

STATE OF CALIFORNIA
STANDARD AGREEMENT
 STD 213 (Rev 05/18)

AGREEMENT NUMBER 18-C0019
REGISTRATION NUMBER

1. This Agreement is entered into between the State Agency and the Contractor named below:
- STATE AGENCY'S NAME
 Department of Pesticide regulation, hereinafter referred to as "State"
- CONTRACTOR'S NAME
 The Regents of the University of California, Riverside, hereinafter referred to as "University"
2. The term of this Agreement is: July 1, 2018 through June 30, 2020
3. The maximum amount of this Agreement is: \$ 149,991.00
4. The Parties agree to comply with the terms and conditions of the following Exhibits, which by this reference are made a part of the Agreement.

Exhibit A – A7: A–Scope of Work; A1–Deliverables; A2–Key Personnel; A3–Authorized Representatives; A4–Use of Intellectual Property; A5–Resumes/Biosketch; A6–Current & Pending Support; A7–Third Party Confidential Information (if applicable) 15 page(s)

Exhibit B – B–Budget; B1–Budget Justification; B2– Subawardee Budgets (if applicable); B3– Invoice Elements 4 page(s)

Exhibit C* – University Terms and Conditions UTC-518

Check mark additional Exhibits below, and attach applicable Exhibits or provide internet link:

- Exhibit D** – Additional Requirements Associated with Funding Sources page(s)
- Exhibit E** – Special Conditions for Security of Confidential Information page(s)
- Exhibit F** – Access to State Facilities or Computing Resources page(s)
- Exhibit G** – Negotiated Alternate UTC Terms 1 page(s)

Items shown with an Asterisk (*) are hereby incorporated by reference and made part of this agreement as if attached hereto.

These documents can be viewed at <http://www.dgs.ca.gov/ols/Resources/ModelContractLanguageUniversities.aspx>.

IN WITNESS WHEREOF, this Agreement has been executed by the Parties hereto.



CONTRACTOR		<i>California Department of General Services Use Only</i>
CONTRACTOR'S NAME (if other than an individual, state whether a corporation, partnership, etc.)		
The Regents of the University of California, Riverside		
BY (Authorized Signature)	DATE SIGNED (Do not type)	
	6-21-2018	
PRINTED NAME AND TITLE OF PERSON SIGNING		
Karen Garcia, Sr. Contract + Grant Officer		
ADDRESS		
245 University Office Bldg, Riverside, CA 92521-0217		
STATE OF CALIFORNIA		
AGENCY NAME		
Department of Pesticide Regulation		
BY (Authorized Signature)	DATE SIGNED (Do not type)	
	6-29-18	
PRINTED NAME AND TITLE OF PERSON SIGNING		
Anise Severns, Assistant Director, Admin Svcs Div		
ADDRESS		
1001 I Street, Sacramento, CA 95814		
		<input checked="" type="checkbox"/> Exempt per: Delegation Letter 74.6

Exhibit A – Scope of Work

Project Summary & Scope of Work

Contract Grant

PI Name: Choe, Dong-Hwan

Project Title: Research the depositional patterns of pesticides throughout a structure after a fogger product is activated

Project Summary/Abstract

Briefly describe the long-term objectives for achieving the stated goals of the project.

1. Project Objectives

Using several different total release pyrethroid containing fogger products that are currently available in California, we propose to conduct the research in experimental house structures with realistic household materials and settings.

The specific aims of this study are to:

- 1) Identify the best sample collection / analysis method that may be used in characterizing the depositional patterns (e.g., surfaces exposed and extracted / analyzed in the laboratory) for pyrethroids after the fogger application (passive collection method, GC-MS or GC-FID or SPME);
- 2) Obtain quantitative distribution of pyrethroids on various surfaces after the fogger application (several variables, such as height, distance from the fogger, vertical vs. horizontal surface, presence of wall or door, etc.);
- 3) Determine the pest control efficacy with laboratory colonies of German cockroach and bed bug (pyrethroid susceptible and resistance strains); and
- 4) Develop a standard method for estimating the potential of off-site movement of pyrethroids from the surfaces (various substrate types such as bath tub, tile, carpet, and flooring).

If Third-Party Confidential Information is to be provided by the State:

- Performance of the Scope of Work is anticipated to involve use of third-party Confidential Information and is subject to the terms of this Agreement; **OR**
- A separate CNDA between the University and third-party is required by the third-party and is incorporated in this Agreement as Exhibit A7, Third Party Confidential Information.

Scope of Work

Describe the goals and specific objectives of the proposed project and summarize the expected outcomes. If applicable, describe the overall strategy, methodology, and analyses to be used. Include how the data will be collected, analyzed, and interpreted as well as any resource sharing plans as appropriate. Discuss potential problems, alternative strategies, and benchmarks for success anticipated to achieve the goals and objectives.

