currently available robotic animals due to excessive use of water, disinfectants and high temperatures. This study consequently raises questions about the application of these robotic animals in more vulnerable populations and adds to the understanding of the required conditions for robotic animals if being developed to be used in healthcare institutions.

Keywords: Robotic animal, social robots, hygiene, literature review, reduced resistance, pathogenic microorganisms

INTRODUCTION

With technology developing at an increasing rate, the use of robots in health care is becoming more and more widespread [1, 2]. This also includes the use of animal shaped social robots that are increasingly used in therapy or as a companion [3, 4], which has been studied before in multiple populations and seems effective in diverse settings such as a tool for social development of autistic children, social interactions with preschool children and as a companion in elderly care [5-7].

Several studies have addressed or are currently addressing the effects of robotic animals used with hospitalized children [8-10]. One of these is 'the New Pals project' [11]. This study, in which Dutch and Spanish universities and hospitals collaborate, explores the possible application of the robotic animal Pleo (a robot in the shape of a baby dinosaur) to reduce anxiety and stress in hospitalized children, especially in pre and post-operative treatment [9, 12].

The New Pals project, which provides the framework and motivation for this study, raises questions about the hygiene of robotic animals in more diverse settings, including those concerning populations with a reduced resistance towards pathogenic microorganisms.

Most of these zoomorphic robots are covered with fur or other forms of realistic skin. Little is known about the ways to effectively handle and clean robotic animals to make them in concordance with existing hygiene standards in hospital settings. However, there are studies that have shown that toys can be contaminated with (pathogenic) micro-organisms and therefore may pose as a potential source of infection [13-19]. It seems likely that this is also the case with robotic animals.

Therefore we aim to synthesize literature on hygiene and robotic animals to provide guidelines regarding their hygienic application in hospitals.

METHOD

Research design

We conducted a literature review for publications regarding hygienic measures when using robotic animals with hospitalized children.

Search strategy

Databases included: Academic Search Elite, Cinahl, Pubmed, Science Direct, Google Scholar and SpringerLink. The following search terms and combination of terms were used: hygiene', 'infection prevention', 'cross infection', 'disinfection', 'decontamination', 'hospital', 'children', 'pediatric', 'oncology', 'healthcare', 'daycare', 'social robot', 'robot animal', 'robotic pet', 'Pleo', 'toys' and 'user manual'.

A filter was used to select only those articles published between 2000 and 2015. Through the 'snowball method' - checking citations and references of relevant found publications - also relevant publications beyond the initial search criteria were found.

Inclusion process

To be included in the final selection, publications had to comply with the following inclusion criteria:

- publications had to consider infection risks, prevention or hygiene with regard to robotic animals in diverse healthcare settings, and
- have well described research designs
- manuals of robotic animals had to contain well described cleaning procedures.

Unfortunately publications regarding hygiene in combination with the use robotic animals in hospital settings do not exist yet. Also, manuals with well described cleaning procedures were scarce.

Therefore we expanded our search to also include toys in general, and other settings such as other healthcare facilities (day care centers, geriatric departments, waiting rooms of general practitioners) and other types of patients (premature infants, elderly, healthy children). We also considered cleaning and disinfection recommendations of surfaces and textile since these are closely related to the materials used in robotic animals.

The search strategy resulted in 12252 publications. After studying the titles of these articles we excluded 12164 publications because they did not fit the inclusion criteria. Of the remaining 88 publications, we excluded 75 publications based on the abstracts. After checking the remaining 13 publications for relevant references, we included 5 additional publications.

We included 18 national and international publications: nine research reports [13-21], six hygienic guidelines/regulations [22-27] and four manuals of robotic animals [28-30]. See table 1 (research reports), table 2 (hygienic guidelines) and table 3 (manuals for robotic animals) for an overview of the included studies and their content.

The nine research reports consisted of three case studies measuring an outbreak of a virus or the amount of (pathogenic) micro-organisms on toys [15, 19, 20], five intervention studies with a pre and posttest (after exposure or after cleaning) without a control group [14, 16-18, 21] and one randomized controlled trial [13].

The six hygienic guidelines/ regulations were aimed at the prevention of infections in diverse settings including hematopoietic stem cell transplant (HSCT) centers (United States) [25], pediatric wards (the Netherlands) [26], a health care organization (Canada)[24], day care centers (the Netherlands) [22], medical day care centers (the Netherlands)[23] and a hospital (the Netherlands) [27].

