Proceedings of ICBioMed 2025 Symposium: AI for Healthcare: Advanced Medical Data Analytics and Smart Rehabilitation
DOI: 10.54254/2753-8818/2025.AU24440

Testing The Effects of Arsenic-Contaminated Air on Mice

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Abstract. Recently, exposure to arsenic-contaminated air has been increasing in certain areas due to increased coal burning. Arsenic is an incredibly harmful and naturally occurring environmental toxin, which means that it causes harmful effects on the human body through exposure. This study investigates the effects of arsenic-contaminated air on mice. Research is conducted using the methods ELISA, BAL, and colorimetric analysis. Possible effects of the arsenic on the mice include lung hemorrhaging, buildup of mucous, and inflammation. This research aims to better understand the effects of arsenic contaminated air on living organisms to improve treatment of patients who have been exposed to this toxin.

Keywords: Air, arsenic, bronchopulmonary, hemorrhaging, toxin

1. Introduction

Arsenic is a naturally occurring, toxic, semi-metallic material that can be found in the Earth's crust, water, air, and soil. It can also be released by human activity and long-term exposure to this environmental toxin can be detrimental to the human body. It finds its way into the environment through several industrial human activities such as mining, metal smelting, burning fossil fuels, and using pesticides [1]. It is then exposed to humans through groundwater and air pollution, which can cause devastating results for the human population in the long run.

Arsenic can inhibit many enzymes, including pyruvate dehydrogenase, glutathione reductase, and hexokinase-2, which are all crucial for survival. Arsenic exposure can cause a diverse variety of diseases in humans such as cancer and bronchopulmonary, cardiovascular, and metabolic diseases [2]. It impairs metabolism, causes protein denaturation, prevents apoptosis of tumor cells, and induces many other harmful effects. Furthermore, arsenic is noted to cause hemorrhage inside the cardiac wall and bloody diarrhea in calves [3]. Countless people, more than 500 million to be exact, are at risk of high levels of arsenic exposure worldwide [4-6].

There have been many advances in biotechnology in recent years, with some even calling it a “revolutionary branch of science at the forefront of research and innovation” [7]. Biotechnology such as Bronchoscopy with BAL and ELISA are used to diagnose diseases and analyze samples for possible molecules present that may cause harm to life. They can examine harmful substances at the molecular level and see the biological effects of them on humans, especially regarding toxic elements such as arsenic and its effect on human organs.

Bronchoscopy with Bronchoalveolar Lavage (BAL) is a way of diagnosing that involves inserting a thin, flexible tube (bronchoscope) through the trachea into the airways to examine the

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DOI: 10.54254/2753-8818/2025.AU24440

lungs and collect fluid samples [8]. It is used to diagnose lung conditions such as pneumonia and interstitial lung disease, collect fluid for analysis, and obtain tissue samples for biopsy. After looking at the lungs, the doctor or researcher "washes" a small part of the lungs with saline. The solution including cells, mucus, and other substances from the lungs is then taken out. It is analyzed to look for signs of inflammation and infection. Bronchoscopy with BAL can be used to test for IL6, which is an important proinflammatory cytokine. It stimulates the production of other inflammatory factors [9].

The enzyme-linked immunosorbent assay (ELISA) is a lab test used to count specific proteins such as mucous, in a sample. It works by using special antibodies that can attach to the target protein. The special plates are first coated with antibodies, then the samples are added. After this, a second antibody is added that will stick to the protein if it is present. Lastly, a substance that can react with the enzyme and change color is added so the amount of protein present is identifiable. ELISA was used to measure mucus content in various eye conditions using the tumor marker CA 19-9 [10]. ELISA can be used specifically to test for the presence of MUC5B, which is a gene that codes for a protein called mucin 5B. Mucins are glycoproteins that play a crucial role in forming mucus. A specific type of ELISA is a TNF-alpha ELISA which is a test used to measure the amount of TNF-alpha, a protein that plays a key role in inflammation, in a sample [11]. High levels of this protein can indicate inflammation in the body.

This research is geared towards investigating the effects of arsenic on mice, predicting that increasing concentrations and treatment durations of arsenic in mice causes lung hemorrhaging, increased mucous, and increased inflammation. Hemorrhaging will be measured by red blood cell count from bronchoscopy with bronchoalveolar lavage (BAL), mucous by ELISA for Muc5b from BAL, inflammation by IL6 and TNF-α with ELISA from BAL. The positive control is treatment with 5Gy of radiation and the negative control is normal air without arsenic. This will provide more insights into the effects of arsenic on life to better understand this environmental toxin and its biological effects.