2. Problem Statement

Pyrethroids are frequently detected in wastewater effluent representing a source of potential toxicity to surface waters to which they discharge (Teerlink 2014). One recent study (Weston et al. 2013) suggested that pyrethroid inputs from indoor cleaning activities within residential areas is significant to total mass loading of pyrethroids in wastewater. Registered uses for pyrethroids include a variety of indoor uses including pet treatments, indoor pest control, and clothing treatment. The presence of pyrethroids on indoor dust has been reported (Julien 2008). Cleaning activities, such as mopping and surface washing, could represent a pathway for pyrethroids to enter the wastewater collection system. Washing pets treated with pyrethroids could also represent a pathway to the wastewater collection system. Total release fogger products (also known as "bug bombs") are available for general public's use. In California, more than 60 product names are registered for this particular type of formulation. Many of them contain pyrethroids and other compounds such as synergists (e.g., piperonyl butoxide) and petroleum propellant blend. These products often list bed bug, flea, or cockroach on their labels as target pests. However, based on a recent study, the efficacy of these fogger products to control insects hidden in harborage sites was brought into question. There is very little understanding of the depositional patterns of pesticides throughout a structure after a fogger product is activated. This information is critical in estimating potential wash-off fractions of active ingredients found within this product type. Wash-off fractions are essential parameters in developing down-the-drain source identification models capable of predicting pesticide loading to the waste stream. In conjunction with their efficacy test using live pest insects, the information will provide an important insight to understand the limitations of these fogger formulations, and to estimate the potential of off-site movement of pyrethroids used in indoor settings.

3. Work to be Performed

- A. University will obtain a suitable research location to answer study objectives. The research station will allow for configuring the internal compartments to test various application scenarios. A digital schematic will be created for each application trial, consisting of detailed room measurements and placement of the fogger during the trial.
- B. At least three current use fogger products will be chosen for the study, each product containing a different active ingredient. Product label information will be recorded for each test, including product name, EPA registration number, active ingredient, percent active ingredient, volume, pests controlled, and effective room size.
- C. At least two configurations will be tested during the application trials. These will include a single room and double room scenarios. The rooms will be designed to simulate a real living area, with raised level countertops and a designated sink. Product label directions will be followed for the duration of the trials.
- D. Pesticide mass will be calculated as concentration and percent recovery of total product mass. Residual concentrations will be evaluated on several structural surfaces, including floors, walls, ceiling, and countertops. Residual concentrations from each of the surfaces will

be tested at several time points after the initiation of the test to evaluate pesticide persistence on various structure surfaces.

- E. Several representative indoor pests (e.g., cat flea, bed bug, German cockroach, brown-banded cockroach) will be set up inside of the experimental structure during the fogger application to determine the pest control efficacy of the treatment. Based on the pest biology, different settings and scenarios will be included (e.g., distance from the fogger, height of the pest location, presence or absence of the harborage or cover) to reflect realistic indoor pest infestation condition.

4. State Responsibilities

- A. State will work with the University to ensure the parameters of the experimental design are adequate to answer all the study questions. Trials will not commence until both parties are satisfied with experimental setup.
- B. State will review draft report and provide feedback to author prior to submission of final report.

Exhibit A1 - Deliverables

SCHEDULE OF DELIVERABLES

List all items that will be delivered to the State under the proposed Scope of Work. Include all reports, including draft reports for State review, and any other Deliverables, if requested by the State and agreed to by the Parties.

If use of any Deliverable is restricted or is anticipated to contain preexisting Intellectual Property with any restricted use, it will be clearly identified in Exhibit A4, Use of Preexisting Intellectual Property.

Unless otherwise directed by the State, the University Principal Investigator shall submit all Deliverables to the State Contract Project Manager, identified in Exhibit A3, Authorized Representatives.

Deliverable	Description	Due Date
Standard Operating Procedures for sample collection and analytical methodology.	University will develop and test the methods and protocols for sample collection and chemical analysis that may be used in characterizing the depositional patterns.	June 30, 2019
Spatial and temporal concentration gradients evaluation	University will calculate and provide a summary of the spatial and temporal concentration gradients for each product and application scenario.	June 30, 2020
Draft Study Report	University shall provide a draft field study report for review. This will document trial methodology, analytical methods, trial results, and product efficacy evaluation.	May 30, 2020
Final Study Report	University shall provide a final field study report documenting: trial methodology, analytical methods, trial results, and product efficacy evaluation.	June 30, 2020
The following Deliverables are subject to Section 19. Copyrights, paragraph B of Exhibit C		

Exhibit A2 – Key Personnel

KEY PERSONNEL

List Key Personnel as defined in the Agreement starting with the PI, by last name, first name followed by Co-PIs. Then list all other Key Personnel in alphabetical order by last name. For each individual listed include his/her name, institutional affiliation, and role on the proposed project. Use additional consecutively numbered pages as necessary.

Last Name, First Name	Institutional Affiliation	Role on Project
PI:		
<i>Choe, Dong-Hwan</i>	<i>UC Riverside, Entomology</i>	<i>Principal Investigator</i>
Co-PI(s) – if applicable:		
<i>Last name, First name</i>	<i>Institutional affiliation</i>	<i>Role on the project</i>
<i>Last name, First name</i>	<i>Institutional affiliation</i>	<i>Role on the project</i>
Other Key Personnel (if applicable):		
<i>Tay, Jia-Wei</i>	<i>UC Riverside, Entomology</i>	<i>Postdoctoral Scholar</i>
<i>Last name, First name</i>	<i>Institutional affiliation</i>	<i>Role on the project</i>

Exhibit A3 – Authorized Representatives

AUTHORIZED REPRESENTATIVES AND NOTICES

The following individuals are the authorized representatives for the State and the University under this Agreement. Any official Notices issued under the terms of this Agreement shall be addressed to the Authorized Official identified below, unless otherwise identified in the Agreement.

