**Clinical Librarian Service Search Results**

**Request:** Are there any studies looking at the survival of respiratory viruses on hands vs. non sterile procedure gloves?

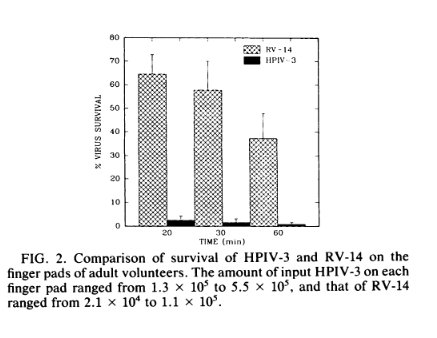
**Summary**

A search of bibliographic databases and the internet retrieved only 9 articles on survival of respiratory viruses on skin or gloves, with only one of these referring to gloves (9, 1980). Most articles assessed skin and surfaces found in the community setting rather than clinical settings. Due to the paucity of literature, no date limit has been applied, and dates are given with references. Survival times in the literature for various respiratory viruses are:

**Rhinovirus and parainfluenza:**

One study assessed rhinovirus survival after 1 or 2 hours: *“Our study showed that rhinovirus can survive on hands for several hours, similar to previous reports of virus survival on human skin, emphasizing that handrelated transmission is the main transmission route…Our study showed that virus survival, and therefore infectiousness, was related to the viral concentration in droplets”* (1, 2015).

An earlier paper (6, 1991) includes this graph comparing human parainfluenza and rhinovirus (rhinovirus is dotted, parainfluenza is solid in the graph):

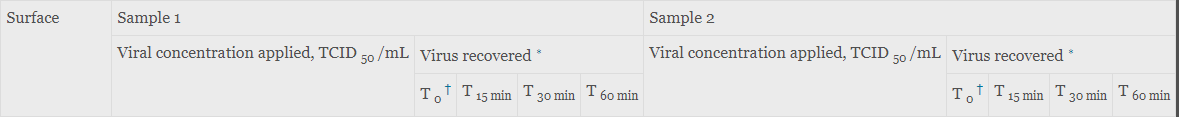


The authors state that nearly 16% of the rhinovirus remained on hands after 3 hours, but the parainfluenza became virtually undetectable after an hour (6, 1991). Conversely, a 1990 study found parainfluenza could survive for up to 10 hours on “nonabsorptive surfaces (stainless steel, laminated plastic, skin)” (7). Without reading the article it is unclear whether this applies to skin or, for example, stainless steel.

**Influenza:**

One study assessed influenza virus survival, using the same methods as article 1 below (2015), and found: *“After 30 min, infectious virus was detectable in only a small minority of subjects. Infectious viruses were detected for a longer period of time when droplets of larger size containing a higher number of particles were tested or when the viral concentration increased. A rapid decrease in infectiousness was observed when droplet integrity was disrupted”* (2, 2014).

Another paper includes this table (4, 2012):





And concludes “The results suggest that H1N1 does not survive long on naturally contaminated skin and fomites” (4, 2012).

A much earlier paper found influenza virus lasted on hands for “up to 5 minutes” (8, 1982).

However, a Thai study found that hourly handwashing during nursery school was needed to reduce influenza-like illness sickness absence in pre-school children, while handwashing every 2 hours or before lunch did not have a significant effect (5, 2012).

**Respiratory syncytial virus:**

A 1980 study in the hospital setting found respiratory syncytial virus remained on rubber gloves for up to one and a half hours, and on skin for up to 20 min (9).

**Cytomegalovirus:**

A study looking at congenital transmission found: *“After application of bacteria to the hands, viable CMV was recovered from 17/20 swabs at 0 min, 18/20 swabs at 1 min, 5/20 swabs at 5 min, and 4/20 swabs at 15 min. After transfer, duration of survival was at least 15 min on plastic (1/2 swabs)…no viable virus was collected from wood, rubber, or hands.”* (3, 2014).

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**Current at:** 1st April 2020

**Time taken for search:** 4 hours.

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I hope that I have interpreted your request correctly. Please let me know if you would like me to search further.

