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TITLE

DISTRIBUTION OF A 100 PPM VINYL CHLORIDE TEST ATMOSPHERE IN AN

INHALATION CHAMBER CONTAINING RAT AND MOUSE RACKS WITH AND WITHOUT

PLASTIC DIVIDERS

11

PAGES
IN FULL
REPORT

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*M. J. McKenna 7/20/79*This
report
is:☐ INTERIM☒ FINAL

and mainly:

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case filed

☒

no patent action required

DESCRIPTIVE SUMMARY WITH CONCLUSIONS:

Rat and mouse racks, with and without plastic dividers, were exposed to a test atmosphere in order to evaluate what effect plastic dividers have on the distribution of vapors in an inhalation chamber.

Plastic dividers in a rat or mouse rack do not effect the desired equal distribution of vapors in an inhalation chamber. The distribution analysis of the test atmosphere was the same for each rat rack, with or without plastic dividers placed between rows of cages. Likewise the chamber concentration was nearly identical at all points near a mouse rack with plastic dividers between rows of cages. Based on these results, it was decided that dividers will be placed between rows of cages for all animal racks in all future vapor or gas inhalation studies conducted in the 14.5 m³ chambers, unless otherwise noted in the study protocol.

The use of dividers between rows of cages will facilitate better animal care and will possibly allow longer periods of time between cage washings. However, the dividers will have to be frequently washed, which probably will result in increased maintenance costs.

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DISTRIBUTION OF A 100 PPM VINYL CHLORIDE TEST ATMOSPHERE IN AN INHALATION
CHAMBER CONTAINING RAT AND MOUSE RACKS WITH AND WITHOUT PLASTIC DIVIDERS

R&S 101774

by

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July 17, 1979

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INTRODUCTION

Inhalation exposures of rats and mice have generally been conducted in chambers using no dividers between rows of cages in order to ensure proper aerodynamic function and equal distribution of the test atmospheres in the chambers. However, there have been two consistent exceptions to this general rule in our laboratory. Six stainless steel 4 m³ chambers were custom designed so that racks can be wheeled into the chambers; racks for these chambers have dividers between rows of cages at all times for collection of animal excreta. The other exception has been the mouse racks which were custom designed for use in the 14.5 m³ epoxy resin-coated chambers. These mouse racks have been particularly troublesome in that they have automatic watering devices which tend to leak, soaking the animals and food in all lower rows of cages. Therefore plastic dividers are used between rows of cages in these racks at all times. These two obvious exceptions in operating procedure have raised questions regarding animal care, since dividers for collection of excreta are present in some instances but not in others. Therefore, the objective of this study is to evaluate what effect plastic dividers have on the distribution of a test atmosphere in an inhalation chamber. This information will facilitate a decision as to whether or not dividers between rows of cages should be used in all racks for inhalation studies conducted in the 14.5 m³ chambers. Vinyl chloride was used as the test atmosphere in this study as a matter of convenience and expediency. A study had just been completed using vinyl chloride and it was advantageous to use the same generating and analytical set-up.

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METHOD

Analyses of the vinyl chloride concentration in Chamber C were conducted under the following gas chromatography conditions:

Column: 3' x 1/8" s.s. Poropak K Type QS 80/100 mesh

Temperatures: Column - 125°C

Detector - 200°C

Injector - 200°C

5 ml gas sampling loops

Air: 290 ml/min

N₂: 35 ml/min

H₂: 30 ml/min

Chamber C (14.5 m³) has a pyramidal-shaped stainless steel ceiling and an epoxy resin coated floor and walls. Airflow through the chamber was maintained at 2600 l/min. The test atmosphere was generated by metering vinyl chloride from a 10 lb. cylinder into the chamber inlet duct.

Six rat racks with plastic dividers were placed in Chamber C and three 1/8" Teflon sample lines were fastened to each rack in the second row, middle row and in the bottom row as shown in Figure 1. The analysis from the normal chamber sampling line, designated in Figure 1 as the reference line, was used as a reference for the other sampling lines. An analysis of the reference line was run prior to conducting the analyses of the 3 sampling lines to each rack. The average G.C. peak height for two samples obtained from each sampling line was compared to the average peak height of the reference line in order to evaluate each sampling line in terms of % of the chamber concentration.

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A tabulation of these analyses is found in Table 1.

In a second experiment, distribution was evaluated when plastic dividers were not present using the same six rat racks as described in the previous paragraph and as shown in Figure 1.