State Agency Contacts	University Contacts
<p>Agency Name: Department of Pesticide Regulation</p> <p><i>Contract Project Manager (Technical)</i></p> <p>Name: Robert Budd Senior Environmental Scientist</p> <p>Address: Department of Pesticide Regulation 1001 I Street Sacramento, CA 95814</p> <p>Telephone: 916/445-2505 Fax: 916/324-4088 Email: robert.budd@cdpr.ca.gov</p>	<p>University Name: University of California at Riverside</p> <p><i>Principal Investigator</i></p> <p>Name: Dong-Hwan Choe Assistant Cooperative Extension Specialist/ Assistant Professor</p> <p>Address: Department of Entomology University of California 3401 Watkins Drive Riverside, CA 92521</p> <p>Telephone: 951/827-5717 Fax: 951/827-3086 Email: donghwan.choe@ucr.edu</p> <p>Designees to certify invoices under Section 14 of Exhibit C on behalf of PI:</p> <ol style="list-style-type: none"> 1. <Name>, <Title>, <EmailAddress> 2. <Name>, <Title>, <EmailAddress> 3. <Name>, <Title>, <EmailAddress>
<p><i>Authorized Official (contract officer)</i></p> <p>Name: Anise Severns Assistant Director</p> <p>Address: Department of Pesticide Regulation 1001 I Street Sacramento, CA 95814</p> <p>Telephone: 916/650-6957 Fax: 916/445-4149 Email: anise.severns@cdpr.ca.gov</p> <p><i>Send notices to (if different):</i></p> <p>Name: Robert Budd</p>	<p><i>Authorized Official</i></p> <p>Name: Karen Garcia Sr. Grants and Contracts Officer</p> <p>Address: Sponsored Programs Administration University of California, Riverside Research and Economic Development 245 University Office Bldg. Riverside, CA 92521</p> <p>Telephone: 951/827-3692 Fax: 951/827-4483 Email: kgarcia@ucr.edu</p> <p><i>Send notices to (if different):</i></p>

<p>Senior Environmental Scientist Address: Department of Pesticide Regulation 1001 I Street Sacramento, CA 95814 Telephone: 916/445-2505 Email: robert.budd@cdpr.ca.gov</p>	<p>Name: <Name> <Title> Address: <Department> <Address> <City,State,Zip> Telephone: <Telephone#> Email: <EmailAddress></p>
<p>Administrative Contact</p> <p>Name: Kim Bateman Contract Analyst Address: Department of Pesticide Regulation 1001 I Street, MS 4A Sacramento, CA 95814 Telephone: 916/445-2512 Fax: 916/445-6845 Email: kim.bateman@cdpr.ca.gov</p>	<p>Administrative Contact</p> <p>Name: Karen Garcia Sr. Grants and Contracts Officer Address: Sponsored Programs Administration University of California, Riverside Research and Economic Development 245 University Office Bldg. Riverside, CA 92521 Telephone: 951/827-3692 Fax: 951/827-4483 Email: kgarcia@ucr.edu</p>
<p>Financial Contact/Accounting</p> <p>Name: Department of Pesticide Regulation Accounts Payable Address: Department of Pesticide Regulation Accounts Payable P.O. Box 4015 Sacramento, CA 95812-4015 Telephone: (916) 445-4149 Email: Accounts_Payable@cdpr.ca.gov</p>	<p>Authorized Financial Contact/Invoicing</p> <p>Name: Kimberly Gala Address: UC Riverside, Accounting Office - 002 Riverside, CA 92521 Telephone: 951/827-1953 Fax: 951/827-3314 Email: kimberly.gala@ucr.edu</p> <p>Designees for invoice certification in accordance with Section 14 of Exhibit C on behalf of the Financial Contact:</p> <ol style="list-style-type: none"> 1. <Name>, <Title>, <EmailAddress> 2. <Name>, <Title>, <EmailAddress> 3. <Name>, <Title>, <EmailAddress>

Exhibit A4 – Use of Intellectual Property

USE OF INTELLECTUAL PROPERTY

If either Party will be using any third-party or pre-existing intellectual property (including, but not limited to data, copyrighted works, known patents, trademarks, service marks and trade secrets) "IP" with restrictions on use, then list all such IP and the nature of the restriction below. If no third-party or pre-existing IP will be used, check "none" in this section.

- A. State: Preexisting IP to be provided to the University from the State or a third party for use in the performance in the Scope of Work.

None or List:

Owner (Name of State Agency or 3 rd Party)	Description	Nature of restriction:

- B. University: Restrictions in Preexisting IP included in Deliverables identified in Exhibit A1, Deliverables.

None or List:

Owner (Name of University or 3 rd Party)	Description	Nature of restriction:

- C. Anticipated restrictions on use of Project Data.

