

Discussion- Cellular Processes and the Genetic Environment

Name

Affiliation

Date

Introduction

The case scenario of the 16 year old represents a person that is possibly suffering from a pre-existing condition of bronchial asthma. This is a serious allergic disease that is usually most common among children in developed nations (Aasbjerg, 2018). The condition is characterized by increased responsiveness of the tracheobronchial tree to a number of stimuli, increased infiltration of different types of inflammatory cells into the airways, the airway smooth-muscle hypertrophy, epithelial damage, constriction and the obstruction of a variable airway which is often associated with the inflammation in the lung airways conditioning and mucous hyper secretion around the bronchial walls (Aasbjerg, 2018). The paper looks at the role that genetics play in asthma, why the patient presents the said symptoms, the involved cells in the process and other characteristics that change the responses.

The role Genetics play in the Disease

Even though Asthma condition can develop from any age, gender or race, in the United States, very high cases have been found to exist among the African American population. This show that asthma is clear genetic component, however the difference between various ethnicities is usually determined by cases of air quality in the households, poverty and the reduced access to the required healthcare treatment. For example in African American children, there is a high prevalence of asthma which means that mortality rate caused by asthma in this population is high (Aasbjerg, 2018). This indicate that asthma strongly runs in families and usually 50% of this is cause by genetic susceptibility while the remaining half is due to environment factors. There is a lot of interests in research on

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familial clustering of asthma in relation to genetic predisposition of the condition. Even though the identification of the genes related to asthma has not been completed, most genetic findings show the already prevailing aspect of the condition at its pathogenesis.

Genetics also play a very important role when it comes to the management of the condition and the findings might help in identification of the environmental factors which can be used to protect an individual from the condition. This means that a relationship between the innate immune system and asthma system receptors for the microbial products is also very interesting (Godar & Lambrecht, 2016). Also when it comes to treatment, evidence shows that a patient like the one in the case scenario may be experiencing a severe intractable asthma for which they may not respond to the steroids in inhalation or capsules (Godar & Lambrecht, 2016). This indicates that they may be having some form of mutation in some of the genes which is responsible for controlling the anti-inflammatory response to the condition.

Why the Patient is presenting the symptoms

The patient is presenting the said symptoms due to the alteration in the airflow from asthma, this causes the intrapleural and alveolar pressures to occur resulting in the reduced perfusion to the alveoli of the patient's lungs. Due to this the respiration will not be uniform at an abnormal low and high V/Q ratios which eventually leads to hyperventilation that leads to hypoxemia a non-presence of CO₂. As the condition worsens, the hyperventilation continues to increase from the hypoxemia, this makes the PH level to go high and the PaCO₂ to go low leading to respiratory alkalosis (Wu & Xiao, 2016). In the event that the patient was not initiated to treatment immediately, it would have led to respiratory failure due to decreased tidal volume and retention of CO₂. Other resultant effect is muscle fatigue,

obstruction of the airways and the failure of ventilation of alveoli when the arterial blood gas shows presents of hypercapnia.

Physiological response to the Stimulus presented in the Scenario

When the patient took the medication, the asthma was triggered causing the body to respond by releasing eosinophils, mast cells, epithelial cells, macrophags and the T lymphocytes that eventually led to the signification inflammation of the airways. The swelling of the tongue and sore throat came from the increase hyper responsiveness of bronchioles which resulted in bronchospasm and the shortness of breath that the patient was experiencing (Wu & Xiao, 2016). In most cases, a patient that is suffering from chronic asthma may find themselves with a permanent airway remodelling due to this. Also the obstruction of the patient's airways from mucous thickening and edema might be present after the allergen exposure from the medication.

The Cells Involved

Given the condition of the patient and the allergen exposure due to the medication, the body responded by releasing the eosinophils, mast cells, macrophages, T lymphocytes and epithelial cells that led to a significant inflammation of the body airways (Fuseini & Newcomb, 2017). The inflammation of the throat also came with the increase in shortness of breath.

Other characteristics effect on the response

The other characteristic is gender which the asthmatic reaction is going to change with it throughout life. During childhood, boys are likely to suffer from allergic reactions of asthma than girls, also boys are twice as likely to be hospitalized when compared to girls. However the asthma prevalence declines during adolescents in males and an increase in females occurs (Fuseini & Newcomb, 2017). As adults women are likely to suffer from

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asthma allergic reactions than men, meaning they will be more likely to be hospitalized as well.

Conclusion

In conclusion, the patient's condition can be contained by finding medication that best suits him. This will mean changing the prescription and ensuring that he is provided medication that does not trigger allergic reaction due to a possible pre-existing condition of asthma.

References

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