We found four manuals of robotic animals with well described cleaning procedures. The manuals of the robotic animals included the manuals for Pleo (a robot in the shape of a baby dinosaur) [30], Paro (a robot in the shape of a baby seal) [28], FurReal Friends Puppy (a robot in the shape of a puppy) [29] and JustoCat (a robot in the shape of a cat, developed for therapy with people suffering from dementia) [31].

Analyses

We found a large variety in settings, study designs, and outcome measures, which made a detailed analysis of the effect of hygiene regulations or cleaning procedures on the hygienic application of robotic animals impossible. Therefore, a narrative synthesis was conducted describing the study design, the target population, the setting, the aim of the study, and the main outcomes.

The included publications were summarized using a pretested form by T.S.S. and were checked by C.V. This form encompassed the following themes: 1) cleaning procedure, 2) cleaning frequency, and 3) playing and sharing.

RESULTS

1) Cleaning procedure

Research reports
Nine research reports addressed the cleaning procedure of toys [13-21]. The recommendations on how to clean toys are often divided between hard (e.g. plastics) and soft toys (e.g. stuffed animal). Hard toys must be cleaned with water and soap and then be immersed in a disinfectant (bleach, hypochlorite or other disinfectants). Subsequently they must be rinsed with water and be air dried [13, 14, 16, 23-25]. For soft toys washing in the washing machine is suggested [13, 17, 18, 23, 24], but opinions about the temperature vary. 46° [13], 60° [17, 23] or 80° [18] are suggested. Soft toys can also be decontaminated by soaking them in a hypochlorite solution, followed by machine washing and drying [16] or by immersing them in a disinfectant, then rinse clean with water and dry in the air [13].

Hygienic guidelines/ hygiene regulations
Six hygienic guidelines make recommendations on the cleaning procedure of toys. Toys should be cleaned with all-purpose cleaner [22, 23] or with a disinfectant [25]. Again, a division between hard and soft toys is made. Hard toys should be scrubbed with warm soapy water, rinsed with clean water, then immersed in a mild bleach solution, rinsed again and then air dried [24, 25]. If possible, hard toys should be washed in the dish washer [24, 25]. Soft toys should be washed in a washing machine [24, 25]. Toys that can't tolerate excessive moisture are to be wiped clean with a cloth that is soaked in a disinfectant solution [24].

Three hygienic guidelines provide information on the cleaning and disinfection of surfaces, objects and linen. Surfaces are to be cleaned with all-purpose cleaner [22, 23]. Surfaces and objects that are soiled with blood, excrements or other body fluids with visible traces of blood, have to be disinfected with alcohol 70% (e.g. Ethanol, Isopropyl) or a chlorine solution [22, 23, 27]. Soiled linen has to be washed in a washing machine at 60° or higher and subsequently machine dried [22]. If this is not possible, it should be washed at 40°, at the longest programme [23].

Robotic animal manuals
The manuals of Paro (seal), Puppy (dog), JustoCat (cat) and PLEO (dinosaur) were studied. Due to their sensitive skin, Paro, Pleo and Puppy cannot be cleaned with cleansers, but should only be cleaned using a brush or a damp towel. Only JustoCat has a removable skin that should be washed at 40° and machine dried at a low temperature. Due to the technological devices in these animals they cannot be exposed to excessive water or other liquids [28-31].

2) Cleaning frequency

Research reports
Six research reports make recommendations regarding the cleaning frequency of toys [14, 17-21]. These recommendations vary between every two weeks [13], weekly [17, 18, 20], daily [21] and under certain circumstances (e.g. infectious outbreak or when contaminated with saliva) daily or directly after use [14, 19, 20].

Hygienic guidelines/ hygiene regulations
Five hygienic guidelines report on the cleaning frequency of toys [22-26]. Recommendations regarding the cleaning frequency vary between monthly [23, 26], weekly [17, 18, 20, 25] in regular circumstances. In case of exceptional circumstances (e.g. infectious outbreak or when contaminated with saliva, defecation or vomit) cleaning procedures should be executed daily or directly after use [19, 22, 23, 25].

