

## Argyria: The Blue Skin Rare Disease

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### ABSTRACT

There are number of diseases which occur due to metal ingestion and argyria is a disease which occurs due to chronic ingestion of silver in original form or in salt form. In human body small amount of silver is naturally present but as amount increases with time due to ingestion colour of skin changes to blue / grey leading to the disease known as argyria. The disease is diagnosed by biopsy of skin tissue, X- ray examination and obviously physical appearance and its treatment is mainly done by avoiding sun exposure, using various supplements like hydroquinone etc.

**Key words:** Argyria, silver, blue colour, sun exposure, pigmentation, treatment.

### INTRODUCTION

Argyria is a disease caused by improper exposure of skin to chemical forms of the element silver, silver dust, or silver compounds which stains the skin grey/blue. Argyria occurs in people who ingest silver in large quantity over a long period. People who work in

factories that manufacture silver can also breathe in silver or its salts. Silver salts, colloidal silver, liquid suspension, microscopic silver particles were also used as internal medication for treatment of variety of diseases. [1]



**Figure 1: Pictorial representation of ARGYRIA**

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In animals and humans, silver accumulates in the body over time. Chronic intake of silver products can result in an accumulation of silver or silver sulphide particles in the skin. As in photography (where silver is used due to its reactivity with light), these particles in the skin darken with exposure to sunlight, resulting in a blue or gray discoloration of the skin. [2]

This condition is known as argyria. Chronic ingestion of silver can similarly lead to an accumulation of silver in the eye (argyrosis) and in other organs. Localized argyria can occur as a result of topical use of substances containing silver, while generalized argyria results from the chronic ingestion of such substances. [3]

### Causes of argyria

- ➔ Silver sutures used for surgery, silver dental filling and other dental procedures are the significant causes for development of argyria.
- ➔ Silver metal workers, working in silver mines, silver manufacturing factories, are prone to argyria disease.
- ➔ Individuals on silver supplements (usually in treatment of cancer, diabetes, AIDS, herpes) can also develop argyria.[4]
- ➔ Burn Patients which are treated by silver sulfadiazine may develop argyria.[5]
- ➔ Once disease develops the blue colour of the skin diffuses and first noted on the skin areas that have maximum exposure. After the skin has

been affected, silver tends to affect the internal organs.

### Argyria symptoms

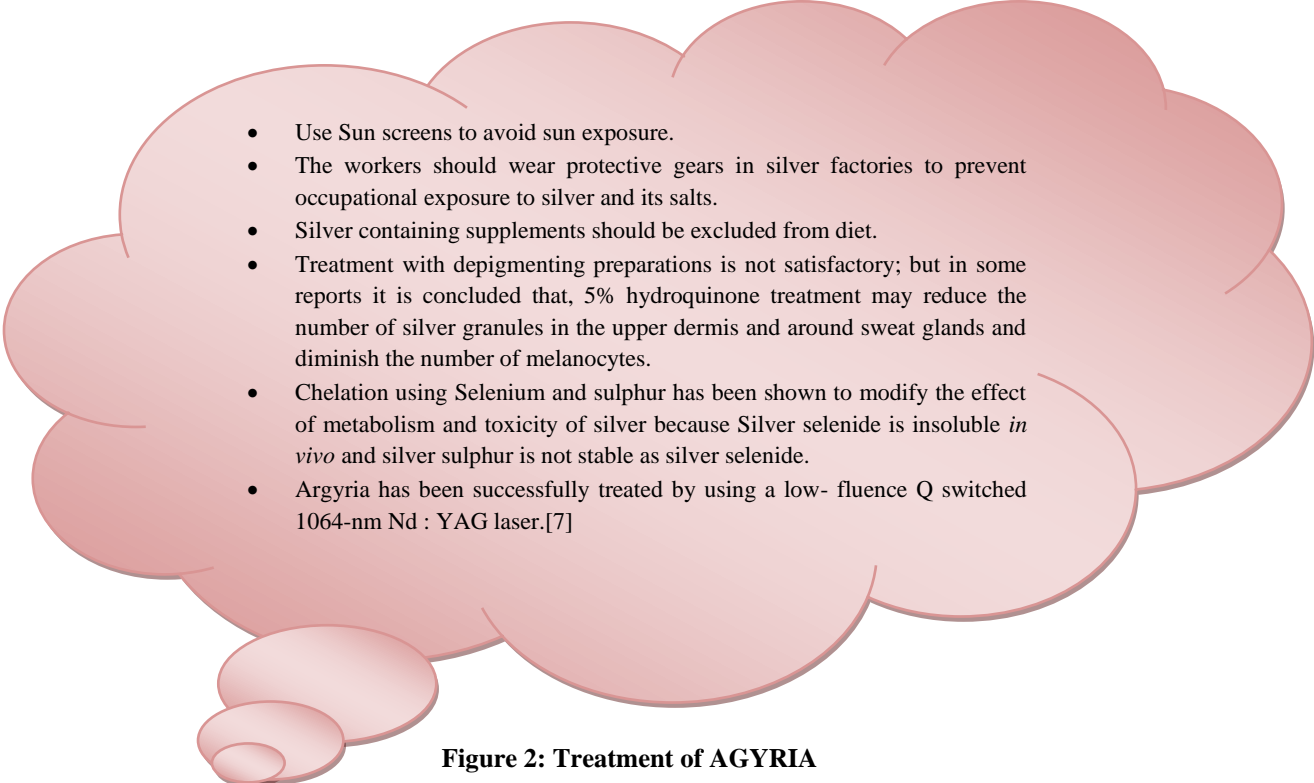
- ✚ Staining of gums that extend to hands, nose and forehead where sun exposure is maximum.[6]
- ✚ Grey/blue staining of skin.

