

Annex C (informative)

Field tests - Paired comparisons

Field 1

C.1 Introduction

~~Although the diffusive uptake will have been determined, and any effect of environmental factors checked, in the laboratory tests,~~ ^{monitoring in} ~~there may be some factors existing in the workplace that will influence the performance of a diffusive sampler. Such factors may be rapidly changing concentrations, or the presence of unanticipated interferences, or the presence of the analyte either as suspended matter or sorbed onto suspended matter. Tests should therefore be conducted under conditions typical for the intended use of the diffusive sampler, to determine the presence of any systematic difference between the sampler results and those of an independent method.~~ ^{Laboratory validation accounts for many of the variables that may be in the field however}

NOTE:

In this context neither the diffusive sampler nor the independent method gives the "true" result, as both are subject to error. The difference between individual paired results should not therefore be interpreted as a bias. ^{fluctuation in humidity}

C.2 Requirement

→ C.2.1 Paired sample t-test

The mean value of $[\log x - \log y]$ should not be significantly different from zero. If it is, it represents a systematic difference between the measurements made by the diffusive and independent methods for which an explanation should be sought.

→ C.2.2 Regression analysis

The 95 % confidence limits of the values a and b (see C.4.2.2) should respectively embrace zero and unity. If not, a deviation represents a systematic difference between the measurements made by the diffusive and independent methods for which an explanation should be sought.

NOTE:

Most computer programs for linear regression analysis assume x is without error and slightly underestimate b as a result. The correlation coefficient, r, has only qualitative value in this context.

C.3 Materials

See 6.1 and 6.2.

C.4 Method of test

C.4.1 Procedure

At an appropriate test site or sites, workers potentially exposed to the analyte should be selected, in order to cover as wide a concentration range as practicable, without deliberately exposing workers to concentrations at or around the limit value. For each selected worker, use one diffusive sampler and one sampler of an independent method (see 6.3; preferably that used to verify the calibration gas mixture in 6.4, provided it is suitable for personal monitoring), placing them in the breathing zone as close as practicable to each other, so that they sample from essentially the same atmosphere. At least 20 data-

pairs are required for this test. Analyze the samplers and calculate the apparent exposure concentration for each sampler. For diffusive samplers use the calculation in 7.5.

C.4.2 Calculations

C.4.2.1 General

Compare the apparent exposure concentration measured by the diffusive sampler with that measured by the independent method. Any suitable statistical test may be used to determine any systematic difference between the two sets of results. Two possible tests are given in C.4.2.2 and C.4.2.3.

C.4.2.2 Paired sample t-test

Construct a table with the data-pair number (i) and the two estimates, x(i) and y(i), of the exposure concentration. In most practical situations, x and y will follow a log-normal distribution, so add columns for log x(i) and log y(i). Add a last column for [log x(i) - log y(i)]. On the assumption that (log x(i) - log y(i)) is normally distributed, calculate the mean and standard deviation and test whether the mean is significantly different from zero by a t-test using 95 % confidence limits.

C.4.2.3 Linear regression analysis

On the assumption that there is a linear relationship between x and y, the relationship between the two sampling methods may be examined by linear regression analysis. It is convenient to use a computer program, and as in C.4.2.2, a logarithmic transformation is desirable in order to normalize the standard deviation of measurements made at different concentrations. The result of a linear regression analysis will normally be the values a and b of the equation:

$$\log y = a + b \cdot \log x \quad \dots (C.1)$$

together with standard errors of a and b, and a correlation coefficient, r.

Annex D (informative)

Field tests - Multiple comparisons

D.1 Introduction

Although the diffusive uptake rate will have been determined, and any effect of environmental factors checked in the laboratory tests, there may be some factors existing in the workplace that will influence the performance of a diffusive sampler. Such factors may be rapidly changing concentrations, or the presence of unanticipated interferences, or the presence of the analyte either as suspended matter or sorbed onto suspended matter. Tests should therefore be conducted under conditions typical of the intended use of the diffusive sampler, to determine the precision of replicate sampler results and those of an independent method under these conditions.

D.2 Requirement

The field precision of the diffusive sampler (see D.4.2.1) should not greatly exceed the precision determined under laboratory conditions (see 7.13). In deciding whether the field precision is acceptable, the determined value for the independent samplers (see D.4.2.2) needs to be taken into account.