Two hygienic guidelines report on the cleaning frequency of surfaces and (bed)linen [22, 23]. Surfaces should be cleaned daily, weekly or periodically [23]. Surfaces, furniture and objects soiled with blood, excrements, vomit, diarrhea or other bodily fluids with visible traces of blood should be cleaned and disinfected immediately [22, 23]. (Bed)linen should be washed weekly (if used by a single child) or daily (if not used by a single child) [23].

3) Playing and sharing

Research reports
Four papers report on sharing toys [14, 18-20]. Three papers advise to provide each patient with his or her own toy [14, 18, 19]. Two papers report that when patients have an infection that needs preventive measures toys should not be exchanged [18, 20].

Hygienic guidelines/ hygiene regulations
Two hygienic guidelines make recommendations on sharing toys [24, 26]. Patient-owned toys and patient-owned toys used by patients in isolation should not be exchanged [24, 26]. Toys that are put in the mouth, should also not be shared [26].

CONCLUSION

Regarding the cleaning procedure and the cleaning frequency of toys there are no definite answers to be drawn from the literature. Frequencies and methods vary, even among comparable institutions to such an extent, that it is not possible to generalize.

With regard to sharing toys, reported studies generally indicate that each patient should be provided with his/her own toy and that the extent to which toys are shared should at least be limited. The comparison of the robotic animal manuals and the advices from the literature regarding cleaning raises the question to which extent these can be integrated. The advised cleaning procedures all include extensive use of water and detergents at a high temperature, which robotic animals that are currently available cannot handle.

DISCUSSION AND PRACTICE IMPLICATIONS

Methodological considerations
Due to a lack of suitable studies, we included few on topic publications, which affects the validity of this study. This study primarily shows that little is known about the hygienic application of robotic animals.

Further, The general quality of the included research reports is low, due to a high amount of case studies and intervention studies that lack a control condition. Though the confirmability of this study was guaranteed through a double check of the results by two researchers in order to preclude bias, the dependability of this study remains debatable.

Finally, the research designs, the settings and testing methods of the included research reports vary greatly. Also, these reports vary greatly in size and comparability. This makes it hard to draw definite conclusions which limits the transferability of this study. The results of this study are therefore not necessarily applicable to all settings in which robotic animals are used. These settings often differ with regard to their clients and the hygienic standards they uphold. E.g. a daycare centre might employ different hygienic regulations than a pediatric ward in a hospital.

Practice implications
Prevention of infections by robotic animals among patients is a new study domain. To prevent robotic animals from becoming ‘dangerous pals’ instead of ‘new pals’ it is necessary to gain more knowledge about this subject. Future research should focus on risks of infections by robotic animals and the preventive measures that should be taken accordingly before these animals can be used in settings with patients that are vulnerable or have diminished resistance.

For a safe use of robotic animals in a healthcare setting, manufacturers of robotic animals, should take infection prevention and hygiene into account, during the design of their products. It might be necessarily to explore the possibilities of redesigning existing robotic animals or to design new ones.

According to this study a robotic animal should have a skin or fur that is able to withstand thorough and regular cleaning. E.g. the skin cannot have cracks and holes that can’t be reached during a cleaning session and preferably it should be possible to wash or clean the skin or fur. According to this study, removable textile parts of a robotic animals should be washable at 80° and be resistant to tumble drying.

Finally, the robotic animal, or at least the skin that seals off the mechanic parts, must be resistant to high temperatures, disinfectants and a large amount of water. When the skin is hermetically sealed off it should be eligible to submersion in:

- warm soapy water, and/or
- bleach solution,
- hypochlorite solution

When the skin is not eligible to submersion, it should be cleanable with one of the following disinfectans:

- alcohol 70% (ethanol, isopropyl),
- accelerated hydrogen peroxide,
- chlorine solution

Another option might be a disposable skin that can be renewed after a period of time or when contaminated.

After designing a robotic animal that fits the above mentioned conditions, the hygiene and cleaning procedures of this robotic animal should be thoroughly tested preferably with a control condition.

