



# PUBLICATION ROUTING SHEET

## NAVAL MEDICAL RESEARCH UNIT SAN ANTONIO (NAMRU-SA)

**Author/Originator:** Tony T. Yuan

**Date:** 24 June 2015

**Publication Title:** Development and Optimization of Silver Nanoparticle Formulation for Fabrication

**Publication Type:** ☐ Journal/ Paper ☒ Tech Report ☐ Presentation/Abstract  
☐ Book Chapter ☐ Briefing ☐ Other:

**NAMRU-SA DOCUMENT NUMBER:** 2014-73

<input type="checkbox"/> 9	<b>Return to the Public Affairs Officer</b>		<b>Return to the Public Affairs Officer</b>	
<b>Routing</b>	<b>Title</b>	<b>Initials</b>	<b>Approved/Disapprove</b>	<b>Date</b>
<input type="checkbox"/> 8	<b>Commanding Officer</b> <b>Consider for Writing Award</b> <input type="checkbox"/> Yes <input type="checkbox"/> No	Sam	<input checked="" type="checkbox"/> <input type="checkbox"/>	27 July 2015
<input type="checkbox"/> 7	<b>Executive Officer</b>		<input type="checkbox"/> <input type="checkbox"/>	
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<input checked="" type="checkbox"/> 5	<b>Research Coordinator</b>	ST	<input checked="" type="checkbox"/> <input type="checkbox"/>	7/24/15
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<input checked="" type="checkbox"/> 3	<b>Director</b> CCC&OM CH&RM	DR	<input checked="" type="checkbox"/> <input type="checkbox"/>	7/12/15
<input checked="" type="checkbox"/> 2	<b>Department Head</b> CCC&OM – Exp&Tra Im&Bio DE&HSI CH&RM – Epi&Bio Bio&Env Max&Dis	1/2	<input checked="" type="checkbox"/> <input type="checkbox"/>	7/2/15
<input checked="" type="checkbox"/> 1	<b>Principal Investigator/Author</b>	ty.	<input checked="" type="checkbox"/> <input type="checkbox"/>	6/24/15

**COMMENTS:**



**NAMRU-SA Science Advisor / Program Manager complete this section:**

☒ The Science Advisory Review Board member / Program Manager has reviewed and approved the manuscript/presentation

**Summary of media sensitive subject matter:**

☐ Yes ☒ No

**If Yes, Explain:**

**Contact Information:**

Name: AJ Burdette (Science Review Board member/ Program Manager)

phone: 210 539-1296

email: alexander.j.burdette2.csr@mail.mil

**Signature:**

*[Handwritten Signature]*

**Date:**

7/13/15

**NAMRU-SA PAO completes this section: NAMRU-SA DOCUMENT# 2014-73**

**Check all of the following items that apply to this publication or presentation:**

If a "yes" option is selected, higher review is required pursuant to BUMEDINST 5721.3B

**Yes NO**

- |                          |                          |  |
|--------------------------|--------------------------|--|
| <input type="checkbox"/> | <input type="checkbox"/> | Non-human primates, cats, dogs or marine mammals   |
| <input type="checkbox"/> | <input type="checkbox"/> | International Media  |
| <input type="checkbox"/> | <input type="checkbox"/> | AIDS/HIV   |
| <input type="checkbox"/> | <input type="checkbox"/> | Controversial or sensitive   |
| <input type="checkbox"/> | <input type="checkbox"/> | Potential media interest   |
| <input type="checkbox"/> | <input type="checkbox"/> | Addresses government policy or findings more appropriately released by the Seat of Gov't |
| <input type="checkbox"/> | <input type="checkbox"/> | Special Research Topic (e.g., Persian Gulf, Women's Issues, PTSD, etc.)                  |

☒ **Cleared** (select if review by higher authority not required)

☐ **Requires Higher Review & Clearance**

**Summary of media sensitive subject matter:**

NONE

**Local Public Affairs Officer Signature:**

*[Handwritten Signature: Flisa Stevenson]*

**Date:**

27 July 2015

PAO Name: **Flisa Stevenson**

Contact Information: Phone: DSN 289-8684, COM (210) 539-8684

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**NAMRU-SA Commanding Officer completes this section:**

**Comments:** small change p.6. Thanks!

**Commanding Officer Signature:**

*[Handwritten Signature: Elizabeth Montcalm-Smith]*

**Date:**

27 July 2015

**Contact Information:**

**CAPT Elizabeth Montcalm-Smith, Ph.D., MSC, USN**

Phone: DSN: 389-0960, (210) 539-0960

elizabeth.a.montcalmsmith.mil@mail.mil





ORA Use Only

File No.

## Request for Clearance for Authored Works

**Instructions:** Pursuant to NAVMEDRSCHCENINST 5721.1C, NMRC must prospectively clear all publications and presentations. NMRC authors should:

1. Complete Parts A-D of this form and Attachment 1 (CPP-2).
2. Route through Directorate for chain of command and scientific review and signature.
3. Submit to ORA for processing and routing for Command review.

