

## Effect of Exposure to Spray Paint on Lung Function of Automobile Spray Painters in Benin City.

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### Abstract

**Background:** Automobile spray paint is a mixture of substances, which include solvents (styrene, isocyanates, xylene and alcohol) with inhibitors and pigments like acrylates and methyl acrylates. Automobile spray painters are prone to developing respiratory symptoms. The aim of this study was to determine the effect of automobile spray paint on lung function of automobile spray painters in Benin City. **Materials and Methods:** A total of forty (40) apparently healthy male subjects between the ages of 20 and 40 years were recruited for this study. They consist of two groups of twenty (20) subjects each. Group A is experimental group and group B is control group. Spirometry measurements were done on both groups which were matched against their age, sex, height and chest circumference. Data was appropriately recorded. Statistical analysis was carried out using Graph Pad Prism 5.0. The independent Student t-test was used to compare means between exposed subjects and unexposed subjects. All results were presented as Means  $\pm$  SEM in graphs. P values less than 0.05 ( $p < 0.05$ ) were considered statistically significant. **Result:** Pulmonary function tests (Forced expiratory volume, FEV<sub>1</sub>; Forced vital capacity, FVC; and Peak expiratory flow rate, PEFR) in the exposed group were significantly lower in the exposed group compared with control. **Conclusion:** This showed that exposure to spray paint reduces lung functions as indicated by the lowered respiratory parameters. This may result in respiratory distress if precautionary measures such as wearing of safety gadgets during work as well as routine medical checkup.

**Key words:** Lung function, PEFR, Spray painter, FVC and FEV<sub>1</sub>

### Introduction

Spray painting is a painting technique where a device sprays a coating (paint, ink, varnish, etc.) through the air onto a surface. The most common types employ compressed gas usually air to atomize and direct the paint particles. Spray guns evolved from airbrushes, and the two are usually distinguished by their size and the size of the spray pattern they produce. Airbrushes are hand-held and used instead of a brush for detailed work such as photo retouching, painting nails or fine art. Air gun spraying uses equipment that is generally larger. Automobile spray paint is a mixture of substances which include solvents (styrene,

isocyanates, xylene and alcohol) with inhibitors and pigments like acrylates and methyl acrylates as well as additives like metals (1). Acrylates and methyl acrylates are associated with difficulty in breathing and irritation of throat; nose and lung passage (2) Automobile spray painters are prone to develop respiratory symptoms (3). Heavy metals like; lead, cadmium, antimony, copper, zinc, chromium, cobalt, arsenic and others, which are the most polluting metals, may also be encountered in paints as inorganic coloured pigments(4). They are dangerous because they accumulate in our bodies causing several effects on the human systems including the pulmonary system (5).

Spirometry records the volume of air inhaled and exhaled plotted against time during various ventilatory maneuvers (6). The graphs obtained from these studies can indicate normal patterns or abnormal patterns characteristic of obstructive, restrictive, or mixed lung disease FEV1 is the dynamic volume most often used with FVC in diagnosis of respiratory diseases. Hence the aim of this study is to evaluate the effect of automobile spray paint on lung function of automobile spray painters using respiratory parameters such as FEV1, FVC and PEFV.

### Materials and method

A total of 40 apparently healthy male subjects between the ages of 20 and 40 years were recruited for this study (7). They consist of two groups of 20 subjects each, group A (experimental) and group B (control). The experimental group is made up of healthy male subjects who had worked for a period of 2 to 15 years. The control group is made up of apparently healthy unexposed male subjects.

Anthropometric measurements which include age, height, weight and chest circumference values were recorded. The

### Results

lung function tests were carried out in all the subjects using digital spirometer [Spiro lab (iv) (Italy)]. Three measurements were done and the highest values were recorded and documented.

### Exclusion criteria

They include subjects with known cardio respiratory diseases, metabolic disorders, thoracic /abdominal surgeries, hypersensitivity and drug therapy. Also subjects with histories of smoking and tobacco usage.

Informed consent was taken from each subject after detail explanation of the research procedure. Self-administered well-structured questionnaire was given to obtain information about workers demographic data, life style, medical history and occupational history.

Statistical analyses were carried out using Graph Pad Prism 5.0. The independent Student t-test was used to compare means between exposed subjects and unexposed subjects. All results were presented as Means  $\pm$  SEM in graphs.  $p < 0.05$  accepted as significant.

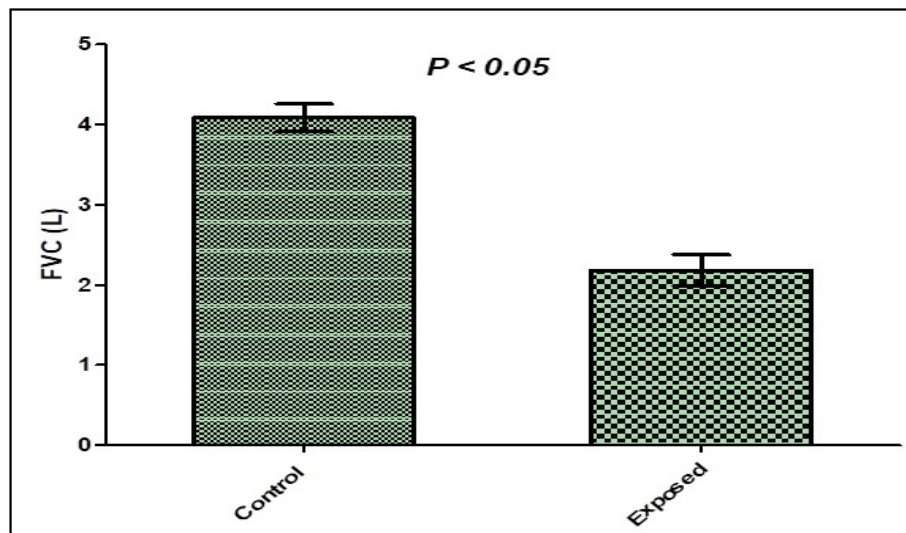


Fig 1: Shows the graphical representation of FVC in spray painters

This shows that FVC was significantly lower in exposed individuals compared with control ( $p < 0.05$ ).

