this reason, virulent bacteriophages, lytic for starter cultures of *Lactococcus lactis* that are used for the production of cheese and other fermented milk products, are used as model viruses, and the laboratory test closely simulates the practical conditions of application.

In conclusion, we believe that the ENs for the evaluation of the virucidal activity of chemical disinfectants or antiseptics (EN 14476:2005 and EN 13610:1999) are valuable, and, although they are not perfect, they do have a useful role in helping to defend human health and industrial needs.

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Reply to Morace et al.

To the Editor—Morace et al.[1] have responded to our previous letter to the journal.[2] They agree with us that vertebrate viruses and not bacteriophages on naturally contaminated environmental hard surfaces pose a danger to public health. However, they disagree with the use of the carrier-based test method for the evaluation of microbicides (at least in the interim period while we wait for the outcome of the ring trial launched under an initiative of the Organization for Economic Cooperation and Development to harmonize test methods for hard-surface microbicides).[3] They consider the current virucidal suspension test methods of the European Union (EU) to be valuable for the evaluation of microbicides intended for use on environmental hard surfaces. They also believe that microbicides for use on virus-contaminated environmental hard surfaces should possess broad-spectrum virucidal activity.

The test methods for microbicides, including virucides, are currently undergoing substantial revisions in an attempt to make them relevant to a variety of field situations. Efforts are in place for global harmonization of hard-surface test methods. While ideally a microbicide should possess broad-spectrum virucidal activity against both enveloped and hard-to-inactivate nonenveloped viruses,[4,5] not every microbicide on the market is effective against a broad spectrum of viruses, particularly against nonenveloped viruses. Only some of the agents (oxidizers, acids, alcohols, or phenolics), depending on their concentrations, may be effective against nonenveloped viruses.[6-8] Therefore, consumers should have access both to limited but specific virucidal microbicides and to broad-spectrum virucidal microbicides. For example, most of the microbicides on the market would provide a valuable arsenal against severe acute respiratory syndrome (SARS)–associated human coronaviruses (HCoV-SARS) and avian influenza viruses, both of which are enveloped viruses, for both the infection control community and the public at large. Thus, microbicides with limited but specific virucidal activity provide microbicidal value in specific situations and yet don't diminish their potential for sustained use. Although we understand that many active ingredients do not provide broad-spectrum activity, we believe it is important for professionals and consumers to have access to broad-spectrum virucidal products, especially because many common illnesses are caused by hard-to-inactivate nonenveloped viruses, such as rhinoviruses and noroviruses.

The current virucidal suspension tests of the EU (BS EN 14476:2005 and EN 13610)[9,10] are used to evaluate both dis-

infectants (for use on virus-contaminated environmental hard surfaces) and antiseptics (for use on hands). It is the use of the suspension test method for evaluating microbicides intended for use on virus-contaminated environmental hard surfaces that is in question.

We are well aware of the carrier-based test methods that simulate field applications and that are being developed for the EU's phase 2/step 2 tests to evaluate the efficacy of microbicides for environmental hard surfaces. While these methods are currently undergoing ring trials, one cannot overlook the data generated by carrier-based methods in which the microbicides are tested under relatively stringent testing conditions; the challenge virus is dried on a prototypical carrier, as specified in ASTM E1053, as opposed to the specifications of the EU's suspension test. The stringent conditions are relevant to the field application of microbicides to virus-contaminated environmental hard surfaces.

Although we agree that the ratio of virus to microbicide is important in a carrier-based virucidal test method and that the ASTM E1053 method[11] calls for the use of a very high disinfectant volume (2 mL) compared with the quantity of virus spread on the Petri dish (0.2 mL), the existence of this weakness in the ASTM E1053 test, which is a hard-surface carrier-based virucidal test method, does not make the ASTM E1053 test a suspension test. Contrary to the assertion by Morace et al.,[1] in the ASTM E1053 virucidal test method the virus must be dried on a prototypical hard surface prior to testing. This process of drying makes it highly difficult for the microbicides to reach and penetrate the challenge virus that is embedded in organic load and to produce the desired virucidal effects; in the EU's suspension tests, however, it is easy for the microbicide to target the challenge virus. Although the ratio of virus to microbicide is currently being addressed in the ring trial, the continual use of suspension tests to evaluate microbicides intended for use on virus-contaminated environmental hard surfaces is not justified. Suspension tests, however, may have a role in dairies and food industries, as stated by Morace et al.[1] Also, we believe that, as good stewards of the global environmental sustainability efforts, we should advocate the prudent use of microbicides after an evaluation process that uses test methods relevant to their field applications.