**Accessing Articles**

Links are provided where online access to the full-text is available. An OpenAthens username and password may be required for online access to articles. You can register for one here: <https://openathens.nice.org.uk/>

Unfortunately there may occasionally be some problems accessing the links provided. In this case the items can be accessed via the Library Journals link: <http://journals.nice.org.uk/>. [Log in to OpenAthens via the link in the top tight-hand corner].

If the full-text is not available, you can request an Inter-Library Loan freely and directly via our Inter-Library Loans system: CLIO. Register for CLIO (using your library membership number) at: [https://derbyill.cliohosting.co.uk](https://derbyill.cliohosting.co.uk/). Further information can be found at: <http://www.uhdblibrary.co.uk/ills>.

**Please acknowledge this work in any resulting paper or presentation as:**

Evidence Search: Respiratory virus survival gloves (LS408). Lindsay Snell (2019). Derby, UK: University Hospitals of Derby & Burton NHS Foundation Trust Library and Knowledge Service.

**Feedback**

Once you have read this report, I would appreciate it if you would complete our online literature search feedback form at:

<https://www.smartsurvey.co.uk/s/LiteratureSearchFeedback20192020/>

This relates to this specific search and will help us to monitor and improve our service. Many Thanks.

Kind regards,

Lindsay Snell

Clinical Librarian

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Tel: Ext. 88156

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**Results**

# 1. Survival of rhinoviruses on human fingers.

**Author(s):** L'Huillier, A G; Tapparel, C; Turin, L; Boquete-Suter, P; Thomas, Y; Kaiser, L

**Source:** Clinical microbiology and infection : the official publication of the European Society of Clinical Microbiology and Infectious Diseases; Apr 2015; vol. 21 (no. 4); p. 381-385

Available at [Clinical microbiology and infection : the official publication of the European Society of Clinical Microbiology and Infectious Diseases](http://www.clinicalmicrobiologyandinfection.com/article/S1198743X14001384/pdf) - from Unpaywall

Rhinovirus is the main cause of the common cold, which remains the most frequent infection worldwide among humans. Knowledge and understanding of the rhinovirus transmission route is important to reduce morbidity as only preventive measures are effective. In this study, we investigated the potential of rhinovirus to survive on fingers. Rhinovirus-B14 was deposited on fingers for 30, 60, 90 and 120 min. Survival was defined as the ability of the virus to grow after 7 days, confirmed by immunofluorescence. Rhinovirus survival was not dependent on incubation time on fingers. Droplet disruption had no influence on survival. Survival was frequent with high rhinovirus concentrations, but rare with low-concentration droplets, which corresponded to the usual rhinovirus concentrations in mucus observed in children and adults, respectively. Our study confirms that rhinovirus infectiousness is related to the viral concentration in droplets and suggests that children represent the main transmission source, which occurs only rarely via adults. It confirms also that rhinovirus hand-related transmission is possible and supports hand hygiene as a key prevention measure.

**Database:** Medline

# 2. Survival of influenza virus on human fingers.

**Author(s):** Thomas, Y; Boquete-Suter, P; Koch, D; Pittet, D; Kaiser, L

**Source:** Clinical microbiology and infection : the official publication of the European Society of Clinical Microbiology and Infectious Diseases; Jan 2014; vol. 20 (no. 1); p. O58

Available at [Clinical microbiology and infection : the official publication of the European Society of Clinical Microbiology and Infectious Diseases](http://www.ingentaconnect.com/openurl?genre=article&issn=1198-743X&volume=20&issue=1&spage=O58) - from IngentaConnect - Open Access

Available at [Clinical microbiology and infection : the official publication of the European Society of Clinical Microbiology and Infectious Diseases](https://onlinelibrary.wiley.com/doi/full/10.1111/1469-0691.12324) - from Wiley Online Library Free Content - NHS

Available at [Clinical microbiology and infection : the official publication of the European Society of Clinical Microbiology and Infectious Diseases](http://www.ingentaconnect.com/openurl?genre=article&issn=1198743X&volume=20&issue=1&spage=O58) - from IngentaConnect

Available at [Clinical microbiology and infection : the official publication of the European Society of Clinical Microbiology and Infectious Diseases](http://search.ebscohost.com/login.aspx?direct=true&scope=site&site=ehost-live&db=mdc&AN=23927722) - from EBSCO (MEDLINE Complete)