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Author biographies

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Table 1. Characteristics of the included research reports in this review

Study characteristics				**Hygiene recommendations**		
Reference ID	**Setting and study design**	**Aim and intervention**	**Results**	**Cleaning procedure**	**Cleaning frequency**	**Playing and sharing**
[18]	Ortho-geriatric ward England Intervention study, with pre and post test	To study the use of soft empathy dolls (n = 1) in relationship to a cluster of prosthetic joint infections with C*lostridium perfringens*. A used doll was washed at 60° and at 80° in a standard washing machine. The doll was tested for potential pathogenic microorganisms pre-, between and post laundry cycles.	The number of different potential pathogenic microorganisms was reduced after the 60° laundry cycle and no microorganism were left after the 80° laundry cycle.	Dolls should be washed at 80° and be tumble-dried.	Weekly	During stay on the ward and in case of a known infection single patient use only Dolls should be washed at 80° before re-using them for other patients.
[15]	Pediatric Ward Canada. Case study	To investigate the outbreak of VRE in relationship to environmental contamination. High touch surfaces, unit playroom, shared items (e.g. baby monitors and computer keyboards) and toys were tested for *Vancomycin Resistant Enterococci* (VRE)	Numerous shared items and toys were contaminated with VRE. Environmental contamination with VRE might have contributed to VRE outbreaks.	Professionals should comply to hand hygiene and to protocols for cleaning/disinfection of shared items and playrooms.		

[17]	2 Neonatal Intensive Care Units Belgium. Intervention study, with pre and post test	To determine whether a washing procedure could decrease the bacterial load of toys. 57 toys of 57 infants were tested for potential pathogenic microorganisms, then were washed at 60°, then tested again, put back in the cribs for at least three days and then tested for the last time.	After the laundry cycle the number of microorganisms (e.g. *Staphylococcus aureus*) significantly decreased.	Toys should be washed at 60° before placing them in an infant's incubator or crib.	Toys should be washed weekly.	
[19]	Pediatric Intensive Care Unit (PICU) England. Case study	To measure the incidence of microbial contamination on toys and to establish whether changes in practice are necessary. 12 toys (6 owned by children and 6 owned by the PICU) were tested for potential pathogenic microorganisms.	Potential pathogenic microorganisms (e.g. *Staphylococcus epidermidis*) were found on 9 toys. 6 of these toys were patient-owned.		Visibly soiled toys should be cleaned according cleaning or disinfection protocol or thrown away, if cleaning can't be achieved.	Toys should be patient-owned and sharing should be minimalized, unless the toys are made of a material that can be properly cleaned and the toys are disinfected between patient use.
[14]	2 general pediatric wards and an infectious disease ward Costa Rica.	To determine if toys were contaminated with potential pathogenic microorganisms when they arrive in hospital and if they were contaminated during the patients stay in hospital.	Tests before the washing procedure revealed that each toy was contaminated with at least one potential pathogenic microorganism (e.g.	Wash and disinfect hard plastic toys by scrubbing the toy in warm soapy water, rinsing it with clean water, immersing it in a mild bleach solution for 10-20 minutes, rinsing it	Toys that are mouthed, should be washed and disinfected between uses.	Infants and toddlers shouldn't share toys. Each group of children should have its own toys and not share these with other groups.

	Intervention study with pre and post test	70 toys were tested for potential pathogenic microorganisms at the arrival of the patients who owned the toys. Afterwards they were cleaned with 4% Chlorhexidine and water and tested again on the 5th-7th day (31 toys), 10-15th day (7 toys) and every week thereafter (5 toys), until the patient was discharged.	*Klebsiella pneumoniae*). After the washing procedure less microorganisms were identified.	again with cool water and letting it air dry.		
[21]	Neonatal Intensive Care Unit (NICU) The United States Systematic review, intervention study with pre and post test	Systematic review on the (possible) relationship between toys and nosocomial infection rates at the NICU. Following the review, a practice change was implemented. All toys were removed from the NICU during 6 months and pre- and post-intervention infection rates were compared	No clear causal relationship between toys and nosocomial infections at the NICU was identified. However, a plausible relationship between toys and the risk of infection was found. During the practice change, the nosocomial infection rates decreased. Although, statistically not significant, it was the lowest rate record in five	All toys should be removed from the NICU.	Toys should be cleaned daily.	

