DISCUSSION

If a viral probe were going to be conducted using impaction devices, what is the best way to ship the agar plates (Andersen, Rodac) from the field to the laboratory once sampling is complete?

CLOSURE

Ice packs are definitely the way to ship impacted petri plates Freezing them on dry ice would preserve some viruses a little better, but would make it difficult to render the agar surface into a useable specimen With overnight delivery, plates and ice packs can be sent easily and received for processing in the laboratory the following day In fact, we have done this with Rodac plates several times, and have recovered adenoviruses, parainfluenzaviruses, echoviruses and other picornaviruses, respiratory syncytial virus, and various mycoplasma species. The only problem we have encountered is fungi in the viral cultures, this was overcome by filtering the contaminated cultures through disposable 0 22 μ filters before subpassaging

DISCUSSION

Should viruses be sampled by wet collection systems (impinger/impactor) or by dry collection systems (filter cassette)? Should different collection methods be used for different families, genera, or serotypes?

CLOSURE

Viruses should be sampled by wet systems to maintain their viability Dried viruses are dead viruses, and until rapid antigen tests become more available, viruses must be kept "alive" to culture them Wet systems are useable for all virus families and genera

DISCUSSION

Can parvovirus B19 be spread by aerosol in medical clinics? What type of engineering controls are appropriate to reduce the risk of aerosol transmission of viral diseases in outpatient clinics, general offices, and schools?

CLOSURE

B19 is a nosocomial pathogen, spread both by aerosols and fomites (H Faden et al , Journal of Infectious Diseases 161 354-355, 1990) Epidemiologic data shows efficient spread within elementary school classrooms and within family units Engineering design of the flow of conditioned air from the floor upwards will minimize the risk of infections by aerosolized viruses

DISCUSSION

You mentioned that herpes simplex 1 and 2 could be infectious from surfaces and aerosols Do you have an approximate number of infections that have occurred by these forms of transmission? How big a problem could this be in a crowded business office, say, with some individuals that are infected with herpes and who practice poor personal hygiene? Could you identify this type of problem by swabbing surfaces?

CLOSURE

Because herpes 1 infections are so common in children, who are exposed from multiple routes of transmission, it is difficult to know the percentage of infections that result from fomites vs aerosols Herpes 2 is spread predominantly by sexual contact Herpetic lesions of either type which are active (and therefore contain high titers of virus) are very painful to the touch, and this reduces the chance of fomite spread, on the other hand, it is possible to contaminate a

surface with lesion fluid via one's fingers without actually touching the lesion For this reason, good personal hygiene is very important in office and home settings If such a problem is suspected, surfaces such as desks and light switches can easily be swabbed with a moist cotton applicator The chances of recovering herpes viruses from these swabs depends heavily on how much virus was initially present and how recently it was deposited (that is, you can recover virus so long as it did not "dry" out) Probably, the very act of swabbing office surfaces would serve to remind those present to be careful!

DISCUSSION

Has anyone demonstrated that good filtration and ventilation in classrooms decrease disease rates?

CLOSURE

Studies during World War II showed that enclosed, crowded barracks were prime targets for outbreaks of adenoviral and influenzal disease, and that these outbreaks could be ameliorated with adequate ventilation Open windows in elementary school classrooms serve the same purpose More recently, a study by Brundage et al [48] showed increased risk of aerosol-transmitted infections in tightly enclosed buildings and a reduced risk in older, more open buildings

DISCUSSION

Speaking of studies of ARD in Army barracks, especially the studies you just referred to showing increased risk in tighter buildings, what controls are feasible in such buildings if transmission is airborne rather than by fomites?

CLOSURE

Outside air can be mixed with recirculated air before it is conditioned, and this will dilute the airborne viruses generated by persons in the building In seasons of obvious outbreaks of respiratory disease, the volume of outside air can be increased to effect a greater dilution Also, the recirculated air can be passed through ultraviolet light, which is very effective against viruses

DISCUSSION

With regards to epidemiology, how significant is the dormant characteristic of viruses when attempting to find sources and etiology?