If the University PI anticipates that any of the Project Data generated during the performance of the Scope of Work will have a restriction on use (such as subject identifying information in a data set) then list all such anticipated restrictions below. If there are no restrictions anticipated in the Project Data, then check "None" in this section.

None or List:

Owner (University or 3 rd Party)	Description	Nature of Restriction:

Exhibit A5 - RÉSUMÉ/BIOSKETCH

RÉSUMÉ/BIOSKETCH

Attach 2-3 page Resume/Biosketch for the PI and other Key Personnel listed in Exhibit A2, Key Personnel.

NAME Choe, Dong-Hwan	POSITION TITLE Assistant Professor / Assistant Extension Specialist in Urban Entomology		
EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
Department of Entomology University of California, Riverside, CA, USA	PhD	2009	Entomology
Department of Entomology University of California, Riverside, CA, USA	MS	2005	Entomology
Department of Agricultural Biology Korea University, Seoul, Korea	BA	2002	Agriculture

Experience and Research Focus

My research focuses on three major areas: urban entomology, insect behavior, and chemical ecology. In particular, my research has focused on exploring innate and learned behaviors of economically or environmentally important insect species to develop more effective integrated pest management (IPM) programs. I use manipulative laboratory studies to investigate how the behaviors of pest insects can be exploited to improve management and to develop novel management techniques. I also test the feasibility of these new techniques in real-world conditions. I draw upon my expertise in behavioral ecology, experimental design, chemical ecology and analytical chemistry to illuminate the biology of target insects, and to inform the design of new approaches for control. In addition to the bioassays involving chemistry, physiology, behavior, and toxicology, the effort to incorporate the behavioral information of target species into the working IPM program often requires extensive design, manufacturing, and testing of devices in the field.

Positions and Employment

11/2011 - Present Assistant CE Specialist and Assistant Professor
 Entomology / UC Riverside.

11/2009 - 10/2011 Postdoctoral Researcher
 Environmental Science, Policy, and Management / UC Berkeley.

Memberships, Honors and Awards

01/2005 - current Member. Entomological Society of America.

2013 Early Career Chair in Urban Entomology.

2013 UC ANR Professional Society Travel Award.

2013 Academic Senate Regents Fellowship.

2008 Bayer Young Scientist of the Year Competition (2nd place)

2008 Selected as one of the "40 Under 40" future leaders of the pest management industry by Pest Management Professional Magazine

Presentations (selected from last four years)

07/2017 Chemical ecology of bed bugs (Heteroptera: Cimicidae) in their microhabitats. 9th International

- Conference on Urban Pest. Birmingham, UK.
- 09/2016 Urban pest ant management with a minimal impact on the environment. International Congress of Entomology. Orlando, FL.
- 08/2016 New innovations in urban pest management. Pest Summit 2016. Singapore Pest Management Association. Singapore.
- 05/2016 Pheromone-assisted techniques to improve Argentine ant management in urban settings. National Conference of Urban Entomology. Albuquerque, NM.
- 11/2015 Updates on chemical ecology of bed bug. Annual Meeting of Entomological Society of America. Entomological Society of America. Minneapolis, MN.
- 09/2015 Bed bug biology, behavior, and control. California Association of Pest Control Advisers (CAPCA) Meeting. California Association of Pest Control Advisers (CAPCA). Santa Paula, CA.
- 05/2015 Do IPM by exploiting pest biology - Using attractants for urban IPM: case studies of wasp and ant. 15th Annual Integrated Pest Management Training for Landscape Professionals. The Unified Port of San Diego and The University of California Cooperative Extension. San Diego, CA.
- 03/2015 Effect of feeding status on mortality response of adult bed bugs to some insecticide products. 24th Annual UCR Urban Pest Management Conference. UCR Extension Center. Riverside, CA.
- 12/2014 Do IPM by understanding pest biology—attract and kill method targeting Argentine ants. Entomology Association of Southern California Quarterly Meeting. Entomology Association of Southern California. Arcadia, CA.
- 10/2014 Drywood Termites - Understanding Their Behavior for Better Pest Management. Target Specialty Products Annual Fall Workshop Series. Target Specialty Products. Ontario, CA.
- 10/2014 Using Attract and Kill Techniques to Control Argentine Ants. NPMA PestWorld 2014. National Pest Management Association. Orlando, FL.

Publications (selected from last four years)