All information must be complete; incomplete answers may result in delay. Please allow NMRC at least 10 working days for its review. Please note that BUMED requires 21 working days for its review and an additional 21 days may be required for items requiring further review by a higher authority (e.g., DoD, SECNAV or CNO).

### Part A – Background Information

1. **Directorate/Dept:** Craniofacial Health and Restorative Medicine
2. **Title of Publication or Presentation:** Development and Optimization of Silver Nanoparticle Formulation for Fabrication
3. **Author(s):** (List authors starting with primary author)  
☐ Check if authors number more than listed below.

<u>Author(s) Name</u>	<u>Contractor</u> Yes/No	<u>Institutional</u> Affiliation	<u>Role in Research</u>
Tony T. Yuan	Yes	NAMRU-SA	Design of experiments; fabrication and development of methodology; conducted experiments; report writing
Natalie A. Forbes	Yes	NAMRU-SA	Conducted experiments; data analysis; report writing
Mauris DeSilva	No	NAMRU-SA	Design of experiments; advisory oversight of experiments conducted; supervision of the project

4. **Work Unit Number (only one work unit/project allowed):** G1009
  - a. **Provide source of support (i.e. BUMED, ONR, AFOSR, DARPA, ARL, etc.):** BUMED
  - b. **Check one of the following, if appropriate:**  
☐ Work was done prior to employment at NMRC  
☐ Work was done as a consultation for another institute while employed by/stationed at NMRC  
☐ Other - please explain:

5. **Is this clearance request the result of research-related activities?** ☒ Yes ☐ No

a. **Activity involves (select all that apply):**

- ☐ **Human Subject Research Protocol No.:**  
List the IRB that approved the research:

- ☐ **Project No.:**

**Projects** that have been reviewed by the IRB Chair and determined to not meet the definition of human subjects' research will have a "project number." Please refer to the form entitled "Determination of Human Subject Research" for further information.

- ☐ **Animal Use Research Protocol No.:**  
List the IACUC that approved the research:

6. Is activity supported by a Grant, CRADA, MTA, NDA or other agreement: ☐ Yes ☒ No

If yes, please provide the following:

- Grant/Agreement Type and No.:
- Grant/Agreement Sponsor Name:
- Grant/Agreement Title:
- Contractor/Collaborator/Recipient Name:
- Has the non-government party been given advance notice of publication required by the agreement prior to submission? ☐ Yes ☐ No

7. **Relevance of manuscript or presentation to operational medicine/Navy medicine:** Since the beginning of operations in Iraq and Afghanistan, the military health care system has dealt with a steady increase in multi-drug resistant organisms. Therefore, the development of next generation antimicrobial compounds, such as silver nanoparticles, is a priority. However, due to the inconsistencies in current fabrication and processing methods, it is unclear whether the antimicrobial effect is caused by the particles or by the residual silver ions left from the fabrication process. Having a better understanding of the fabrication process of silver nanoparticles could improve future silver containing products, which is important to lowering toxicity and improving efficacy. This could have significant impact on the treatment of warfighters in military facilities.

8. **Summary of media sensitive subject matter:** Not applicable.

## Part B – Purpose/Forum

1. **Journals** (please attach copies of submission)

Journal title:

- ☐ Manuscript ☐ Letter to the Editor ☐ Case Report ☐ Other:  
☐ Domestic ☐ Foreign (Country)

2. **Meeting/Conference** (please attach copies of submissions)

a. Name:

b. Dates of Meeting:

c. Location:

- ☐ Abstract for oral presentation/briefing (submission deadline date)  
☐ Abstract for poster/exhibit (submission deadline date)  
Please submit an electronic copy of poster one week prior to departure.  
☐ Keynote presentation (submission deadline date)  
☐ Other, please explain:

3. **Other** (please attach copies of submissions)

- ☐ Book chapter, provide title of book, editor(s), publisher:  
☒ Technical report



## Part C – Required Disclaimers and Acknowledgments

**Note on Abstracts:** Because abstracts are usually limited to a specific word count and/or are used to determine whether the work will be accepted for publication or presentation, the required Navy disclaimers, acknowledgement of support, human and animal involvement statements are generally not included in the abstract. However, these statements should be included in the actual publication and/or presentation (e.g., posters, slides, etc.)

### 1. Disclaimer:

**Publications and presentations** for which an author claims Navy affiliation, the disclaimer provided below should be included. Further, manuscripts and professional articles completed in an official capacity or funded by the government shall identify the author with complete name, military grade, title and command.