CLOSURE

Viruses are never dormant in the biological sense of the word Some can become latent in an infected person by retreating to nerve cells (e g , herpes viruses), lymphoid tissue (e g , adenoviruses), etc. They are not transmissible from the latent state Rather, viruses are always spread by person-to-person or person-surface-person transmission Therefore, the person who recently became infected serves as a potent source of virus for the next several days

DISCUSSION

Could you describe the proper sampling and sample transport methods and what are the caveats of sampling for viruses?

CLOSURE

I believe that impactor samplers work well with 1, 2, or 3-minute exposure of the agar plates The plates should be immediately sealed with tape and shipped with cold packs overnight to the laboratory This prevents drying and deterioration and reduces bacterial and fungal growth on the plates

DISCUSSION

What effect does the humidity level in room air have on the collection of airborne viruses?

CLOSURE

Humidity has a great deal to do with survival of viruses in air, and therefore with collection of airborne viruses The air probably should be sampled longer (e g , 4 or 5 minutes) in dry air because any viruses present will lose their infectivity quicker, and therefore the longer sampling time will increase the chances of picking up virus

DISCUSSION

Assuming that herpes virus type 6 is the cause of chronic fatigue syndrome, can this disease be transmitted in air? How long do Epstein-Barr virus and herpes type 6 virus remain viable in air?

CLOSURE

Current data suggest that herpes 6 is not the cause of chronic fatigue syndrome, but is associated with a childhood rash illness called roseola infantum Anecdotal information suggests that both herpes 6 and Epstein-Barr virus (EBV) are highly labile in air, and are spread predominantly by direct contact with secretions and only to a lesser extent by aerosols and fomites

DISCUSSION

Can routine air sampling for viruses in general be helpful in surveillance of hospital environments or around infectious waste incinerators, etc.?

CLOSURE

Here you have a cost vs benefit problem I believe that routine virus sampling, with the necessary culturing and identification work, is too costly to be done on an ongoing basis. Large hospitals have "Infection Control Officers" who monitor suspicious outbreaks of a virus within a section of the hospital (nosocomial infections) It is routine practice in such situations to institute rigorous handwashing, mask and gown changes, disinfection of surfaces, and cohorting or isolation of patients to contain the outbreak It is also feasible to sample air and surfaces in the affected parts of the hospital, including infectious waste incinerators, in an effort to trace the source of the outbreak Environmental sampling would, of course, have to be done before the general disinfection steps were carried out

DISCUSSION

What are the predominant viruses found in an office setting, and what is a good means to sample for these viruses from the air?

CLOSURE

In a typical office environment with middle-aged adults, influenza virus, rhinoviruses, and enteroviruses would predominate, because these are the agents of respiratory disease outbreaks among adults They will likely be present only during the outbreaks, which are seasonal. Sampling methods have been discussed earlier

DISCUSSION

What are the key aspects of sampling for aerosolized influenza and rhinovirus in a confined environment such as an airliner cabin?

CLOSURE

Air sampling can be done with impaction devices placed at air outlets and inlets of airliner cabins to determine the extent of viral

contamination in the air and whether viruses are getting through the cooling system intact and being released back into the cabin The same principles apply that have been discussed above, and the viral cultures done in the laboratory upon receipt of the agar plates can be optimized for these particular viruses

DISCUSSION

Is antigen sampling an adequate way to look for viruses in air?

CLOSURE

Theoretically, yes At the moment, however, we have little information on the durability of viral antigens in air. The adenovirus hexon antigen has been detected in ophthalmic solutions, air filters, etc. (see text, Sect. 4 0). Certainly, monoclonal antibodies used in EIA or TR-FIA tests are an excellent start for such studies

DISCUSSION

Is air sampling for human viruses practical and useful?

CLOSURE

I believe it is practical when people are apparently getting sick in a building, and when there is epidemiologic evidence to confirm this. Often, the investigation will turn up a causative problem that the building managers did not know existed Air systems and water systems have frequently been incriminated in such outbreaks