Available at [Clinical microbiology and infection : the official publication of the European Society of Clinical Microbiology and Infectious Diseases](http://www.clinicalmicrobiologyandinfection.com/article/S1198743X14602196/pdf) - from Unpaywall

Indirect transmission of the influenza virus via finger contamination with respiratory mucus droplets has been hypothesized to contribute to transmission in the community. Under laboratory conditions, influenza-infected respiratory droplets were reconstituted as close as possible to natural conditions. We investigated experimentally the survival of influenza A (H3N2) and A (H1N1)pdm09 viruses on human fingers. Infectious virus was easily recoverable on all fingers 1 min after fingertip contamination but then decreased very rapidly. After 30 min, infectious virus was detectable in only a small minority of subjects. Infectious viruses were detected for a longer period of time when droplets of larger size containing a higher number of particles were tested or when the viral concentration increased. A rapid decrease in infectiousness was observed when droplet integrity was disrupted. Our findings could help to set up the promotion of hand hygiene to prevent influenza hand contamination.

**Database:** Medline

# 3. Cytomegalovirus Survival and Transferability and the Effectiveness of Common Hand-Washing Agents against Cytomegalovirus on Live Human Hands

**Author(s):** Stowell J.D.; Cannon M.J.; Forlin-Passoni D.; Radford K.; Bate S.L.; Dollard S.C.; Bialek S.R.; Schmid D.S.

**Source:** Applied and Environmental Microbiology; Jan 2014; vol. 80 (no. 2); p. 455-461

Available at [Applied and environmental microbiology](http://europepmc.org/search?query=(DOI:10.1128/AEM.03262-13)) - from Europe PubMed Central - Open Access

Available at [Applied and environmental microbiology](http://aem.asm.org/lookup/doi/10.1128/AEM.03262-13) - from HighWire - Free Full Text

Available at [Applied and environmental microbiology](https://aem.asm.org/content/aem/80/2/455.full.pdf) - from Unpaywall

Congenital cytomegalovirus (CMV) transmission can occur when women acquire CMV while pregnant. Infection control guidelines may reduce risk for transmission. We studied the duration of CMV survival after application of bacteria to the hands and after transfer from the hands to surfaces and the effectiveness of cleansing with water, regular and antibacterial soaps, sanitizer, and diaper wipes. Experiments used CMV AD169 in saliva at initial titers of 1x105 infectious particles/ml. Samples from hands or surfaces (points between 0 and 15 min) were placed in culture and observed for at least 2 weeks. Samples were also tested using CMV real-time PCR. After application of bacteria to the hands, viable CMV was recovered from 17/20 swabs at 0 min, 18/20 swabs at 1 min, 5/20 swabs at 5 min, and 4/20 swabs at 15 min. After transfer, duration of survival was at least 15 min on plastic (1/2 swabs), 5 min on crackers and glass (3/4 swabs), and 1 min or less on metal and cloth (3/4 swabs); no viable virus was collected from wood, rubber, or hands. After cleansing, no viable virus was recovered using water (0/22), plain soap (0/20), antibacterial soap (0/20), or sanitizer (0/22). Viable CMV was recovered from 4/20 hands 10 min after diaper wipe cleansing. CMV remains viable on hands for sufficient times to allow transmission. CMV may be transferred to surfaces with reduced viability. Hand-cleansing methods were effective at eliminating viable CMV from hands. © 2014, American Society for Microbiology. All Rights Reserved.

**Database:** EMBASE

# 4. Survival of influenza virus on hands and fomites in community and laboratory settings.

**Author(s):** Mukherjee, Dhritiman V; Cohen, Bevin; Bovino, Mary Ellen; Desai, Shailesh; Whittier, Susan; Larson, Elaine L

**Source:** American journal of infection control; Sep 2012; vol. 40 (no. 7); p. 590-594

Available at [American journal of infection control](https://auth.elsevier.com/ShibAuth/institutionLogin?entityID=https://idp.eng.nhs.uk/openathens&appReturnURL=https%3A%2F%2Fwww.clinicalkey.com%2Fcontent%2FplayBy%2Fdoi%2F%3Fv%3D10.1016%2Fj.ajic.2011.09.006) - from ClinicalKey

