DISCUSSION

Could you address the limitations of the LAL assay in detecting endotoxin from different gram-negative bacteria?

Would some LPS not be detected by LAL, yet still have biological activity on humans?

CLOSURE

Endotoxins from various gram-negative bacteria will be detected by the Limulus amebocyte lysate (LAL) assay. The test may not differentiate necessarily endotoxins with varying degrees of toxicities when assayed for different biological properties. It is known, for example, that various gram-negative bacteria are not equally toxic when inhaled by animals.

Questions have been made recently concerning endotoxins which remain associated to the bacterial cells and whether their presence will be estimated accurately by the LAL assay. Research relating results from dose and response measurements should lead to resolution of some of these types of questions.

DISCUSSION

What is the recommended method for air sampling of endotoxin?

The outline mentions a hypothetical case of endotoxin-related humidifier fever. What would be the best way to sample and analyze airborne and bulk water samples?

CLOSURE

Standard methods for air sampling for endotoxins have not been defined. In many ways the methods would depend on the environment to be measured and the type and quantity of airborne materials. The manuscript addresses certain methods which have proven to be successful, and various groups have endorsed the chromogenic modification of the Limulus amebocyte lysate test for quantitating endotoxins in environmental samples.

DISCUSSION

Do all bacteria contain endotoxin? What determines their presence and release?

CLOSURE

Gram-negative bacteria contain endotoxins. They are released after bacterial lysis and during active cell growth. From this we know, therefore, that endotoxins can be found in environments in which viable gram-negative bacteria cannot be demonstrated.

DISCUSSION

Do you see any role of protozoa in ingestion of gram-negative bacteria and enrichment for endotoxins?

CLOSURE

It would seem that any situation in which the growth of gram-negative bacteria is increased could result in the formation and presence of endotoxins.

DISCUSSION

Are there any data on levels of endotoxin and/or human effects in homes downwind from sewage treatment plants?

CLOSURE

Published data do exist for exposures and health-related effects in workers in waste treatment and sewage sludge operations both in the United States and in Sweden. I am not aware if those investigators examined areas beyond the occupational environments.

DISCUSSION

What level of endotoxins in bulk carpet or HVAC systems would be considered "contaminated" regardless of the presence of adverse health symptoms?

Have you ever measured endotoxin concentrations in cooling tower reservoir water, especially after biocide treatment?

How do you decontaminate?

CLOSURE

Our experience in these areas is limited to only one preliminary study of carpet in which we found 4.6×10^3 colony forming units of gram-negative bacteria per square inch. The endotoxin level was 7.58×10^4 Endotoxin Units per square inch. It is difficult to interpret these data from such a limited study. I am not aware of an agreed upon action level for this type of contamination.

Removal of gram-negative bacteria from contaminated materials would remove the source of new endotoxin contamination. Engineering controls and decontamination procedures are beyond the scope of this paper.