

Original Article

Role of Silver Nanoparticles in the Treatment of Diseases**Nusair Ahmed Malik¹***Health Centre Teaching Hospital, University of the Punjab. Lahore¹***Abstract:**

Interdiction: Diabetes mellitus is a category of glycemetic disorder that is characterized by persistently elevated blood sugar levels. One of the most prevalent diseases affecting humans is diabetes. Pakistan is now the sixth-largest nation in terms of the number of people with diabetes.

The aim of the research work is to learn more about how silver nanoparticles are used in Pakistan to treat diabetes. Scientists are very interested in silver nanoparticles (Ag-NPs) because of their distinct characteristics and excellent antibacterial activity.

Method: 100 samples of diabetic patients and same number of normal healthy controls are collected from Health Centre, Punjab University Lahore (Quaid-e-Azam Campus) and District Head Quarters Hospital Sheikhpura. Physical parameters have been recorded. Biochemical parameters have been recorded by using different standard protocols. Silver nano particles have been prepared by using Turkevich Method.

Result: Through their antibacterial qualities, a decrease in wound inflammation, and a regulation of fibrogenic cytokines, silver nanoparticles have benefits.

Conclusion: Clinical observations confirm the wound dressing made of Ag NP is safe.

Keywords: Nanoparticles, Diabetes, Silver, turkevich methods, Punjab Pakistan

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frequent gum infection or illness. Bruises and cuts don't heal well or soon.

Introductions

Diabetes is a collection of metabolic illnesses in which a person's blood glucose levels are elevated due to insufficient insulin production, improper cell response to insulin, both, or neither of these factors.

Types of diabetes

Type 1: The pancreatic beta cells that produce insulin lost in people with type 1 diabetes mellitus.

Type 2: Insulin resistance, which may also be accompanied by comparatively decreased insulin production, is a feature of type 2 diabetes mellitus (DM). As compared to type 1, type 2 diabetes is more common.

Prediabetes:

When a person's blood glucose levels are higher than usual but not high enough to be diagnosed as type 2 DM, the condition known as prediabetes is present.

Gestational diabetes:

Some pregnant women experience blood glucose levels that are so high that their bodies are unable to create enough insulin to completely absorb it.

Symptoms:

regular urination an excessive thirst, extreme hunger, Loss or growth of weight, strange weight loss, increased exhaustion, Irritability distorted vision more yeast infections on the skin, Skin itch Male sexual dysfunction,

Causes:

The full list of additional causes of diabetes is as follows: genetic issues with beta-cell function, genetic issues with insulin production or action, mutations in mitochondrial DNA, Pancreatic neoplasia Cystic fibrosis Fibrocalculous pancreatopathy, Insulin gene mutations, Defects in proinsulin conversion, Growth hormone excess, Insulin receptor mutations, Endocrinopathies, Drugs, Cushing syndrome, Exocrine pancreatic defects Chronic pancreatitis, Hyperthyroidism, Pheochromocytoma, Glucagonoma, Cytomegalovirus infection B, Thyroid hormone energetic agonist Pancreatectomy, Infections, Hemochromatosis, Glucocorticoid

Prevention:

For type 1 diabetes, there is no proven preventive intervention. By eating a healthy diet, exercising regularly, and maintaining a normal body weight, type 2 diabetes can be postponed. Maintaining a diet high in whole grains and fibre, as well as picking healthy fats like the polyunsaturated fats found in fish, nuts, and vegetable oils, are dietary adjustments proven to be useful in preventing diabetes. Diabetes can be prevented by limiting sugary drinks, consuming less red meat, and cutting back on other sources of saturated fat. Quitting smoking can also be a significant preventive

intervention because tobacco use is linked to an elevated risk of diabetes and its consequences.

Medication:

There are numerous distinct classes of anti-diabetic drugs. Some, like metformin, are ingested, whereas others, like GLP-1 agonists, are exclusively administered intravenously. Only insulin, often a combination of normal and NPH insulin, or artificial insulin analogues, can be used to treat type 1 diabetes. For type 2 diabetes, metformin is typically advised as the first line of treatment.

Surgery:

When type 1 diabetics experience significant difficulties, a pancreas transplant may be an option. Surgery to reduce weight is frequently an efficient treatment for people with obesity and type 2 diabetes.

Epidemiology:

Around the world, 422 million adults are thought to have diabetes mellitus. By 2030, the number is anticipated to nearly double. 1.5 million deaths were caused by diabetes.

In Pakistan **9 million** people are affected by diabetes.

This number will grow to 11.4 million by 2030 unless measures are taken to control the disease.

Total prevalence: About 10% of the population (12.9 million people) has diabetes.

Diagnosed: 9.4 million people are diagnosed with diabetic.

Undiagnosed: while 3.5 million are undiagnosed.

Pre diabetes: 38,000,000 Pre diabetics including 20.5% of women and 15.9% of males. In terms of the number of people with diabetes, Pakistan is thought to rank as the sixth-largest nation. By 2030, it will be the fourth-largest country.