2. Hypothesis

Increasing concentrations and treatment durations of arsenic in mice causes lung hemorrhaging, increased mucous, and increased inflammation.

2.1. Materials and methods

The positive control is the group of mice receiving treatment with 5Gy of radiation and the negative control is the group of mice receiving normal air without arsenic.

2.1.1. Method 1: amount of RBC lysis by colorimetric analysis of serum

The equipment includes a spectrophotometer, which is used for measuring the absorbance at a specific wavelength. A centrifuge is also needed to separate the serum from the blood sample. Pipettes and tips are needed to accurately measure and transfer samples. Test tubes would be used for mixing and handling blood samples. A vortex mixer would also be used to ensure that the reagents and samples are mixed well. The materials needed would be a blood sample from the mice. The colorimetric assay reagent Drabkin’s reagent would be needed.

Step 1 of the procedures would be to collect the lung blood sample from the mouse exposed to arsenic as the positive control and a sample from a mouse not treated as the negative control. Step 2

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would be to centrifuge the blood to separate plasma and red blood cells. Step 3 would be to prepare a calibration curve by making hemoglobin standards at known concentrations. Step 4 would be to add in the reagent to detect hemoglobin presence. Step 5 would be to calculate the amount of RBC lysis based on the color intensity of the serum sample compared to the standard curve.

The groups compared would be the negative control group and the positive control group treated with an arsenic concentration of 1/2.5/5 mg/L for 1/2/3 weeks respectively.

2.1.2. Method 2: mucous increase by ELISA for Muc5b

The equipment includes an ELISA reader for reading absorbance after the colorimetric reaction. A centrifuge is also needed to remove things that are not needed. Pipettes and tips are needed to accurately measure and transfer samples. Test tubes would be used for mixing and handling blood samples. A microplate (96-well plate), The standard plate for ELISA is also needed. The materials needed would be a mucous sample from the mice. A Mub5B ELISA kit, substrate solution, and a stop solution would also be needed.

Step 1 of the procedures would be to collect the lung mucous sample from the mouse exposed to arsenic as the positive control and a sample from a mouse not treated as the negative control. Step 2 would be to perform the ELISA test for the protein Muc5b. This includes plate coating, blocking, adding the samples, washing, adding the detection antibody, washing again, adding the substrate, and finally performing the stop reaction. Step 3 would be to measure and calculate the results.

The groups compared would be the negative control group and the positive control group treated with an arsenic concentration of 1/2.5/5 mg/L for 1/2/3 weeks respectively.

2.1.3. Method 3: testing for IL 6/TNF-α increase by ELISA

The equipment includes an ELISA reader for reading absorbance after the colorimetric reaction. A centrifuge is also needed to remove things that are not needed. Pipettes and tips are needed to accurately measure and transfer samples. Test tubes would be used for mixing and handling blood samples. A microplate (96-well plate), The standard plate for ELISA is also needed. The materials needed would be a mucous sample from the mice. An ELISA kit, substrate solution, and a stop solution would also be needed.

Step 1 of the procedures would be to collect the lavage fluid sample from the mouse exposed to arsenic as the positive control and a sample from a mouse not treated as the negative control. Step 2 would be to perform the ELISA test for either the protein IL 6 or TNF-α. This includes plate coating, blocking, adding the samples, washing, adding the detection antibody, washing again, adding the substrate, and finally performing the stop reaction. Step 3 would be to measure and calculate the results.

The groups compared would be the negative control group and the positive control group treated with an arsenic concentration of 1/2.5/5 mg/L for 1/2/3 weeks respectively.

2.2. Statistical analysis

In the cases where the results are inconsistent with each other, replicates may need to be done. The same test will be run multiple times to make sure that the results are accurate and consistent. There will be 10 replicates to ensure variety and reliability.

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2.2.1. Two-way ANOVA

Since there are two factors to analyze (arsenic concentration and treatment duration), this test can be used to test for the individual effects of arsenic concentration and treatment duration. Their interaction on each outcome (hemorrhaging, mucous, and inflammation) can also be seen through the results of this test. It can be applied separately to each of the outcome measures (red blood cell count, Muc5b, IL6, TNF-α).