A third experiment was conducted using a mouse rack with plastic dividers in the middle of Chamber C as would occur when rats and mice are exposed simultaneously. Eighteen sampling lines were fastened to the mouse rack; two rat racks with plastic dividers were placed on each side of the mouse rack as shown and described in Figure 2. Sampling and evaluation techniques were the same as in experiments 1 and 2.

RESULTS

Experiment 1.

Distribution of the test atmosphere within the chamber varied slightly more than 10% (Table 1). The largest deviation from the reference line values occurred for those sample lines which were attached to the rack in the left rear of the chamber.

Experiment 2.

Distribution of the test atmosphere within the chamber varied approximately 10% (Table 2) and was nearly identical to the distribution observed in Experiment 1. Again, the largest deviation from the reference line values occurred for those sample lines which were attached to the rack in the left rear of the chamber. Therefore, the plastic dividers apparently did not alter the distribution of the test atmosphere. The variations in chamber distribution noted in both Experiments 1 & 2 were thought to reflect an imbalance in airflow patterns resulting from improper adjustment of chamber exhaust ports.

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Experiment 3.

Distribution of the test atmosphere was very uniform and apparently was unaffected by the presence of plastic dividers (Table 3). Analyses of the sample lines attached to the mouse rack were nearly identical in all instances to the reference value.

SUMMARY AND CONCLUSIONS

Rat and mouse racks, with and without plastic dividers, were exposed to a test atmosphere in order to evaluate what effect plastic dividers have on the distribution of vapors in an inhalation chamber.

Plastic dividers in a rat or mouse rack do not effect the desired equal distribution of vapors in an inhalation chamber. The distribution analysis of the test atmosphere was the same for each rat rack, with or without plastic dividers placed between rows of cages. Likewise the chamber concentration was nearly identical at all points near a mouse rack with plastic dividers will be rows of cages. Based on the results, it was decided that dividers will be placed between rows of cages for all animal racks in all future vapor or gas inhalation studies conducted in the 14.5 m³ chambers, unless otherwise noted in the study protocol.

The use of dividers between rows of cages will facilitate better animal care and will possibly allow longer periods of time between cage washings. However, the dividers will have to be frequently washed, which probably will result in increased maintenance costs.

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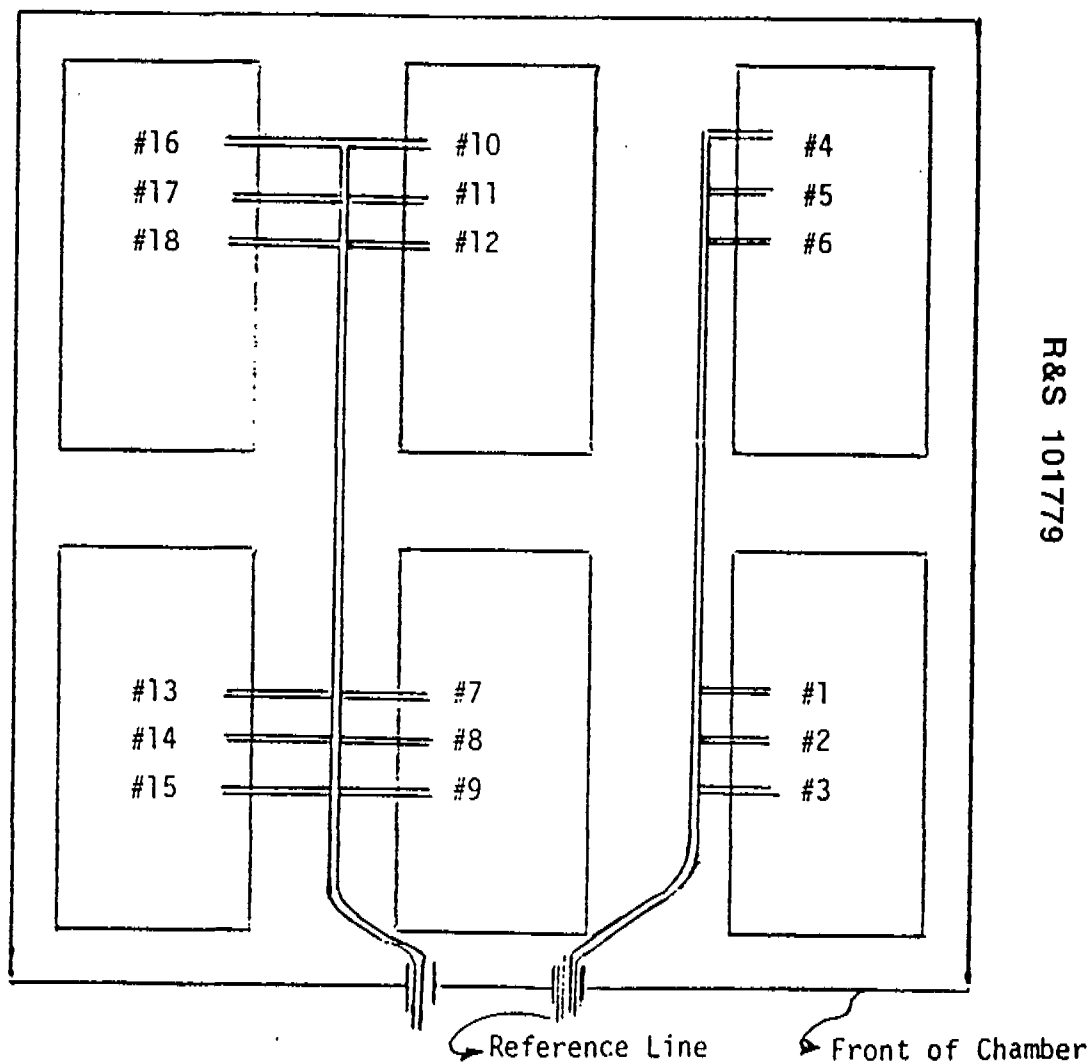
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Figure 1