*The views expressed in this article are those of the author and do not necessarily reflect the official policy or position of the Department of the Navy, Department of Defense, nor the U.S. Government.*

☒ **Yes, page:** 1 of the technical report

### 2. Source of support (e.g., WUN):

**All publications and presentations** must disclose all sources of Navy funding, for example:

*This work was supported/funded by work unit number xxxx.*

☒ **Yes, page:** 1 of the technical report

☐ **No, please explain:**

### 3. Human Research Protections/IRB statement:

**All publications and presentations** concerning research involving the use of human subjects must contain the following statement:

*The study protocol was approved by the Naval Medical Research Center Institutional Review Board in compliance with all applicable Federal regulations governing the protection of human subjects.*

☐ **Yes, page:**

☒ **No. If human research protocol number provided above please explain:** Not applicable.

### 4. Animal Care and Use statement:

**All publications and presentations** concerning research involving animals must contain such a statement.

*The study protocol was reviewed and approved by the Walter Reed Army Institute of Research/Naval Medical Research Center Institutional Animal Care and Use Committee in compliance with all applicable Federal regulations governing the protection of animals in research.*

☐ **Yes, page:** (Use this for NAMRU-SA) The study protocol was reviewed and approved by the 711th HPW/RHD JB-SA-Fort Sam Houston Institutional Animal Care and Use Committee (IACUC) in compliance with all applicable Federal regulations governing the protection of animals in research.

☒ **No. If animal research protocol number provided above please explain:** Not applicable.

### 5. Copyright statement:

**The copyright statement** must be attached to all government work when submitted to civilian media for publication.

*I am a military service member (or employee of the U.S. Government). This work was prepared as part of my official duties. Title 17 U.S.C. §105 provides that 'Copyright protection under this title is not available for any work of the United States Government.' Title 17 U.S.C. §101 defines a U.S. Government work as a work prepared by a military service member or employee of the U.S. Government as part of that person's official duties.*

☐ **Yes, page:** 1 of the technical report

## Part D – Author Attestation & Directorate Review

**AUTHOR:** I attest that the above information is correct and accurate to the best of my knowledge.

**Signature:** \_\_\_\_\_

**Print Name:** Tony Tao Yuan

**Print Title:** Postgraduate Fellow

**Date:** 6/24/15

**Rank:**

### DEPARTMENT HEAD:

**Signature:** \_\_\_\_\_

**Print Name:** CAPT Jonathan Stahl

**Date:** 7/12/15

### DIRECTORATE:

**Signature:** \_\_\_\_\_

**Print Name:** CDR David A. Leal

**Date:** 7/13/15

**COMMANDING OFFICER:** This submission has received scientific review.

**Signature:** \_\_\_\_\_

**Print Name:** CAPT E. Montcalm-Smith, Ph.D., MSC, USN

**Date:** 27 July 2015





## Request for Clearance for Authored Works Attachment 1

**ORA Use Only:**

File No.

Submitting  
Command:

Author's Command:

### Part A – NMSC PAO Synopsis

**Instructions:** Investigators complete this document and submit as an attached Word Document. This synopsis should be prepared in non-scientific terms and consistent with Part B of the Publication Clearance Request Document (CPP-1).

The text provided below is to be used as an example only. Authors should highlight the gray areas and press the backspace button on your keyboard. The text provided below will disappear and authors will be able to input their own information here as appropriate.

- 1. Publication Title:** Development and Optimization of Silver Nanoparticle Formulation for Fabrication
- 2. Purpose/Forum** The objective of this study was to evaluate a method for the consistent fabrication of silver nanoparticles (AgNPs) with diameters between 10 and 20 nm.
- 3. Background/Synopsis:** Multidrug-resistant (MDR) infections are on the rise in military and civilian populations. Silver nanoparticles show promise as an antimicrobial agent; however, there remains gaps in the knowledge on the mechanisms in which the AgNPs are fabricated. Due to these gaps, there are a limited number of AgNP products available for commercial use. Additionally, the lack of a standardized fabrication method has resulted in issues with reproducibility and particle aggregation with many AgNPs that are available. Thus, research is needed to better understand the fabrication of AgNPs and to establish guidelines to standardize a method of fabrication.
- 4 Results:** The data showed that changes in reagents concentration can have a number of different effects on the final silver nanoparticle product and reproducibility. The optimized formulation of 25 mL of 0.2 mM AgNO<sub>3</sub> with sodium citrate (1.5 mM), PVP (Mw ~29k Da, 0.7mM), NaBH<sub>4</sub> (0.8mM), and H<sub>2</sub>O<sub>2</sub> (60μL, 30%) gave an average AgNP size of 12 ± 4 nm with the best reproducibility while maintaining its size and morphology. Additionally, the results showed that ultracentrifugation is important to remove the majority of excess silver ions in the final product.
- 5. Conclusions:** An optimized formulation was identified to fabricate silver nanoparticles that allows for simple post-process with ultracentrifugation. Formulation obtained from this study will provide a platform in which to test antimicrobial efficacy of silver nanoparticles and the incorporation of these particles for more clinical applications.
- 6. Sensitive areas/media interest:** N/A.