### Diagnosis of argyria

- Biopsy of skin tissues that are seemed to be argyria affected.
- Fluorescent X-Ray examination of blue/ grey patches demonstrates the evidence of excessive silver.
- Generally humans have nearly 1 mg of silver in their body but argyria occurs when the silver content is 4mg or greater than 4 mg.
- Sometimes argyria is considered as side effects of other medicines and is not taken seriously by the physician and therefore misdiagnosed and not treated properly.

### Treatment of argyria

Before treatment starts, discontinue the source of silver ingestion. The following treatment should be followed:

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- Use Sun screens to avoid sun exposure.
  - The workers should wear protective gears in silver factories to prevent occupational exposure to silver and its salts.
  - Silver containing supplements should be excluded from diet.
  - Treatment with depigmenting preparations is not satisfactory; but in some reports it is concluded that, 5% hydroquinone treatment may reduce the number of silver granules in the upper dermis and around sweat glands and diminish the number of melanocytes.
  - Chelation using Selenium and sulphur has been shown to modify the effect of metabolism and toxicity of silver because Silver selenide is insoluble *in vivo* and silver sulphur is not stable as silver selenide.
  - Argyria has been successfully treated by using a low- fluence Q switched 1064-nm Nd : YAG laser.[7]

**Figure 2: Treatment of ARGYRIA**

### Inheritance and genetics of argyria

Inheritance of argyria tells whether the disease is inherited from parents or runs in families. The level of inheritance of a condition depends on how important genetics are to the disease. Strongly genetic diseases are usually inherited, partially genetic diseases are sometimes inherited and non genetic diseases are not inherited. Argyria is not related to genetics and hence it comes under non genetic disease. [8]

### Other diseases causing pigmentation

#### Methemoglobinemia

It is a disorder characterized by presence of higher level of methemoglobin (has  $\text{Fe}^{3+}$  rather than  $\text{Fe}^{2+}$  in haemoglobin in the blood). Methemoglobin is the oxidized form of haemoglobin which has very less affinity for oxygen. Increased levels of methemoglobin are due to the mechanisms that defend against oxidative stress with in red blood cell and the  $\text{Fe}^{2+}$  of the heme group is oxidized to  $\text{Fe}^{3+}$ . Due to this, haemoglobin converts to methemoglobin which results in reduced ability to release oxygen to tissues and thereby hypoxia which give the blood bluish or chocolate brown colour.[9]

#### Chrysiasis

Chrysiasis is a disease caused by parenteral administration of gold salts, generally for the treatment of rheumatoid arthritis and tuberculosis. Just like silver, a gold preparation used parenterally for a long period produce a permanent skin disorder (pigmentation if the skin is exposed to sun light or artificial ultra violet radiation. Gold can be identified by light microscopy, electron microscopy and spectroscopy. [10]

#### Carotenaemia

Carotenaemia is a disease in which excess carotenoids (orange pigment) are present in blood due to which the skin colour becomes orange. This disease generally occurs in vegetarians and young children. [11]

### Different Patients of Argyria

#### Paul Karason

Due to Argyria, Paul Karason's skin turned so blue that he was called as Blue Man by the media in 2007/2008.

Paul Karason is also famous by his name Papa Smurf. He developed the disease because he drank colloidal silver made with salt in water to increase conductivity for 12 years. He took colloidal silver to treat severe dermatitis (cracking and peeling on skin). After applying Colloidal silver for nearly three months his friends noticed that Paul's skin had a bluish tinge. On doctor's advice Paul took a heavy metal test and the reports revealed that his silver levels were higher than normal. Later in 2008, a friend loaned him an ionic footbath device. Paul felt that with regular use of this unit, his skin was slowly getting lighter in colour. [12, 13]

#### Rosemary Jacobs

Rosemary Jacob developed blue staining on skin in 1956 at the age of 14 years. The diagnosis was done by biopsy which showed the little specks of silver in the skin. She studied many literatures about the disease but could not find any cure for the disease for her whole life. [14]

#### Stan Jones

Jones suffered from argyria due to consumption of home made silver product. He made the silver product due to the fear that antibiotics will not be available in near future (in 2000). According to him he was perfectly fit and fine due to ingestion of silver (home made) and only skin colour is affected.[15]

### CONCLUSION

It can be concluded that argyria is a disease which occurs by chronic ingestion of metal i.e. silver and its salts. The disease is detected or diagnosed by physical appearance of the person which changes to grey and then blue. There is no proper treatment for the disease except surgery but it can be treated(not successfully) by taking precautions like avoiding sun exposure and using depigmenting agents.

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