



Silver Nanoparticles Teratogenicity on Developing Skeletal System of Fetuses



Jyoti Prakash Pani*, Singh Royana and Shamal SN

Department of Anatomy, Institute of Medical Sciences Banaras Hindu University Varanasi, India

Submission: April 22, 2017; Published: April 28, 2017

*Corresponding author: Jyoti Prakash Pani, Research Scholar Department of Anatomy, Institute of Medical Sciences Banaras Hindu University Varanasi, UP, India, Tel: 8433668356; Email: jyotiprakashimsbhu@gmail.com

Abstract

Two aspects of general risk evaluation are, to point out destruction cause and risk percentage calculation. The agent's capability to do harm the host is termed as risk, but when the same agent can produce adverse outcome to the species its calculation is called risk assessment. Related exposure of risk for stipulated period is called critical review of risk. Among all nanoparticles Silver nanoparticle is important because of its antifungal and antimicrobial activity. Also known to be anti-inflammatory and wound healer, but these properties of silver compounds are executed in low dose. At higher dose (5, 10, 15, 20mg/kg b.w.) and bigger size it exhibits toxic and teratogenic effects whether oral gavages or any other exposure whereas sham control (Double distilled water vehicle) group is the comparer. 35 pups were used in this experiment.

The treated group mothers were received polyvinyl pyrrolidone coated and sodium borohydride stabilized colloidal silver fresh made solution through repeated oral gavages from 7th to 12th day of gestational age. Fetuses collected on 18th day of gestation. After measuring weight and crown rump length fetuses eviscerated in 1% KOH till the flesh and bones were crystal clear and stained by 1% Alizarin stain and preserved in thymol added 40%, 80% and 100% glycerol and were examined by powerful hand lens on the dysmorphology sight. Bigger size & high dose Nanosilvers were having skeletal effects upon pups of Swiss albino mice when translocated indirectly through mother causing common skeletal dysmorphology like unossification, clefts, scoliosis, spina bifida and hypoplasia.

Keywords: Sternal Cleft; Increased Web Space; Ribs Flattening; Close Type Neural Tube Defect; Evisceration

Introduction

The present industrial sector related to textile industry, medicine product industry, house hold industry have enormously spread the use of Silver nanoparticle in higher concentration in their respective consumer products which literally responsible for arouse of various teratogenic and toxic effects on offspring's. The vivid use of AgNps in higher concentration and higher dose in industries including textile, house hold, mining, medicine and other fields in existing life is responsible for a major role in bubbling teratogenic and malformation issues of various body systems of human being which is an alara. Varieties of teratogenic effects are executed due to silver nanoparticle among which one of the important is skeletal dysmorphology. The current research enlightes the present world about effect of silver nanoparticle on skeletal system which was till today only hypothesized.

Material and Methods

The present study was done on horn exteriorized and collected pups of Swiss albino mice of 5,10,15,20 mg/kg.b.w.

AgNps colloidal solution treated groups including Sham control (1, 2, 3, 4 and 5) through repeated oral gavages to evaluate the percentage of skeletal dysmorphology. 35 exteriorized pups from above mentioned group were exposed to 1% KOH evisceration and Alizarin staining protocol. 6 fetuses were observed resorption.

Observation and Findings

The percentage of skeletal dysmorphology was found higher and highest in 15mg and 20mg AgNps/ kg b.w. treated group pups. The skeleton of pregnant Swiss Albino mice after experiment were exhibited unossified 5th sternal segment from the sternal bar, unossified Manubrium segment with sternal cleft, maxillary and mandibular hypoplasia, unossified frontal, parietal and nasal bone, failure of fusion of posterior segment of the hip bone, 10,11 and 12th rib rudimentation, absence of mid shaft of 6 to 12th rib along with increase of the inter rib space due to flattening, absence of body & spinous process is seen from whole thoracic segment with neural tube defect of close type.