			years.			
[16]	6 general practitioner practices, one day care center and one public library New Zealand. Intervention study with pre and post tests	To determine the bacteriology of toys in a GP's waiting room and the potential for cross-infection. 46 toys (30 hard and 16 soft toys) were tested for potential pathogenic microorganisms and then decontaminated. The toys of the GP's office were placed back in the waiting room and 4 of them (2 hard and 2 soft) were tested again after two and seven days.	At pre-decontamination testing, potential pathogenic microorganisms were found on both hard and soft toys, although the contamination rates were higher on soft toys. After two day, the level of microorganisms was low for the hard toys and low or moderate for soft toys. Seven days after decontamination the level of microorganisms was the same as before the decontamination on both hard and soft toys.	Hard (plastic) toys can be decontaminated by cleaning them and then soaking them in a hypochlorite solution (2.5 g/l) for an hour. Soft toys can be decontaminated by soaking them in a hypochlorite solution (2.5 g/l) for 30 minutes, followed by machine washing and drying.		
[20]	Pediatric ward United States. Case study	To investigate an outbreak of the rotavirus on the pediatric ward in relationship to toys, available on the ward (in the playroom). No toys were tested, only patients (n = 8)	The infection control team found out that communal toys hadn't been cleaned according protocol for several months. Improperly cleaned toys may have contributed to the rotavirus outbreak.	The playroom should be cleaned with bleach (during a rotavirus outbreak).	Toys in the playroom should be cleaned weekly, according protocol. During a rotavirus outbreak, the playroom should be cleaned daily.	Sharing toys may contribute to a rotavirus outbreak. Patients with diarrhea should be restricted from the playroom.

[13]	2 day care nurseries Denmark RCT	To determine if washing and disinfection toys reduces sickness absence and the microbial pathogen load in a day care environment. 12 day care nurseries were randomized into an intervention (N=6) and control (N=6) group. Test samples were taken before and after the intervention. Intervention: toys and linen were washed and disinfected every two weeks. Toys and linen suitable for machine washing were washed at 46° and then disinfected. Toys not suitable for machine washing were immersed in disinfectant or cleaned with a microfiber cloth with disinfectant. The toys were then rinsed with clean water and dried in the air.	Few potential pathogenic microorganisms were found in both groups, before and after the intervention (15 out of 240 samples and 11 out of 240 samples). The intervention decreased the presence of adenovirus, rhinovirus and RSV in the intervention group, compared to the control group. However, the metapneumovirus was decreased in the control group, compared with the intervention group. The number of days of absence due to sickness was not reduced.	The general recommendations to clean toys regularly is not supported. (Authors note: However, the intervention did reduce the level of pathogenic microorganisms and viruses. This might not be significant for healthy day care going children, but might make a difference for sick children with weakened immune systems.)		

Table 2. Characteristics of the included hygiene regulations/ guidelines in this review

Study characteristics				Hygiene recommendations		
Reference ID	**Setting and study design**	**Aim and intervention**	**Results**	**Cleaning procedure**	**Cleaning frequency**	**Playing and sharing**
[22]	Day care centers in the Netherlands.	Hygiene guideline for the management of a gastroenteritis outbreak in day care centers.		Toys soiled with vomit and diarrhea have to be cleaned with all-purpose cleaner, then rinsed with clean water, dried with a clean cloth or paper towel, disinfected with alcohol (70%) and then air dried. Soiled linen should be washed at 60° or higher and then machine dried. Surfaces should be cleaned with all-purpose cleaner. Surfaces soiled with vomit or diarrhea should be disinfected with alcohol 70% (small surfaces) or a chlorine solution (big surfaces).	Toys used by sick children have to be cleaned daily. Surfaces soiled with vomit and diarrhea have to be cleaned and disinfected immediately.	
[23]	Medical day care centers and ‘Boddaert’ centers (centers for children with	Hygiene guideline for preventing infections in medical day care centers and ‘Boddaert’ centers.		Toys should be cleaned with all-purpose cleaner. Soiled linen should be washed in a washing machine at 60° or at 40°	Toys and stuffed animals should be cleaned or washed monthly. Mouthed toys should be cleaned	

	developmental and behavioral disorders) in the Netherlands.			(longest washing programme). Surfaces (< 0.5 m²), furniture and objects soiled with blood, excrements or other body fluids with visible traces of blood have to be wiped clean with a paper towel, cleaned with all-purpose cleaner, rinsed with clean water, dried with a clean cloth or a paper towel, disinfected with alcohol 70% and air dried or (if possible) immersed in a chlorine solution for at least 5 minutes, rinsed with clean water and air dried. Surfaces (> 0.5 m²) should be disinfected with a chlorine solution.	daily. Surfaces, furniture and objects soiled with blood, excrements or other body fluids with visible traces of blood should be cleaned and disinfected immediately.	
[24]	All clinical and community-based services of a Canadian healthcare organization.	Hygiene guideline/policy for toys and toy cleaning to prevent the spread of disease and outbreaks involving toys.		Toys are to be inspected for damage, cracks or broken parts during every cleaning session. Broken toys have to be discarded.	Toys should be cleaned weekly or sooner, if visibly soiled. Toys that are	Patient-owned toys should be kept in the patient's room.