2.2.2. Correlation analysis (pearson or spearman)

This can be used to test relationships between different inflammatory markers or between markers of mucous buildup and hemorrhaging. Correlation analysis will help to see whether changes in one place are connected with changes in another. The correlation between IL6 and TNF-α or between red blood cell count and Muc5b levels can be tested.

2.2.3. Regression analysis

To be able to see the relationship between arsenic concentration/duration and the measured outcomes, Linear Regression can be used for results like red blood cell count, Muc5b, IL6, and TNF-α. They can be fitted into linear models with arsenic concentration and treatment duration as predictors.

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3. Results table

Table 1: Combination results of experiments and correlation to hypothesis

Combination Result # (CR#)	Arsenic increases RBC lysis by colorimetric analysis of serum	Arsenic increases mucous by ELISA for Muc5b	Arsenic increases IL 6 by ELISA	Arsenic increases TNF-α by ELISA	Support of the hypothesis
1	+	+	+	+	Full
2	+	+	+	-	Partial
3	+	+	-	+	Partial
4	+	+	-	-	Partial
5	+	-	+	+	Partial
6	+	-	+	-	Partial
7	+	-	-	+	Partial
8	+	-	-	-	Partial
9	-	+	+	+	Partial
10	-	+	+	-	Partial
11	-	+	-	+	Partial
12	-	+	-	-	Partial
13	-	-	+	+	Partial
14	-	-	+	-	Partial
15	-	-	-	+	Partial
16	-	-	-	-	Fully Contradicts

Table Legend: “+” indicates the measurement changes in the direction indicated in the column header like the positive control (5Gy of radiation) and the opposite to the negative control in PBS. “-” indicates the measurement changes in the opposite of the direction indicated in the column header like the negative control (PBS) and the opposite to the positive control (Taxol).

According to Table 1, CR1 (Combination Result 1) shows that arsenic does in fact increase the lysis of red blood cells and the amount of mucous. The colorimetric analysis of serum for lysing red blood cells is evidence that arsenic in the organism will cause hemorrhaging. Using ELISA to test for Muc5b also shows the increase of mucous in the organism’s lungs, showing that arsenic does indeed increase the amount of mucous in the organism’s lungs. Furthermore, the toxin increases the amount of IL 6 and TNF-α, two proinflammatory cytokines as tested by ELISA.

According to Table 1, CR2 (Combination Result 2) shows the increases of red blood cell lysis, mucous, and IL 6 but not the increase of TNF-α. The positive result of the increased lysing of red blood cells shows that arsenic does indeed cause hemorrhaging in the organism. The presence of Muc5b and the buildup of mucous in the lungs tested by ELISA also shows that there is mucous buildup. However, although there is an increase in IL 6, the proinflammatory cytokine, there is a negative result for the increase in TNF-α.

According to Table 1, CR3 (Combination Result 3) is like CR2 in that an increase in one of the inflammatory cytokines is not observed through testing using ELISA. Specifically, IL 6 is not increased but TNF-α shows that the inflammation in the organism is not as major as the result shows

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in CR1. The positive results of increases in red blood cell lysis and the mucous by observing the protein Muc5b in CR3 is the same as CR1 and CR2.

According to Table 1, CR4 (Combination Result 4) shows that arsenic causes both an increase in the lysis of red blood cells and the amount of mucous present in the lungs. However, there is a negative result for the increases in the proinflammatory cytokines, IL 6 and TNF-α, which shows that there is little to no inflammation in the lungs after the organism encounters arsenic.

According to Table 1, CR5 (Combination Result 5), much unlike CR4, shows the increase of both proinflammatory cytokines IL 6 and TNF-α using ELISA, which supports the section of the hypothesis stating that exposure to arsenic causes inflammation in the organism when exposed to arsenic in the environment. CR5 is very similar to CR1 in the aspect that both show ample evidence of inflammation being present. Furthermore, this result also shows an increase in the lysing of red blood cells through the method of colorimetric analysis of serum.

According to Table 1, CR6 (Combination Result 6) provides a good amount of evidence for hemorrhaging in the lungs with the observation of the increase of lysis of red blood cells using a colorimetric analysis of serum. However, the result for an increase in mucous buildup caused by arsenic was negative, showing that exposure to the environmental toxin may not cause an increase in the protein Muc5b, which is responsible for synthesizing mucous. This result shows a positive result in an increase in the proinflammatory cytokine IL 6, but a negative result for an increase in the other cytokine TNF-α, which only shows some but not much inflammation in the lungs, as only one of the responsible proteins is present in a rising amount.