However, we agree that the presence of nonenveloped viruses in domestic and/or healthcare settings cannot be ignored and that an ideal microbicide should be effective against all types of viruses. The latter can be true of a microbicide that is claimed to be a general virucide but not true for a specific virucide, for example, a microbicide that is claimed to be efficacious against HCoV-SARS or avian influenza viruses. Given that modern technology was able to identify the HCoV-SARS and avian influenza viruses even as the viruses were circulating in the community,[12-14] the argument that we should use only nonenveloped viruses in testing does not hold. An emerging virus could be identified rather quickly, at least to the extent that it could be placed in the viral hierarchy[4] where appropriate, and ecofriendly microbicides could be targeted to the specific emerging virus for prevention and control. This desirable outcome compares favorably with a scenario in which excessive amounts of microbicide are poured into the environment with questionable extra public health value and in contradiction to the EU's Biocides Product Directive.

In conclusion, we strongly believe that while we wait for the outcome of the ring trial conducted by the Organization for Economic Cooperation and Development, both the consumer product manufacturing industries and academia should take the high road and evaluate microbicides by means of available carrier-based test methods, instead of suspension tests, as microbicides go through the screening process to enter the marketplace. During this interim period, we also encourage the EU's regulatory agencies to accept virucidal data generated by means of carrier-based virucidal test methods that have been accepted by other international regulatory agencies (the Australian Therapeutic Goods Administration, the Canadian General Standards Board, and the US Environmental Protection Agency).[15-17]

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Evaluation of the Efficacy of a Conventional Cleaning Regimen in Removing Methicillin-Resistant *Staphylococcus aureus* From Contaminated Surfaces in an Intensive Care Unit

TO THE EDITOR—Methicillin-resistant *Staphylococcus aureus* (MRSA) is a major nosocomial pathogen in United Kingdom hospitals that causes substantial increases in morbidity and mortality rates, particularly among patients in the intensive care unit (ICU).[1,2] Most transmission of MRSA from patient to patient is thought to be mediated by transiently colonized healthcare workers (HCWs), with colonized patients acting as reservoirs.[3] Recently, Hardy et al.[4] reported on the contribution of environmental MRSA contamination to the spread of MRSA between hospitalized patients. Guidelines for controlling MRSA transmission in the United Kingdom emphasize the importance of environmental cleaning and recommend the application of cleaning regimens after discharge of patients infected or colonized with MRSA.[5] However, it has been reported that such cleaning regimens are not always effective at removing MRSA from contaminated environmental surfaces.[6,7] The objective of this study was to examine the efficacy of daily level 2 cleaning (ie, environmental decontamination of a room or bed space, in which detergents are used to clean and 1% hypochlorite solution is used to disinfect the area) in eliminating MRSA from environmental sampling sites touched by MRSA-positive patients, their visitors, and/or the HCWs providing their care.

The study was carried out between April 2006 and March 2007 in the 8-bed ICU at Antrim Area Hospital, a 426-bed general teaching hospital in Northern Ireland. Prior to commencement of the study, all upward-facing surfaces in the ICU and all equipment used in the care of ICU patients were cleaned with detergent and disinfected with 1% hypochlorite solution; in addition, all bed screens were replaced. If an MRSA-positive patient was identified, that patient's bed space and patient care equipment were cleaned daily, in accordance with the level 2 cleaning protocol.

The following 3 types of sample sites were identified and examined: (1) patient-specific sites touched by HCWs (ie, drawer handles, bench tops, syringe-driver pumps, ventilator panels and/or screens, Baxter or infusion pumps for central vascular catheters, and syringe-driver panels), (2) sites touched by HCWs and/or patients or visitors (ie, bedside stand and cot sides), and (3) sites touched by HCWs at the central nursing station (ie, computer "enter" keys, computer mouse devices, and staff telephone handsets). Sample areas from each of the above sample sites were delineated with alcohol-sterilized 2.5 × 2.5 cm or 10 × 10 cm metal templates, and swab samples were collected with a sterile swab (Transwab; Medical Wire and Equipment) moistened in sterile water.

During the first 9 months of the study, samples were collected from the sites immediately prior to the level 2 cleaning and every hour after the level 2 cleaning for up to 7 hours. Consideration of the results obtained during this period led to an increase in sampling intervals during the last 3 months of the study (ie, samples were obtained 1, 3, and 5 hours after the cleaning). Swab samples were plated on selective chromogenic agar (bioMérieux), and colonies exhibiting morphology typical of MRSA were recovered and analyzed with catalase tests and coagulase tests, as well as by use of an automated phenotypic identification system (Vitek 2; bioMérieux). Isolates confirmed to be MRSA were typed with pulsed-field gel electrophoresis (PFGE) by use of techniques based on the methods described by Tenover et al.[8]

A total of 37 MRSA-positive patients were identified during the study period, and environmental screening was performed for 14 of these patients. MRSA was recovered from environmental sites for 6 patients before and/or after the level 2 cleaning, as detailed in the Table. For the remaining 8 patients,