				Wash toys in warm soapy water, then rinse the soap off and disinfect the toys by any of the following: - Wash toys in a dishwasher (if possible) - Wash cloth toys in a washing machine and then machine dry - Soak toys in a bleach solution for at least 2 minutes (30 ml bleach/4 l warm water) - Use a desinfectant - Use an accelerated hydrogen peroxide product (0.5%) Toys that are mouthed should be rinsed with clean warm water to remove the disinfection agent. Air dry the toys after disinfection. Toys that can't tolerate excessive moisture are to	mouthed should be cleaned after each use.	

				be wiped clean with a cloth that is soaked in a disinfectant solution. Wipe toys clean after 2 minutes, if the toys might be damaged by the disinfectant.		
[26]	Pediatric wards in hospitals in the Netherlands.	Hygiene guideline for the prevention of infections.			Toys for communal use and stuffed animals have to be cleaned monthly. Toys that are visibly soiled have to be cleaned immediately.	Patient-owned toys, toys used by patients in isolation, stuffed animals and toys that are mouthed have to be used by single patients only.
[25]	Hematopoietic stem cell transplant (HSCT) centers in the United States.	Hygiene guideline for preventing opportunistic infections among hematopoietic stem cell transplant recipients.		Toys should be disinfected with a nontoxic FDA- or EPA-registered disinfectant and rinsed with clean water. Cloth and plush toys should be washed in a washing machine or dry cleaned. Hard toys should be scrubbed with warm soapy water, rinsed with clean water, then	All toys should be cleaned ≥1 times/week and as needed.	

				immersed in a mild bleach solution for 10-20 minutes, rinsed again and then air dried. If possible, toys can also be washed in a dish washer or washing machine.		
[27]	Flevozieken-huis, a hospital in the Netherlands.	Hygiene guideline for preventing infections in the hospital.		Surfaces and materials should be disinfected with alcohol 70% (Ethanol, Isopropyl). This requires 2 minutes to work. Small surfaces contaminated with visible blood, should be wiped clean with a cloth and disinfected with alcohol 70% (Ethanol, Isopropyl). Surfaces and materials can also be disinfected with a Relavit chlorine solution (1 tablet/5 litres of water). This requires 5 minutes to work. Big surfaces contaminated with blood, should be wiped clean with a cloth and disinfected with a Relavit		

				chlorine solution.		

Table 3. Characteristics of the included manuals of robotic animals in this review

Study characteristics				Hygiene recommendations		
Reference ID	**Setting and study design**	**Aim and intervention**	**Results**	**Cleaning procedure**	**Cleaning frequency**	**Playing and sharing**
[28]	PARO	User manual		Clean PARO's fur with a soft cloth and brush PARO's fur with a soft brush in the direction of the fur. If the fur can't be cleaned, contact the distributor to inform whether the fur can be cleaned or replaced. Do not use water or other liquids. Do not use cleaning agents.		
[29]	Furreal Friends puppy	User manual		Clean the fur by brushing it with a cloth or soft brush to loosen any dirt. Then use a slightly damp cloth to remove stains. Do not put the robot in the washing machine. Do not submerge the robot under water. Do not use cleaning agents.		
[30]	PLEO	User manual		Clean PLEO with a damp cloth and wipe carefully.		

				Do not use soap or other cleaning agents. Do not immerse or expose PLEO to water or other liquids		
[31]	JustoCat	User manual		Wash JustoCat®'s fur and inner cushion in the washing machine at 40°C and tumble dry at a low temperature. Remove the motor box before washing. Wipe the motor box with surface disinfectant before placing it in the inner cushion. Do not immerse the motor box in disinfectant or any other liquid.		