BACKGROUND Transmission dynamics modeling provides a practical method for virtual evaluation of the impact of public health interventions in response to prospective influenza pandemics and also may help determine the relative contribution of different modes of transmission to overall infection rates. Accurate estimates of longevity for all forms of viral particles are needed for such models to be useful. METHODS We conducted a time course study to determine the viability and longevity of H1N1 virus on naturally contaminated hands and household surfaces of 20 individuals with laboratory-confirmed infection. Participants coughed or sneezed into their hands, which were sampled immediately and again after 5, 10, and 30 minutes. Samples also were obtained from household surfaces handled by the participants immediately after coughing/sneezing. Clinically obtained H1N1 isolates were used to assess the viability and longevity of the virus on various artificially inoculated common household surfaces and human hands in a controlled laboratory setting. Viral detection was achieved by culture and real-time reverse-transcriptase polymerase chain reaction. RESULTS The results suggest that H1N1 does not survive long on naturally contaminated skin and fomites, and that secretions deposited on hands by coughing or sneezing have a concentration of <2.15 × 10 to 2.94 × 10 TCID(50)/mL. CONCLUSIONS These data can be used to estimate the relative contribution of direct and indirect contact transmission on overall infection rates.

**Database:** Medline

# 5. Appropriate time-interval application of alcohol hand gel on reducing influenza-like illness among preschool children: a randomized, controlled trial.

**Author(s):** Pandejpong, Denla; Danchaivijitr, Somwang; Vanprapa, Nirun; Pandejpong, Temyos; Cook, Earl Francis

**Source:** American journal of infection control; Aug 2012; vol. 40 (no. 6); p. 507-511

Available at [American journal of infection control](https://auth.elsevier.com/ShibAuth/institutionLogin?entityID=https://idp.eng.nhs.uk/openathens&appReturnURL=https%3A%2F%2Fwww.clinicalkey.com%2Fcontent%2FplayBy%2Fdoi%2F%3Fv%3D10.1016%2Fj.ajic.2011.08.020) - from ClinicalKey

BACKGROUND We studied the efficacy of different time-interval applications of alcohol hand gel as a strategy for the prevention of influenza-like illness (ILI) in preschool-age children. METHODS We performed a classroom-based cluster randomization at a kindergarten school in Bangkok, Thailand. A total of 1437 children were placed into 3 test groups, based on the frequency of alcohol hand gel use for hand hygiene: only before lunch (q lunch), every 120 minutes (q 120), and every 60 minutes (q 60). The primary outcome was a change in the school absenteeism rate caused by ILI. RESULTS The rates of absenteeism from confirmed ILI (sick days/present days) were 0.026 in the q lunch group, 0.025 in the q 120 group, and 0.017 in the q 60 group. Significant reductions in absenteeism rates were seen when comparing the q 60 group with the q 120 group (rate difference, 0.009; 95% confidence interval [CI], -0.002 to 0.015; P = .008) and comparing the q 60 group with the q lunch group (rate difference, 0.0096; 95% CI, 0.004-0.016; P = .002). No such differences were detected between the q 120 and q lunch groups (rate difference, 0.001; 95% CI, 0.005-0.007; P = .743). CONCLUSIONS The compulsory hourly use of alcohol gel as classroom hand disinfection could significantly reduce the rate of absenteeism from ILI in preschool-age children.

**Database:** Medline

# 6. Potential role of hands in the spread of respiratory viral infections: studies with human parainfluenza virus 3 and rhinovirus 14.