Schematic of Positioning Rat Racks and Sample Lines in Chamber C



The inlets of sample lines numbers 1, 4, 7, 10, 13, and 16 were positioned in the middle cage of the second row in each rack respectively.

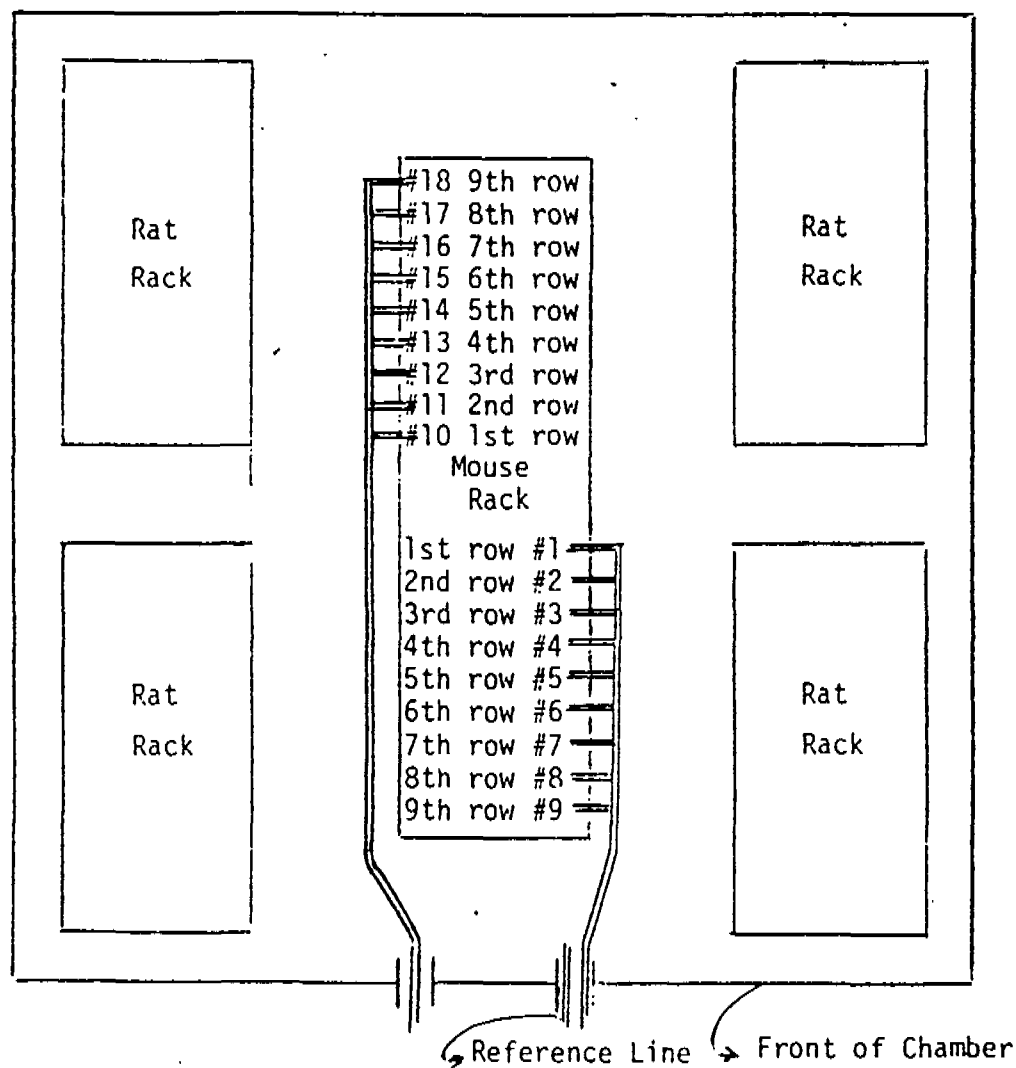
Sample line inlets 2, 5, 8, 11, 14, and 17 were positioned in the middle cage of the middle row of each rack respectively.