According to Table 1, CR7 (Combination Result 7) is like CR6 in that it also provides evidence with a positive result for the increase in the lysing of red blood cells caused by arsenic but a negative result for an increase in mucous buildup caused by the same environmental toxin. This combination result, unlike the one in CR6, shows a positive result in an increase in the proinflammatory cytokine TNF-α, but a negative result for an increase in the other cytokine IL 6.

According to Table 1, CR8 (Combination Result 8) is still showing an increase in the lysis of red blood cells using a colorimetric analysis of serum, which is a sign of hemorrhaging. However, there is no increase in mucous as with the result found by an ELISA analysis of the protein Muc5b in the lungs. This shows that there is no mucous buildup, which is inconsistent with the hypothesis. Moreover, both results from the use of ELISA for proinflammatory cytokines, IL 6 and TNF-α, are negative, meaning that there is no increase in either protein.

According to Table 1, CR9 (Combination Result 9) does not show arsenic causing an increased amount of red blood cell lysis after using a colorimetric analysis, which can be interpreted as that arsenic does not cause hemorrhaging. However, the results do show an increase in the amount of mucous present in the organism's lungs due to arsenic, which supports the hypothesis. Furthermore, this result also has a positive result for an increase in the proinflammatory cytokines IL 6 and TNF-α. The amount of these proteins means that there is inflammation in the organism's lungs after its exposure to arsenic.

According to Table 1, CR10 (Combination Result 10) is like CR9 in that it does not show arsenic causing an increased amount of red blood cell lysis after using a colorimetric analysis of serum. This also suggests that there is no hemorrhaging in the lungs after the organism is exposed to arsenic in its environment. There is also evidence for a buildup of mucous in the organism's lungs judging from the result after using ELISA to test for the presence of the protein Muc5b. However, as for the inflammation, even though there is a positive result for the increased amount of IL 6, a proinflammatory cytokine, there is a negative result for a possible increased amount of TNF-α.

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According to Table 1, CR11 (Combination Result 11) is incredibly like CR10 in that both does not show arsenic causing an increased amount of red blood cell lysis but provides evidence for a buildup of mucous in the organism's lungs judging from the result after using ELISA to test for the presence of Muc5b. However, the results for the cytokines are switched. In this result, there is no increased amount of IL 5, but there is for TNF-α. The increased presence of only one of the proinflammatory cytokines shows that there is only partial inflammation in the lungs of the organism after it was exposed to arsenic.

According to Table 1, CR12 (Combination Result 12) has a negative result for the hemorrhaging in the lungs because there is no observed increase in the amount of red blood cell lysis after the organism was exposed to arsenic. There is an increase in the amount of mucous in the lungs as the positive result of the test for the Muc5b protein responsible for mucus synthesis means mucous buildup. However, the tests for both proinflammatory cytokines have negative results, which means that there is no increase in the amount of IL 6 nor TNF-α.

According to Table 1, CR13 (Combination Result 13) shows that arsenic does not cause an increase in the lysis of red blood cells and the amount of mucous present in the lungs, which is inconsistent with the effects stated in the hypothesis. However, there is a positive result for the increases in the proinflammatory cytokines, IL 6 and TNF-α, which shows that there is in fact inflammation in the lungs after the organism meets arsenic. This suggests that exposure to said environmental toxin in the surroundings may not cause hemorrhaging and a buildup of mucous despite showing signs of inflammation.

According to Table 1, CR14 (Combination Result 14) is like CR3 in that an increase in one of the inflammatory cytokines is not observed through testing using ELISA. Specifically, TNF-α is not increased but IL 6 shows that the inflammation in the organism is not as major as the result shows in CR1. The negative results of increases in red blood cell lysis and the mucous by observing the protein Muc5b shows that the organism does not show symptoms of lung hemorrhaging and a buildup of mucous in the organ once exposed to said toxin.

According to Table 1, CR15 (Combination Result 15) does not show the increases of red blood cell lysis, mucous, and IL 6 but only the increase of TNF-α. The negative result of the increased lysing of red blood cells shows that arsenic does not cause hemorrhaging in the organism, which does not align with the hypothesis. Moreso, the fact that there is no mucous buildup in the lungs tested by ELISA also does not support the hypothesis. However, although there is an increase in TNF-α, the proinflammatory cytokine, there is a negative result for the increase in IL 6.