Diabetes treatment with silver nanoparticles

Silver nano particles:

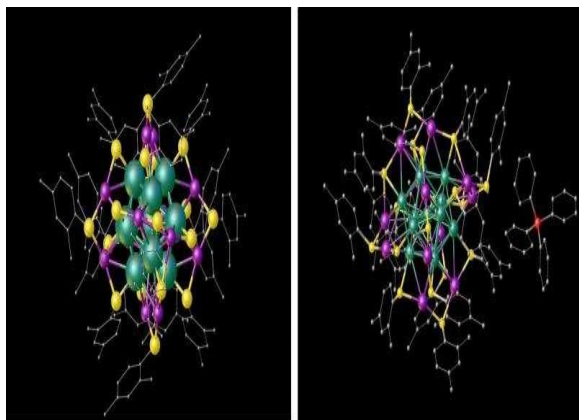
The word "Nano" stands for a billionth, or 10^9 units. The particles that are less than 100 nm in diameter called Nano particle.



Silver particles smaller than 100 nm are known as nanoparticles of silver.



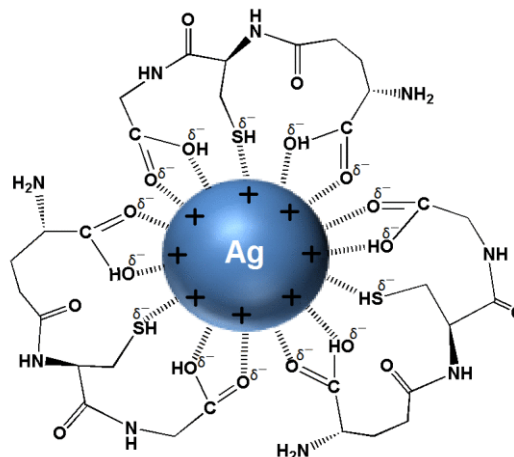
The biocidal activity of AgNPs depends on their surface coatings, size, and shape.



Applications for AgNPs with special optical, electrical, and antibacterial characteristics include biosensing [1], photonics [2], electronics [3], and antimicrobial [4].

AgNPs' highly effective broad-spectrum antibacterial action is one of the key avenues for the creation of products including textiles, food storage containers, antiseptic

sprays, catheters, and bandages. [5]. AgNPs have been effective in the treatment of cancer.



Synthesis:

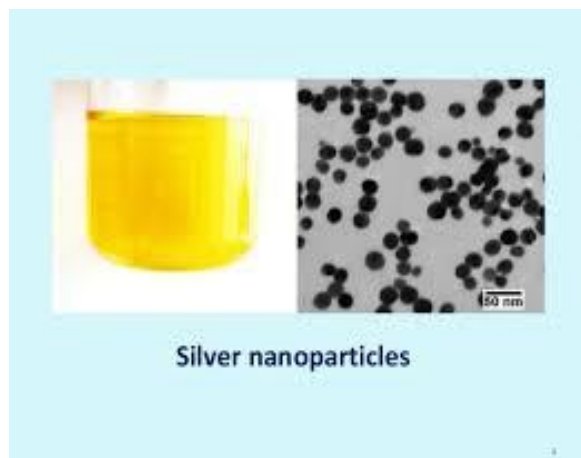
Metallic nanoparticles can be produced using a variety of techniques.

- ❖ Turkevich method (1951): Trisodium citrate reduces silver
- ❖ The Brust technique (1994) uses sodium borohydride to decrease silver.

Turkevich Method for Ag NP Synthesis:

- ❖ 60mL of a 1mM silver nitrate solution should be heated.
- ❖ Stir the mixture with a magnetic stir bar until it reaches boiling.
- ❖ Then add 6mL of 10mM trisodium citrate drop wise at a rate of around one drop per second.
- ❖ Change watch glass
- ❖ Wait for the color to turn light golden.

- ❖ Take off the beaker from the hot plate and allow the mixture to cool.



At a large scale, silver always appears to be silver.

But color solutions of silver

- Particles of different sizes have varied hues because the precise oscillations rely on the

size and form of the particles.



Silver nano particles Application:

Topical dressings containing silver are now frequently used to treat persistent ulcers and infections in exposed wounds. Zirconium phosphate nanoparticles with Ag⁺ placed on them are a unique, highly crystalline, and nano sized antibacterial substance.

In these dressings, new silver is released as silver is consumed through interaction with target cells or inactivated through protein and anion complexes in wound fluid, resulting in a persistent, consistent supply of active silver.

Silver interferes with the respiratory chain at the cytochromes to produce its antibacterial actions [44].

Silver ions can attach to DNA and prevent DNA replication, as well as interfere with elements of the microbial electron transport system [45–47].

Yeast, filamentous fungus, viruses, aerobic, anaerobic, Gram-negative, and Gram-positive bacteria are all susceptible to silver's antimicrobial effects [42, 48–52].

The quickest healing times were correlated with dressings that offer a moist healing environment, such as hydrocolloids, transparent films, or calcium alginate.



Figure 2. (A) Hand skin defect after amputation of 4 fingers caused by motor saw. Skin graft rejection occurred several days after covering the defect; the figure shows the appearance of the wound 5 days after skin graft rejection. (B) Treatment continued with a hydrofiber silver dressing, leading to considerable reduction of the wound area within 2 weeks. (C) The wound was completely epithelialized within 1 month. (D) The scar 1 year after treatment was completed.

Conclusions:

Due to the numerous secondary infections that diabetes wounds are susceptible to, silver nanoparticles and Ag+ carriers may help with the delayed healing of diabetic wounds.

These nanoparticles can aid diabetic patients in wound healing more quickly and with fewer scarring.

Conflict of interest: None

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