- Welzel, K., S. Lee, A. T. Dossey, K. R. Chauhan, and D.-H. Choe. 2018. Verification of Argentine ant defensive compounds and their behavioral effects on heterospecific competitors and conspecific nestmates. *Sci. Rep.* 8: 1477
- Merrill, K. C., C. L. Boser, C. Hanna, D. A. Holway, I. Naughton, D.-H. Choe, and E. E. Wilson Rankin. 2017. Argentine ant (*Linepithema humile*) eradication efforts on San Clemente Island, CA, USA. *West. N. Am. Naturalis*. (in press, accepted on 7 Sep 2017)
- Romero, A., A. M. Sutherland, D. H. Gouge, H. Spafford, S. Nair, V. Lewis, D.-H. Choe, S. Li, and D. Young. 2017. Pest management strategies for bed bugs (Hemiptera: Cimicidae) in multiunit housing: a literature review on field studies. *J. Integr. Pest Manag.* 8 (1): 13.
- Tay, J.-W., M. Hoddle, A. Mulchandani, D.-H. Choe. 2017. Development of an alginate hydrogel to deliver aqueous bait for pest ant management. *Pest Manag. Sci.* 73: 2028–2038.
- Greenberg, L., M. K. Rust, S. Wright, and D.-H. Choe. 2017. Argentine ant control around homes: efficacy of treatments and urban runoff. *Int. J. Pest. Manage.* 63: 242–250.
- Rust, M. K., D.-H. Choe, E. Wilson-Rankin, K. Campbell, J. Kabashima, M. Dimson. 2017. Controlling yellow jackets with fipronil-based protein baits in urban recreational areas. *Int. J. Pest. Manage.* 63: 234–241.
- Vetter, R.S., Tarango, J., Campbell, K., Tham, C., Hayashi, C., Choe, D. 2016. Efficacy of several pesticide products on brown widow spider (Araneae: Theridiidae) egg sacs and their penetration through the egg sac silk. *J. Econ. Entomol.* 109: 267-272.

- Welzel, K., Choe, D. 2016. Development of a pheromone-assisted baiting technique for Argentine ants (Hymenoptera: Formicidae). *J. Econ. Entomol.* 109: 1303-1309.
- Choe, D.-H., H. Park, C. Vo, A. Knyshov. 2016. Chemically mediated arrestment of the bed bug, *Cimex lectularius*, by volatiles associated with exuviae of conspecifics. *PLOS ONE* 11(7): e0159520.
- Vetter, R.S., Hoddle, M.S., Choe, D., Thoms, E. 2014. Exposure of brown recluse and brown widow spiders to a commercial sulfuryl fluoride fumigation. *J. Econ. Entomol.* 107:1813-1817.
- Choe, D.-H., K. Campbell. 2014. Fatal attraction - the application of lure-and-kill tactics for urban pest ants. *Pest Control Technology*. 42: 44, 48, 50-51, 54, 56, 58.
- Choe, D.-H., K. Campbell. 2014. Effect of feeding status on mortality response of adult bed bugs (Hemiptera: Cimicidae) to some insecticide products. *J. Econ. Entomol.* 107: 1206-1215.
- Choe, D., Tsai, K., Lopez, C., Campbell, K. 2014. Pheromone-assisted techniques to improve the efficacy of insecticide sprays against *Linepithema humile* (Hymenoptera: Formicidae). *J. Econ. Entomol.* 107: 319-325.

JIA-WEI TAY

Department of Entomology
University of California Riverside
Riverside, CA 92521, USA

Phone (mobile): (951) 429-4432
Phone (lab): (951) 827-5729
Email: jia.tay@ucr.edu

EDUCATION

- September 2015 – present: **Postdoctoral Researcher**
Department of Entomology
University of California, Riverside, CA
Advisor: Dr. Dong-Hwan Choe
- November 2014: **Ph.D. in Urban and Industrial Entomology**
Universiti Sains Malaysia (University of Science Malaysia)
Advisor: Professor Chow-Yang Lee
- September 2009: **Bachelor of Applied Biology (Honors)**
Biology and Management of Vector and Parasites
Universiti Sains Malaysia

PREVIOUS EMPLOYMENT

- 2015 – present: **Postdoctoral Employee**
Department of Entomology
University of California, Riverside
- 2014 – 2015: **Research Assistant**
School of Biological Sciences
Universiti Sains Malaysia
- 2009 – 2014: **Graduate Teaching Assistant and Laboratory Instructor**
School of Biological Sciences
Universiti Sains Malaysia

TEACHING

- 2009 – 2014: Teaching Assistant and Laboratory Instructor**
School of Biological Sciences
Universiti Sains Malaysia
- 2015 – 2018: Guest Lecturer**
Department of Entomology
University of California, Riverside

STUDENT MENTORSHIP

- 2017 Sakshi Gangodkar: Undergraduate student in Life sciences, University of California, Riverside
2017 Steve Truong: Undergraduate student in Entomology, University of California, Riverside
2017 Shao-Hung (Dennis) Lee. Undergraduate student in Entomology, University of California, Riverside
2016 Hoeun (Joyce) Park: Undergraduate student in Biology, University of California, Riverside
-

- 2016 Mary Ellen Nguyen: Undergraduate student in Biology, University of California, Riverside
2013 Isaac Leow Chin-Soon: Undergraduate student in Entomology, Universiti Sains Malaysia, Penang, Malaysia

AWARDS

- 2014 Agricultural Crop Trust Scholarship Award
2010 – 2014 Universiti Sains Malaysia Fellowship Award
2010 – 2014 Postgraduate Research Grant Scheme
2013 Travel Fund, 2nd Global Conference on Entomology
2008 – 2009 Dean List, School of Biological Sciences

PROFESSIONAL MEMBERSHIPS

1. Sigma Xi
2. Entomological Society of America

COMMUNITY OUTREACH (selected)

1. International Scholar Research Showcase and Poster Fair, International Education Week, University of California, Riverside. 6 – 9 November 2017.
2. Entomology Booth. Riverside Insect Fair, Riverside, CA. 29 April 2017.
3. Entomology Booth. Riverside Insect Fair, Riverside, CA. 30 April 2016.
4. UC Riverside Urban Pest Management Conference, Riverside, CA. 23 March 2016.