According to Table 1, CR16 (Combination Result 16) has negative results for all the tests. There is no increase in the lysis of red blood cells as tested by the colorimetric analysis of serum, which means that the organism does not experience hemorrhaging when exposed to arsenic. Furthermore, there are no signs of a buildup of mucous because the amount of the protein Muc5b did not increase. Neither of the two proinflammatory cytokines, IL 6 and TNF-α, had increases as tested by ELISA.

4. Discussion

Previous research has discussed things such as the toxicity of arsenic and its role in the environment, but this research specifically aims to study the effects of arsenic 5Gy radiation on the lungs of mice, hoping to discover more regarding the effects of this environmental toxin on the body of a human. This research aims to determine whether or not exposure to arsenic causes lung hemorrhaging, a buildup of mucous, and inflammation, all of which are harmful symptoms that could easily be lethal towards humans.

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According to Table 1, CR1: All these positive results align with the hypothesis that arsenic indeed causes these effects on the contaminated organism. Hemorrhaging, buildup of mucous, and inflammation in the lungs would cause these results. These results could be interpreted as that arsenic-contaminated air does indeed cause these things in an organism. Some follow-up future experiments that could be done is to test the severity of these effects.

According to Table 1, CR2: The positive results for the hemorrhaging and buildup of mucous supports the hypothesis, while the inflammation tests only provide partial support of the assumption. Hemorrhaging, buildup of mucous, and perhaps partial inflammation in the lungs would cause these results. These results could be interpreted as arsenic does indeed cause lung hemorrhaging and mucous buildup, but a wrong binding agent could have been used while running the experiment. Future experiments could rerun the inflammation tests since in this result only one of the proteins increased.

According to Table 1, CR3: This supports the section of the hypothesis that states that arsenic will cause lung hemorrhaging and a buildup of mucous in the organ once exposed to said toxin, but the inflammation tests only provide partial support of the assumption. Hemorrhaging, buildup of mucous, and perhaps partial inflammation in the lungs would cause these results. These results could be interpreted as arsenic does indeed cause lung hemorrhaging and mucous buildup, but a wrong binding agent could have been used while running the experiment. Future experiments could rerun the inflammation tests since in this result only one of the proteins increased.

According to Table 1, CR4: This is a partial support of the hypothesis as two of the effects (hemorrhaging and mucous buildup) had positive results, but the second half showed negative results. These results could be interpreted as arsenic does indeed cause lung hemorrhaging and mucous buildup, but it does not cause inflammation, which could have been caused by sample contamination. Future experiments could research reasons as to why it did not cause inflammation and the severity of the other symptoms.

According to Table 1, CR5: There is a negative result for the increase in mucous, which is inconsistent with the hypothesis, causing this result to provide only a partial support to the entire hypothesis. These results could be interpreted as arsenic does indeed cause lung hemorrhaging and inflammation, but it does not cause mucous buildup, which could have been caused by overlooking variables. Future experiments could research reasons as to why it did not cause mucous buildup and the severity of the other symptoms.

According to Table 1, CR6: There is a negative result for the increase in mucous and a negative result for one of the proinflammatory cytokines, which is inconsistent with the hypothesis, causing this result to provide only a partial support to the entire hypothesis. These results could be interpreted as arsenic does indeed cause lung hemorrhaging, but it does not cause mucous buildup and complete inflammation, which could be caused by the wrong binding agent being used. Future experiments could research reasons as to why it did not cause mucous buildup and rerun the inflammation experiments to spot any possible errors.

According to Table 1, CR7: There is a negative result for the increase in mucous and a negative result for one of the proinflammatory cytokines, specifically IL 6, which is inconsistent with the hypothesis, causing this result to provide only a partial support to the entire hypothesis. These results could be interpreted as arsenic does indeed cause lung hemorrhaging, but it does not cause mucous buildup and complete inflammation, which could have been caused by an inconsistency in the procedure. Future experiments could research reasons as to why it did not cause mucous buildup and rerun the inflammation experiments to spot any possible errors.

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According to Table 1, CR8: The positive result for the lung hemorrhaging and the negative results for the mucous buildup and inflammation means that this result is a partial support of the hypothesis. These results could be interpreted as arsenic does indeed cause lung hemorrhaging, but it does not cause mucous buildup and inflammation, which could have been caused by the use of wrong binding agents. Future experiments could research reasons as to why it did not cause mucous buildup and inflammation. The degrees of hemorrhaging can also be researched.