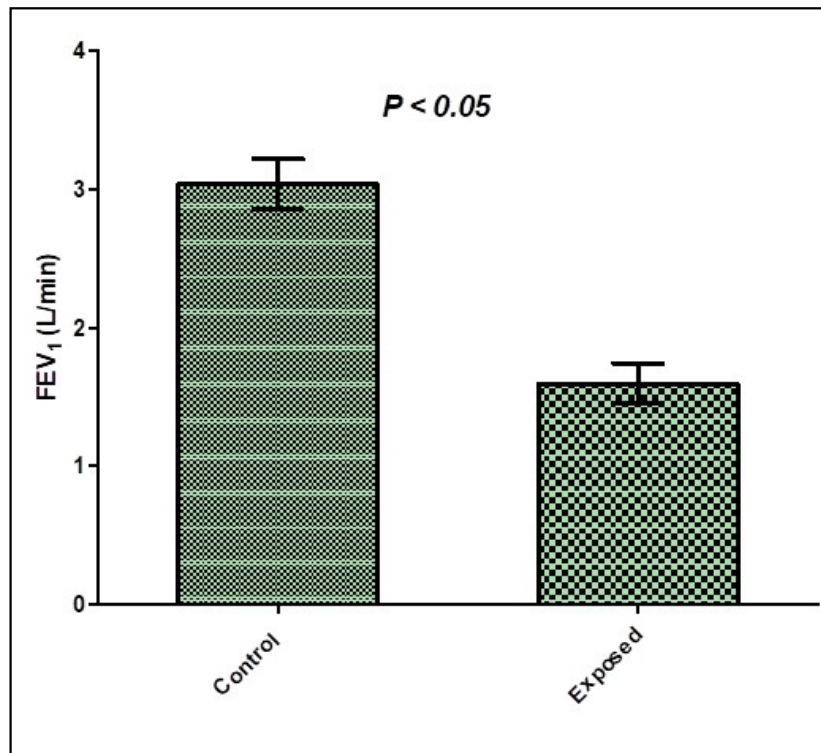


Fig 2: Shows the graphical representation of **FEV<sub>1</sub>** in spray painters

This shows that FEV<sub>1</sub> was significantly lower in exposed individuals compared with control ( $p < 0.05$ ).

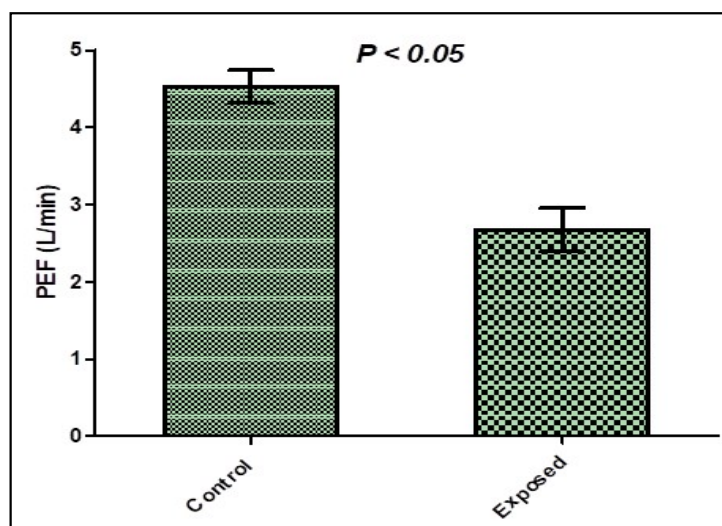


Fig 3: Shows the graphical representation of **PEF** in spray painters

This shows that PEF was significantly lower in exposed individuals compared with control ( $P < 0.05$ ).

### Discussion

Result from this study reveal that lung function parameters (FEV<sub>1</sub>, FVC and PEFR) was significantly lower in the exposed

group. Pulmonary function tests are used to assess various aspects of lung function. These noninvasive tests, spirometry are used to help diagnose lung diseases as well as to

monitor how treatment and management of respiratory diseases.

The reduction in FEV1, FVC and PEFr may be indicators of ongoing inflammatory process or disease condition triggered by components of the spray paint on the respiratory tract (6,8, 9,10). This result from generation of reactive oxygen radicals (isocyanide) that elicit inflammatory responses which results in remodeling and subsequent narrowing of the respiratory tract(11) Lung obstructive diseases can be assessed using results gotten from these lung function tests ranging from mild to severe life threatening airway obstructive diseases.

The aforementioned results can be explained in light of the findings of Tornling (1,10)

They revealed that with exposure isocyanates can induce extrinsic allergic alveolitis and reactive airways dysfunction syndrome (RADS), while sensitization-induced asthma can be provoked with very low exposure.

In conclusion, this study shows that exposure to spray paints reduces lung function and thus workers should be educated on the consequences of exposure to spray paints, hence routine medical evaluation is advocated.

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