PEER-REVIEWED PUBLICATIONS

1. **Jia-Wei Tay**, Mark Hoddle, Ashok Mulchandani and Dong-Hwan Choe. 2017. Development of an alginate hydrogel to deliver aqueous bait for pest ant management. *Pest Management Science* 73: 2028-2038. DOI: 10.1002/ps.4616.
2. Ching-Chen Lee, Hirotaka Nakao, Shu-Ping Tseng, Hung-Wei Hsu, Gwo-Li Lin, **Jia-Wei Tay**, Johan Billen, Fuminori Ito, Chow-Yang Lee, Chung-Chi Lin and Chin-Cheng Yang. 2017. Worker reproduction of the invasive yellow crazy ant *Anoplolepis gracilipes*. *Frontiers in Zoology* 14:24. DOI 10.1186/s12983-017-0210-4.
3. **Jia-Wei Tay** and Chow-Yang Lee. 2015. Induced disturbances cause *Monomorium pharaonis* (Hymenoptera: Formicidae) nest relocation. *Journal of Economic Entomology* 108: 1237-1242.
4. **Jia-Wei Tay** and Chow-Yang Lee. 2015. Effects of a juvenile hormone analogue pyriproxyfen on monogynous and polygynous colonies of the Pharaoh ant *Monomorium pharaonis* (Hymenoptera: Formicidae). *Tropical Biomedicine* 32: 453-462.
5. **Jia-Wei Tay**, Kok-Boon Neoh, and Chow-Yang Lee. 2014. The roles of the queen, brood and worker castes in the colony growth dynamics of the pharaoh ant, *Monomorium pharaonis* (Hymenoptera: Formicidae). *Myrmecological News* 20: 87-94.
6. **Jia-Wei Tay** and Chow-Yang Lee. 2014. Influences of pyriproxyfen on fecundity and reproduction of the pharaoh ant (Hymenoptera: Formicidae). *Journal of Economic Entomology* 107: 1216-1223.
7. Shao-Xiong Cheah, **Jia-Wei Tay**, Lai-Kheng Chan, and Zairi Jaal. 2013. Larvicidal, oviposition, and ovidal effects of *Artemisia annua* (Asterales: Asteraceae) against *Aedes aegypti*, *Anopheles sinensis*, and *Culex quinquefasciatus* (Diptera: Culicidae). *Parasitology Research* 112: 3275-3282.

CONFERENCE PROCEEDINGS

1. **Jia-Wei Tay**, Mark Hoddle, Ashok Mulchandani and Dong-Hwan Choe. 2017. The use of an alginate hydrogel to deliver aqueous bait to manage an invasive ant pest in residential settings. In: Proceedings of the 9th International Conference on Urban Pests. Birmingham, UK. M.P. Davies, C. Pfeiffer and W.H. Robinson (eds). Pureprint Group, UK, pp. 265-269.

INVITED TALKS

1. Biology and management of invasive Argentine ants. Invasive Ant Conference 2018, Research Institute for Sustainable Humanosphere, Kyoto University, Japan. 23 January 2018.
2. Alginate hydrogel for pest ant management. Entomological Association of Southern California, Fall Meeting, Los Angeles County Arboretum, Arcadia, California. 12 September 2017.
3. Development of a hydrogel bait to deliver liquid ant bait for pest ant management. 26th annual UC Riverside Urban Pest Management Conference, University of California, Riverside. 29 March 2017.
4. Enhancing biological control of citrus pests with hydrogel baits for sustainable Argentine ant, *Linepithema humile* management. XXV International Congress of Entomology, Orange County Convention Center, Orlando, Florida. 28 September 2016.

ORAL PRESENTATIONS (selected)

1. **J.-W. Tay**. The use of an alginate hydrogel to deliver aqueous bait to manage an invasive ant pest in residential settings. *9th International Conference on Urban Pests*. Birmingham, UK. 12 July 2017.
2. K.A. Schall, **J.-W. Tay**, L. Greenberg, and M. Hoddle. Fire Ant Baiting Technology in Almonds: Today and Beyond. UC Cooperative University of California Almond Integrated Pest Management Meeting, Kearney Agricultural Research and Extension Center, Parlier, CA. 7 January 2016.
3. M.S. Hoddle, K.A. Schall, **J.-W. Tay**, D.-H. Choe, and A. Mulchandani. What is the Potential Future of Ant Control in Citrus Without Chlorpyrifos? IPM Conference: "What is the Future of Chlorpyrifos in Citrus IPM?", Tulare County UCCE Office, Tulare, CA. 12 January 2016.
4. **J.-W. Tay**. 2nd Global Conference on Entomology, organized by V Sivaram Research Foundation and Century Foundation Bangalore, in Kuching, Sarawak, Malaysia. 8-12 November 2013.
5. **J.-W. Tay**. International Symposium on Insects, organized by Entomological Society of Malaysia, in Kuala Lumpur, Malaysia. 3-5 December 2012.
6. **J.-W. Tay**. 6th International Conference on Biopesticides, organized by Maejo University and University of California Riverside, in Chiang Mai, Thailand. 11-16 December 2011.