**Author(s):** Ansari, S A; Springthorpe, V S; Sattar, S A; Rivard, S; Rahman, M

**Source:** Journal of clinical microbiology; Oct 1991; vol. 29 (no. 10); p. 2115-2119

Available at [Journal of clinical microbiology](http://europepmc.org/search?query=(DOI:10.1128/JCM.29.10.2115-2119.1991)) - from Europe PubMed Central - Open Access

Available at [Journal of clinical microbiology](https://jcm.asm.org/content/29/10/2115) - from HighWire - Free Full Text

Available at [Journal of clinical microbiology](https://www.ncbi.nlm.nih.gov/pubmed/1658033) - from PubMed

Available at [Journal of clinical microbiology](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC270283/) - from PubMed Central

Available at [Journal of clinical microbiology](https://jcm.asm.org/content/jcm/29/10/2115.full.pdf) - from Unpaywall

Hands often become contaminated with respiratory viruses, either directly or through contact with contaminated surfaces. Spread of such viruses could then occur by touching the nasal mucosa or the conjunctivae. In this quantitative study, we compared the survival of mucin-suspended human parainfluenza virus 3 (HPIV-3) and rhinovirus 14 (RV-14) and the transfer of the viruses to and from the fingers of adult volunteers. When each finger pad was contaminated with 10 microliters of either HPIV-3 (1.3 x 10(5) to 5.5 x 10(5) PFU) or RV-14 (2.1 x 10(4) to 1.1 x 10(5) PFU), less than 1.0% of HPIV-3 and 37.8% of RV-14 remained viable after 1 h; after 3 h, nearly 16% of RV-14 could still be detected, whereas HPIV-3 became undetectable. Tests on the potential spread of viruses from contaminated hands or surfaces were conducted 20 min after contamination of the donor surface by pressing together donor and recipient surfaces for 5 s. Transfer of HPIV-3 from finger to finger or finger to metal disk could not be detected, but 1.5% of infectious HPIV-3 was transferred from disk to finger. Irrespective of the type of donor or recipient surface, 0.7 to 0.9% of RV-14 was transferred. The relatively rapid loss of HPIV-3 infectivity on hands suggests that their role in the direct spread of parainfluenza viruses is limited. However, the findings of this study further reinforce the view that hands can be vehicles for rhinovirus colds. These results also suggest a role for nonporous environmental surfaces in the contamination of hands with respiratory viruses.

**Database:** Medline

# 7. Survival and disinfection of parainfluenza viruses on environmental surfaces.

**Author(s):** Brady, M T; Evans, J; Cuartas, J

**Source:** American journal of infection control; Feb 1990; vol. 18 (no. 1); p. 18-23

Three dilutions of each of three parainfluenza strains were placed on nonabsorptive (stainless steel, laminated plastic, skin) and absorptive (hospital gown, facial tissue, laboratory coat) surfaces to assess persistence of virus recovery at 0, 0.5, 1, 2, 4, 6, 8, and 10 hours. Virus persisted longest on stainless steel. Additionally, the ability to recover virus was enhanced by increasing the initial concentration of virus in the initial inoculum. Drying of the inoculum on surfaces reduced but did not immediately eliminate the ability to recover virus. Cleaning the contaminated surface with a number of commonly available disinfectant or antiseptic agents reduced or eliminated virus with only short exposure times. It is likely that removal of contaminated material by vigorous cleaning was as important as the actual disinfecting substance. In general, all three strains of parainfluenza virus responded similarly. Persistence of all three strains of parainfluenza virus for up to 10 hours on nonabsorptive surfaces and up to 4 hours on absorptive surfaces suggests a need to consider fomites a possible source of transmission of the parainfluenza viruses inside and outside the hospital.

**Database:** Medline

# 8. Survival of influenza viruses on environmental surfaces.

**Author(s):** Bean, B; Moore, B M; Sterner, B; Peterson, L R; Gerding, D N; Balfour, H H

**Source:** The Journal of infectious diseases; Jul 1982; vol. 146 (no. 1); p. 47-51

To investigate the transmission of influenza viruses via hands and environmental surfaces, the survival of laboratory-grown influenza A and influenza B viruses on various surfaces was studied. Both influenza A and B viruses survived for 24-48 hr on hard, nonporous surfaces such as stainless steel and plastic but survived for less than 8-12 hr on cloth, paper, and tissues. Measurable quantities of influenza A virus were transferred from stainless steel surfaces to hands for 24 hr and from tissues to hands for up to 15 min. Virus survived on hands for up to 5 min after transfer from the environmental surfaces. These observations suggest that the transmission of virus from donors who are shedding large amounts could occur for 2-8 hr via stainless steel surfaces and for a few minutes via paper tissues. Thus, under conditions of heavy environmental contamination, the transmission of influenza virus via fomites may be possible.