According to Table 1, CR9: The negative result for the lung hemorrhaging and the positive results for the mucous buildup and inflammation means that this result is a partial support of the hypothesis. These results could be interpreted as arsenic does not cause lung hemorrhaging, but it does cause mucous buildup and inflammation, which could be due to overlooking certain factors in the test. Future experiments could research reasons as to why it did not cause lung hemorrhaging. The relationship between mucous buildup and inflammation can also be researched.

According to Table 1, CR10: There is a negative result for the lung hemorrhaging and a negative result for one of the proinflammatory cytokines, which is inconsistent with the hypothesis, causing this result to provide only a partial support to the entire hypothesis. These results could be interpreted as arsenic does indeed cause mucous buildup, but it does not cause hemorrhaging and complete inflammation, which might have been caused by a wrong binding agent. Future experiments could research reasons as to why it did not cause hemorrhaging and rerun the inflammation experiments to spot any possible errors.

According to Table 1, CR11: There is a negative result for the lung hemorrhaging and a negative result for one of the proinflammatory cytokines, specifically IL 6, which is inconsistent with the hypothesis, causing this result to provide only a partial support to the entire hypothesis. These results could be interpreted as arsenic does indeed cause mucous buildup, but it does not cause hemorrhaging and complete inflammation, which might have been caused by inconsistency in the experiment. Future experiments could research reasons as to why it did not cause hemorrhaging and rerun the inflammation experiments to spot any possible errors.

According to Table 1, CR12: The negative result for the lung hemorrhaging and inflammation along with the positive results for the mucous buildup means that this result is a partial support of the hypothesis. These results could be interpreted as arsenic does not cause lung hemorrhaging and inflammation, but it does cause mucous buildup, and it could be due to a wrong binding agent being used. Future experiments could research reasons as to why it did not cause lung hemorrhaging. The relationship between the presence of hemorrhaging and inflammation can also be researched.

According to Table 1, CR13: The negative result for the lung hemorrhaging and mucous buildup along with the positive result for inflammation shows a partial support of the hypothesis. These results could be interpreted as arsenic does not cause lung hemorrhaging and mucous buildup, but it does cause inflammation, and it may have been caused by overlooking factors. Future experiments could research the relationship between the presence of hemorrhaging and mucous buildup. The severity of the inflammation could also be studied.

According to Table 1, CR14: The negative result for the lung hemorrhaging and mucous buildup along with the partial positive result for inflammation shows a partial support of the hypothesis. These results could be interpreted as arsenic does not cause lung hemorrhaging and mucous buildup, but it also does not cause complete inflammation, perhaps due to sample contamination or overlooking certain variables. Future experiments could research the relationship between the presence of hemorrhaging and mucous buildup. The tests for inflammation could also be rerun to see if there are any errors.

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According to Table 1, CR15: The negative result for the lung hemorrhaging and mucous buildup along with the partial positive result for inflammation, specifically a negative result in IL 6, shows a partial support of the hypothesis. These results could be interpreted as arsenic does not cause lung hemorrhaging and mucous buildup, but it also does not cause complete inflammation because a wrong binding agent might have been used. Future experiments could research the relationship between the presence of hemorrhaging and mucous buildup. The tests for inflammation could also be rerun to see if there are any errors.

According to Table 1, CR16: There are negative results for hemorrhaging, mucous buildup, and inflammation, which fully contradicts the hypothesis. These results could be interpreted as that arsenic does not cause any of these things, and that a separate factor caused this result. Future experiments could research why this happened and if the mouse had any genetic mutation that caused it to be immune. This way this immunity towards arsenic could be studied and used in human medicine.

A longer treatment duration and high amounts of concentration will cause the amount of red blood cells lysed, the mucus buildup, and the number of inflammatory cytokines to increase. On the other hand, if the treatment duration is too short and the concentration is too low, false negatives may be produced.

5. Conclusion

Overall, this study investigates the effect of arsenic in the environment on an organism's lungs, specifically mice. It shows whether arsenic causes lung hemorrhaging, a buildup of mucous, and inflammation. The results would show the effects of 5Gy radiation on mice with arsenic in its surroundings. If the hypothesis is supported, then the harmful effects of this environmental toxins can be further studied. Future research may aim towards how to protect people from getting into contact with arsenic and how to control symptoms.

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