Number 3, 6, 9, 12, 15, and 18 sample line inlets were positioned in the middle cage of the bottom row of each rack respectively.

The reference line extended approximately 3 inches into the chamber.

Figure 2

Schematic of Positioning Sample Lines to Mouse Rack in Chamber C



The mouse rack contains 9 rows of cages on each side with each row separated from the other by a plastic divider.

Sample lines #1 through #9 were positioned in the middle cage of each row of the right front half of the rack.

Lines #10 through #18 were positioned in the middle cage of each row of the left back half of the rack.

The reference line extended approximately 3 inches into the chamber proper.

The 4 rat racks contained plastic dividers.

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Table 1

DISTRIBUTION CHECK OF 6 RAT RACKS IN CHAMBER C
UTILIZING PLASTIC DIVIDERS IN THE RAT RACKS

<u>Sample Line</u>	<u>Peak Height Av.</u>	<u>% of Control*</u>
Reference	62	-
#1	62	100
#2	62	100
#3	58	93.5
Reference	61.75	-
#4	59.75	96.8
#5	59.75	96.8
#6	56.25	91.1
Reference	60.25	-
#7	57.5	95.4
#8	56.5	93.8
#9	56	92.9
Reference	58	-
#10	56	96.6
#11	55	94.8
#12	51.75	89.2
Reference	57.75	-
#13	52.5	90.9
#14	52.5	90.9
#15	52.75	91.3
Reference	57.5	-
#16	50.25	87.4
#17	50.25	87.4
#18	49.6	86.3

*These values represent the percentage of the value obtained by sampling through the reference line.

Table 2

DISTRIBUTION CHECK OF 6 RAT RACKS WITHOUT DIVIDERS IN CHAMBER C

<u>Sample Line</u>	<u>Peak Height Av.</u>	<u>% of Control*</u>
Reference	60.5	-
#1	63	104
#2	60	99.1
#3	58	95.9
Reference	60.5	-
#4	60.25	99.6
#5	61	101
#6	57.5	95
Reference	59.25	-
#7	57.75	97.5
#8	57	96.2
#9	56.5	95.4
Reference	58	-
#10	57	98.3
#11	56.25	97
#12	54	93.1
Reference	59.25	-
#13	54	91.1
#14	53.5	90.3
#15	53.5	90.3
Reference	57.75	-
#16	52	90
#17	54.25	93.9
#18	53	91.8

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*These values represent the percentage of the value obtained by sampling through the reference line.

Table 3

DISTRIBUTION ANALYSIS OF A MOUSE RACK IN CHAMBER C
CONTAINING 4 RAT RACKS WITH PLASTIC DIVIDERS

<u>Sample Line</u>	<u>Peak Height Av.</u>	<u>% of Control*</u>
Reference	58.5	-
#1	55.25	94.4
#2	56.75	97.0
#3	56	95.7
Reference	56.5	-
#4	55	97.3
#5	54.25	96.0
#6	56.5	100
Reference	57	-
#7	56	98.2
#8	54.5	95.6
#9	52.5	92.1
Reference	64.25	-
#10	60.25	93.8
#11	61.75	96.1
#12	62	96.5
Reference	64.75	-
#13	62.25	96.1
#14	61.5	95.0
#15	61	94.2
Reference	62	-
#16	59.75	96.4
#17	60	96.8
#18	58	93.5

*These values represent the percentage of the value obtained by sampling through the reference line.

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