**Database:** Medline

# 9. Possible transmission by fomites of respiratory syncytial virus.

**Author(s):** Hall, C B; Douglas, R G; Geiman, J M

**Source:** The Journal of infectious diseases; Jan 1980; vol. 141 (no. 1); p. 98-102

To test whether nosocomial spread of respiratory syncytial virus (RSV) could occur through contact with environmental surfaces contaminated by RSV-infected nasal secretions, survival in the environment of RSV isolated from media, pooled adult secretions, and secretions from hospitalized infants was examined. RSV in freshly obtained infant secretions was recovered from countertops for up to 6 hr, from rubber gloves for up to 1 1/2 hr, from cloth gowns and paper tissue for 30--45 min, and from skin for up to 20 min. RSV in media and pooled secretions survived for slightly longer periods. Further experiments demonstrated that infectious virus could be transferred to hands touching these contaminated surfaces and could be recovered from these hands for up to 25 min. These studies suggest that survival of RSV in the environment of infected infant secretions is sufficient to allow transfer of infectious virus to the hands of hospital personnel. Thus, self-inoculation by contact with contaminated infant secretions may be a potential mode of nosocomial transmission of RSV.

**Database:** Medline

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**Databases searched:** MEDLINE, EMBASE, Cinahl, Emcare, PubMed, UpToDate, DynaMed.