PATENT APPLICATION

1. "The use of biodegradable hydrogel to deliver aqueous bait to control pest ants" (2016). Patent Pending: U.S. Provisional Patent Application No. 62/400,161 (UC Ref No. 2017-154 / BIR Ref No. 0071220-000174)

Exhibit A6 – Current & Pending Support

CURRENT & PENDING SUPPORT

University will provide current & pending support information for Key Personnel identified in Exhibit A2 at time of proposal and upon request from State agency. The "Proposed Project" is this application that is submitted to the State. Add pages as needed.

PI: Choe, Dong-Hwan					
Status (currently active or pending approval)	Award # (if available)	Source (name of the sponsor)	Project Title	Start Date	End Date
Proposed Project	18-C0019	Department of Pesticide Regulation	Wash off potential and pest control efficacy of indoor fogger insecticide products (total release foggers)	07/01/2018	06/30/2020
CURRENT	15-PML-R002	Department of Pesticide Regulation	Enhancing biological control of citrus pests with improved ant control technologies	7/1/2015	3/30/2018
CURRENT					
PENDING					

NAME OF INDIVIDUAL					
Status	Award #	Source	Project Title	Start Date	End Date
Proposed Project					
CURRENT					
CURRENT					
PENDING					

NAME OF INDIVIDUAL					
Status	Award #	Source	Project Title	Start Date	End Date
Proposed Project					
CURRENT					
CURRENT					
PENDING					

NAME OF INDIVIDUAL					
Status	Award #	Source	Project Title	Start Date	End Date
Proposed Project					
CURRENT					
CURRENT					
PENDING					

Exhibit B - Budget
Budget for Project Period

Principal Investigator (Last, First):

Choe, Dong-Hwan

Exhibit B

COMPOSITE BUDGET FOR ENTIRE PROPOSED PROJECT PERIOD
07/01/2018 to 04/15/2020

BUDGET CATEGORY	From: To:	7/1/2018	7/1/2019				
		6/30/2019	6/30/2020	Year 1	Year 2	Year 3	TOTAL
PERSONNEL: <i>Salary and fringe benefits.</i>				\$61,214	\$53,518	\$0	\$114,732
TRAVEL				\$300	\$300	\$0	\$600
MATERIALS & SUPPLIES				\$2,700	\$2,000	\$0	\$4,700
EQUIPMENT				\$0	\$0	\$0	\$0
CONSULTANT				\$0	\$0	\$0	\$0
SUBRECIPIENT				\$0	\$0	\$0	\$0
OTHER DIRECT COSTS (ODC)	<i>Subject to IDC Calc</i>						
ODC #1	Y			\$0	\$0	\$0	\$0
ODC #2	Y			\$0	\$0	\$0	\$0
ODC #3	Y			\$0	\$0	\$0	\$0
ODC #4	Y			\$0	\$0	\$0	\$0
ODC #5	Y			\$0	\$0	\$0	\$0
ODC #6	Y			\$0	\$0	\$0	\$0
TOTAL DIRECT COSTS				\$0	\$0	\$0	\$0
Indirect (F&A) Costs							
	<i>Rate</i>	<i>F&A Base</i>					
	25%	MTDC *		\$64,214	\$55,778	\$0	\$119,992
				\$16,054	\$13,945	\$0	\$29,999
TOTAL COSTS PER YEAR				\$80,268	\$69,723	\$0	
TOTAL COSTS FOR PROPOSED PROJECT PERIOD							\$149,991

* MTDC = Modified Total Direct Cost

JUSTIFICATION. See Exhibit B1 - Follow the budget justification instructions.

Funds Reversion Dates: Unless otherwise specified, fund reversion dates are three years from fiscal year end of year funded

Project Period Budget Flexibility (lesser of % or Amount)

Prior approval required for budget changes between approved budget categories above the thresholds identified.

% 10.00%
 or
 Amount \$10,000

Exhibit B1

Budget Justification

The Budget Justification will include the following items in this format.

Personnel

Name. Starting with the Principal Investigator list the names of all known personnel who will be involved on the project for each year of the proposed project period. Include all collaborating investigators, individuals in training, technical and support staff or include as “to be determined” (TBD).

Role on Project. For all personnel by name, position, function, and a percentage level of effort (as appropriate), including “to-be-determined” positions.

Dong-Hwan Choe (PI) – Choe will be leading the project as a PI for the entire project period. Choe will oversee the entire project progress by advising the postdoctoral scholar and research staff associate in the project. Salary coverage is not requested in the project budget.

Jia-Wei Tay (Postdoctoral Scholar, \$100,320) – Tay will work 70% of time during the entire period of the project. Under Choe’s supervision and guidance, Tay will design the study, conduct the experiment, collect the data, analyze the data, and write up the reports. The budget assumes a starting salary of \$42,581 @ 100% time. Postdoc’s salary is increased 2% annually. The person will provide day-to-day continuity of the research effort.