(5mg/kgb.w.) The percentage of skeletal dysmorphology seen in this group is 32%. The 10mg/kgb.w. AgNps treated group fetuses present skeletal dysmorphology in the form of absence of lumbar and sacral vertebra, absence of hip bones, severely degenerated ribs without cartilages, unossified and undeveloped frontal and parietal bone, scoliosis of thoracic and lumbar region, absence of cervical vertebra, maxillary hypoplasia, disclosure of sagittal and coronal sutures, undeveloped lower limb bones. The percentage of skeletal dysmorphology calculated in this group is 40%.

Among 15 mg AgNps treated group pups were observed absence of cervical vertebrae with absence of 12th rib and rest of the vertebrae were observed undeveloped spinous process, Metatarsal cleft of dorsal view of foot, unossified hip bone on ventral view with absence of segment and fibrosis, unossified temporal bone which is found fibrosed on lateral view of skull, absence of proximal segment of innominate bone, vertebral column anomaly with rudimentation of 6th and 9th rib and absence of 10th, 11th and 12th ribs, unossified parietal bone, Anencephaly with scoliosis vertebrae is seen in L1-L5, unossified hip bone, unossified scapulae of both side is seen on dorsal view, Absence of cartilage from 6th to 12th rib. The percentage of skeletal dysmorphology seen in this group is 60%. The 20mg/kg b.w. AgNps treated group fetuses were exhibited highest percentage of skeletal dysmorphology (75%) with Scoliosis of lumbar region, unossified occipital bone, scapulae and hip bone, big fibrosis of maxilla, frontal and parietal bones, second to sixth segment of sternum., cleft of ankle joint, increased space of 1st, 2nd rib and 5th to 8th ribs of left side, cleft of symphysis pubis joint, unossified mandible with hypoplasia, absence of spinous process with wavy ribs, complete fusion of the 2nd to 8th cervical vertebrae, mild scoliosis and unossified occipital and parietal bone with absence of scapulae and hypo plastic vertebrae.

Discussion

There are plenty of data available among nanosilver teratogenicity from various manufactured products, this existing study indicated dysmorphology of skeletal system of vertebrate pups of Swiss albino mouse variety which is predominant among several type of teratogenicity executed till today. Nanosilver shows antagonistic properties in lower dose such as antimicrobial and antiseptic properties (0.25-1mgAgNps/kg b.w.) through topical application but surprisingly it shows teratogenic effects like skeletal dysmorphology in 5, 10, 15, 20 mg AgNps/ kg b.w. dose through oral gavages. This is definitely a big question for present research world who are really ignore about potential adverse effect [1,2]. The question arise in this point of view is why this potential adverse and teratogenic effect in higher dose and bigger size but not in lower dose and smaller size. The answer to this question is higher dose and bigger size silver nanoparticles obstruct the imbibing nutrition at micro tissue porous level.

The present study indicates skeletal dysmorphology effects after repeated oral gavages of synthesized bigger size silver nanoparticle colloidal solution at higher dose on pups of pregnant Swiss albino mice and hypothesis comes at the end that whether there is significant association between gross anomalous skeletal tissue and histopathology changes or not?

References

1. Benn T, Cavanagh B, Hristovski K, Posner JD, Westerhoff J (2010) The release of nanosilver from consumer products used in the home. *J Environ Qual* 39(6): 1875-1882.
2. Sawosz E, Grodzik M, Zielinska M, Niemiec T, Olszanska B, et al. (2009) Nanoparticles of silver do not affect growth, development and DNA oxidative damage in chicken embryos. *J Arch Geflugelk* 73(3): 208-213.



This work is licensed under Creative Commons Attribution 4.0 License
DOI: [10.19080/APBIJ.2017.02.555590](https://doi.org/10.19080/APBIJ.2017.02.555590)

**Your next submission with Juniper Publishers
will reach you the below assets**

- Quality Editorial service
- Swift Peer Review
- Reprints availability
- E-prints Service
- Manuscript Podcast for convenient understanding
- Global attainment for your research
- Manuscript accessibility in different formats
(Pdf, E-pub, Full Text, Audio)
- Unceasing customer service

Track the below URL for one-step submission

<https://juniperpublishers.com/online-submission.php>