**Search History:**

|  |  |  |  |
| --- | --- | --- | --- |
| **#** | **Database** | **Search term** | **Results** |
| 9 | Medline | (glove\*).ti,ab | 10217 |
| 10 | Medline | exp "GLOVES, PROTECTIVE"/ | 4863 |
| 11 | Medline | (nitrile).ti,ab | 4498 |
| 22 | EMBASE | (glove\*).ti,ab | 13584 |
| 23 | EMBASE | exp "GLOVES, PROTECTIVE"/ OR GLOVE/ | 9134 |
| 24 | EMBASE | (nitrile).ti,ab | 5571 |
| 35 | CINAHL | (glove\*).ti,ab | 3885 |
| 36 | CINAHL | GLOVES/ | 3154 |
| 37 | CINAHL | (nitrile).ti,ab | 123 |
| 38 | CINAHL | (35 OR 36 OR 37) | 5302 |
| 48 | EMCARE | (glove\*).ti,ab | 3701 |
| 49 | EMCARE | exp "GLOVES, PROTECTIVE"/ OR GLOVE/ | 3376 |
| 50 | EMCARE | (nitrile).ti,ab | 195 |
| 53 | EMCARE | (skin OR hands OR hand).ti,ab | 190799 |
| 54 | EMCARE | EPIDERMIS/ | 2819 |
| 55 | EMCARE | SKIN/ | 27624 |
| 56 | EMCARE | "HAND PALM"/ | 521 |
| 57 | EMCARE | FINGER/ | 3628 |
| 58 | EMCARE | HAND/ | 3844 |
| 63 | EMBASE | EPIDERMIS/ | 34741 |
| 64 | EMBASE | SKIN/ | 155376 |
| 65 | EMBASE | "HAND PALM"/ | 2710 |
| 66 | EMBASE | FINGER/ | 24361 |
| 67 | EMBASE | HAND/ | 27049 |
| 68 | EMBASE | (skin OR hand OR hands).ti | 221115 |
| 71 | CINAHL | (skin OR hands OR hand).ti,ab | 151964 |
| 72 | CINAHL | EPIDERMIS/ | 928 |
| 73 | CINAHL | SKIN/ | 13289 |
| 76 | CINAHL | exp HAND/ | 16839 |
| 77 | CINAHL | (71 OR 72 OR 73 OR 76) | 165546 |
| 80 | Medline | EPIDERMIS/ | 20871 |
| 81 | Medline | SKIN/ | 188471 |
| 83 | Medline | FINGERS/ | 29702 |
| 84 | Medline | HAND/ | 41901 |
| 85 | Medline | (skin OR hand OR hands).ti | 206170 |
| 86 | Medline | (9 OR 10 OR 11 OR 80 OR 81 OR 83 OR 84 OR 85) | 402580 |
| 87 | Medline | exp VIRUSES/ OR exp "VIRUS DISEASES"/ | 1275784 |
| 88 | Medline | exp "RESPIRATORY TRACT DISEASES"/ | 1319882 |
| 91 | Medline | (survival OR stability OR stable OR "how long" OR viability OR viable).ti,ab | 1995314 |
| 92 | Medline | "MICROBIAL VIABILITY"/ | 12462 |
| 93 | Medline | "TIME FACTORS"/ | 1174811 |
| 94 | Medline | (91 OR 92 OR 93) | 3044751 |
| 95 | Medline | (flu OR influenza\* OR parainfluenza\* OR rhinovirus\*).ti,ab | 132130 |
| 96 | Medline | (respiratory ADJ3 virus\*).ti,ab | 22256 |
| 97 | Medline | (respiratory ADJ3 viral).ti,ab | 5909 |
| 98 | Medline | (respiratory).af | 615825 |
| 99 | Medline | (87 AND 98) | 57877 |
| 100 | Medline | (87 AND 88) | 106752 |
| 101 | Medline | exp "INFLUENZAVIRUS A"/ OR exp "INFLUENZAVIRUS B"/ OR exp "INFLUENZAVIRUS C"/ | 44319 |
| 102 | Medline | exp "RESPIRATORY SYNCYTIAL VIRUS, HUMAN"/ | 2456 |
| 103 | Medline | "RESPIRATORY SYNCYTIAL VIRUSES"/ | 5865 |
| 104 | Medline | PNEUMOVIRINAE/ | 18 |
| 105 | Medline | PNEUMOVIRUS/ | 153 |
| 106 | Medline | METAPNEUMOVIRUS/ | 1272 |
| 107 | Medline | RHINOVIRUS/ | 3677 |
| 108 | Medline | (95 OR 96 OR 97 OR 99 OR 100 OR 101 OR 102 OR 103 OR 104 OR 105 OR 106 OR 107) | 215076 |
| 109 | Medline | (86 AND 94 AND 108) | 107 |
| 110 | EMBASE | (22 OR 23 OR 24 OR 63 OR 64 OR 65 OR 66 OR 67 OR 68) | 414419 |
| 111 | EMBASE | "MICROBIAL VIABILITY"/ | 3893 |
| 112 | EMBASE | "VIRUS VIABILITY"/ | 441 |
| 113 | EMBASE | "TIME FACTOR"/ | 32922 |
| 114 | EMBASE | (survival OR stability OR stable OR "how long" OR viability OR viable).ti,ab | 2682114 |
| 115 | EMBASE | (111 OR 112 OR 113 OR 114) | 2712246 |
| 116 | EMBASE | (flu OR influenza\* OR parainfluenza\* OR rhinovirus\*).ti,ab | 148911 |
| 117 | EMBASE | (respiratory ADJ3 virus\*).ti,ab | 25695 |
| 118 | EMBASE | (respiratory ADJ3 viral).ti,ab | 7792 |
| 119 | EMBASE | exp \*VIRUS/ | 437150 |
| 120 | EMBASE | (respiratory).af | 1054291 |
| 121 | EMBASE | (119 AND 120) | 20655 |
| 122 | EMBASE | exp \*VIRUS/ OR exp \*"VIRUS INFECTION"/ | 1024365 |
| 123 | EMBASE | exp "RESPIRATORY TRACT DISEASE"/ | 2369425 |
| 124 | EMBASE | (122 AND 123) | 116237 |
| 125 | EMBASE | exp "INFLUENZA VIRUS"/ | 31143 |
| 126 | EMBASE | exp "RESPIRATORY SYNCYTIAL VIRUS, HUMAN"/ | 4453 |
| 128 | EMBASE | PNEUMOVIRINAE/ | 224 |
| 129 | EMBASE | PNEUMOVIRUS/ | 129 |
| 130 | EMBASE | exp METAPNEUMOVIRUS/ | 3411 |
| 131 | EMBASE | exp RHINOVIRUS/ | 8307 |
| 132 | EMBASE | (116 OR 117 OR 118 OR 121 OR 124 OR 125 OR 126 OR 128 OR 129 OR 130 OR 131) | 234481 |
| 133 | EMBASE | (110 AND 115 AND 132) | 173 |
| 134 | EMCARE | (48 OR 49 OR 50 OR 53 OR 54 OR 55 OR 56 OR 57 OR 58) | 199150 |
| 135 | EMCARE | "MICROBIAL VIABILITY"/ | 134 |
| 136 | EMCARE | "VIRUS VIABILITY"/ | 69 |
| 137 | EMCARE | "TIME FACTOR"/ | 1203 |
| 138 | EMCARE | (survival OR stability OR stable OR "how long" OR viability OR viable).ti,ab | 389377 |
| 139 | EMCARE | (135 OR 136 OR 137 OR 138) | 390511 |
| 140 | EMCARE | (flu OR influenza\* OR parainfluenza\* OR rhinovirus\*).ti,ab | 25169 |
| 141 | EMCARE | (respiratory ADJ3 virus\*).ti,ab | 3737 |
| 142 | EMCARE | (respiratory ADJ3 viral).ti,ab | 1247 |
| 143 | EMCARE | exp VIRUS/ | 127557 |
| 144 | EMCARE | (respiratory).af | 190052 |
| 145 | EMCARE | (143 AND 144) | 8386 |
| 146 | EMCARE | exp VIRUS/ OR exp "VIRUS INFECTION"/ | 258473 |
| 147 | EMCARE | exp "RESPIRATORY TRACT DISEASE"/ | 504964 |
| 148 | EMCARE | (146 AND 147) | 52964 |
| 149 | EMCARE | exp "INFLUENZA VIRUS"/ | 4833 |
| 150 | EMCARE | exp "RESPIRATORY SYNCYTIAL VIRUS, HUMAN"/ | 843 |
| 151 | EMCARE | PNEUMOVIRINAE/ | 13 |
| 152 | EMCARE | PNEUMOVIRUS/ | 11 |
| 153 | EMCARE | exp METAPNEUMOVIRUS/ | 592 |
| 154 | EMCARE | exp RHINOVIRUS/ | 1284 |
| 155 | EMCARE | (140 OR 141 OR 142 OR 145 OR 148 OR 149 OR 150 OR 151 OR 152 OR 153 OR 154) | 63100 |
| 156 | EMCARE | (134 AND 139 AND 155) | 155 |
| 157 | CINAHL | (35 OR 36 OR 37 OR 71 OR 72 OR 73 OR 76) | 169069 |
| 160 | CINAHL | "TIME FACTORS"/ | 174745 |
| 161 | CINAHL | (survival OR stability OR stable OR "how long" OR viability OR viable).ti,ab | 261295 |
| 162 | CINAHL | (160 OR 161) | 419722 |
| 163 | CINAHL | (157 AND 162) | 13336 |
| 164 | CINAHL | (flu OR influenza\* OR parainfluenza\* OR rhinovirus\*).ti,ab | 27926 |
| 165 | CINAHL | (respiratory ADJ3 virus\*).ti,ab | 3087 |
| 166 | CINAHL | (respiratory ADJ3 viral).ti,ab | 1124 |
| 167 | CINAHL | exp VIRUSES/ OR exp "VIRUS DISEASES"/ | 212965 |
| 168 | CINAHL | (respiratory).af | 164170 |
| 169 | CINAHL | (167 AND 168) | 13426 |
| 170 | CINAHL | exp VIRUSES/ OR exp "VIRUS DISEASES"/ | 212965 |
| 171 | CINAHL | exp "RESPIRATORY TRACT DISEASES"/ | 298936 |
| 172 | CINAHL | (170 AND 171) | 33905 |
| 173 | CINAHL | exp "INFLUENZAVIRUS A"/ OR exp "INFLUENZAVIRUS B"/ OR exp "INFLUENZAVIRUS C"/ | 5695 |
| 175 | CINAHL | exp "RESPIRATORY SYNCYTIAL VIRUSES"/ | 972 |
| 176 | CINAHL | (164 OR 165 OR 166 OR 169 OR 172 OR 173 OR 175) | 49665 |
| 177 | CINAHL | (163 AND 176) | 96 |

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