Kathleen Campbell (Staff Research Associate, \$14,412) – Campbell will work 10% of time during the entire period of the project. Campbell will assist Choe and Tay for the current project in setting up the experiment, collecting data, and arranging other logistics for the research in the experimental house structures at South Coast Research Extension Center. Starting monthly salary is \$3,459 @ 100% time and Kathleen will be hired at 10% time to help with this project for the entire duration of the project. Salaries are based upon current University of California policies and escalated at 2% annually.

Fringe Benefits.

In accordance with University policy, explain the costs included in the budgeted fringe benefit percentages used, which could include tuition/fee remission for qualifying personnel to the extent that such costs are provided for by University policy, to estimate the fringe benefit expenses on Exhibit B.

Fringe benefits rates are calculated as a percentage of the gross salary and are in accordance with the rates reported to our audit agency, DHHS. Benefit for Kathleen Campbell starts at 58.8%. The composite postdoctoral researcher benefit rate for Jia-Wei Tay is 25.7% of salaries.

Travel

Itemize all travel requests separately by trip and justify in Exhibit B1, in accordance with University travel guidelines. Provide the purpose, destination, travelers (name or position/role), and duration of each trip. Include detail on airfare, lodging and mileage expenses, if applicable. Should the application include a request for travel outside of the state of California, justify the need for those out-of-state trips separately and completely.

The budget (\$600) enables the investigators to travel for the experimental structures at South Coast Research Experiment Station at Irvine, CA, to conduct the proposed research activity and collect samples. Even though the dates, destinations, and durations of these trips are not known at this time, it is expected that at least 6 different trips will be needed for PI (Choe) and one additional person (e.g. postdoctoral scholar or SRA) per year to carry out the proposed research.

Materials and Supplies

Itemize materials supplies in separate categories. Include a complete justification of the project’s need for these items. Theft sensitive equipment (under \$5,000) must be justified and tracked separately in accordance with State Contracting Manual Section 7.29.

The budget includes \$2,660 for entire project duration (\$1,700 for the year 1 and \$960 for the year 2) for materials, supplies, and consumables. These are items that will be used to purchase items to set up the compartments in the experimental house structures, different surface materials (e.g., tiles, painted surface, bath tub, etc.) for the research. The fund will be also used to purchase at least two different kinds of total release fogger products to be tested, technical pyrethroids for quantitative analyses, thin layer chromatography plates, SPME (solid phase microextraction) devices, etc. Items may include, but are not necessarily limited to, chemicals, reagents, glassware, pesticides, and software as needed to carry out the purposes of the project.

Equipment

List each item of equipment (greater than or equal to \$5,000 with a useful life of more than one year) with amount requested separately and justify each.

N/A

Consultant Costs

Consultants are individuals/organizations who provide expert advisory or other services for brief or limited periods and do not provide a percentage of effort to the project or program. Consultants are not involved in the scientific or technical direction of the project as a whole.

Provide the names and organizational affiliations of all consultants. Describe the services to be performed, and include the number of days of anticipated consultation, the expected rate of compensation, travel, per diem, and other related costs.

N/A

Subawardee (Consortium/Subrecipient) Costs

Each participating consortium organization must submit a separate detailed budget for every year in the project period in Exhibit B2 Subcontracts. Include a complete justification for the need for any subawardee listed in the application.

N/A

Other Direct Costs

Itemize any other expenses by category and cost. Specifically justify costs that may typically be treated as indirect costs. For example, if insurance, telecommunication, or IT costs are charged as a direct expense, explain reason and methodology.

N/A

Rent

If the Scope of Work will be performed in an off-campus facility rented from a third party for a specific project or projects, then rent may be charged as a direct expense to the award.

The budget includes \$2,000 (\$1,000 per year) for renting the experimental house structure (3 units) at South Coast Research Experiment Center (Irvine, CA) to carry out pyrethroid residue collection and analyses.

Indirect (F&A) Costs

Indirect costs are calculated in accordance with the budgeted indirect cost rate in Exhibit B.

Indirect (F&A) cost (total \$30,0008) is calculated based on 25% rate.

Exhibit B3 – Invoice Elements

Invoice and Detailed Transaction Ledger Elements

In accordance with Section 14 of Exhibit C – Payment and Invoicing, the invoice, summary report and/or transaction/payroll ledger shall be certified by the University’s Financial Contact and the PI (or their respective designees).

Summary Invoice – includes either on the invoice or in a separate summary document – by approved budget category (Exhibit B) – expenditures for the invoice period, approved budget, cumulative expenditures and budget balance available¹

- Personnel
- Equipment
- Travel
- Subawardee – Consultants
- Subawardee – Subcontract/Subrecipients
- Materials & Supplies
- Other Direct Costs
 - TOTAL DIRECT COSTS (if available from system)
- Indirect Costs
 - TOTAL

Detailed transaction ledger and/or payroll ledger for the invoice period ²

- Univ Fund OR Agency Award # (to connect to invoice summary)
- Invoice/Report Period (matching invoice summary)
- GL Account/Object Code
- Doc Type (or subledger reference)
- Transaction Reference#
- Transaction Description, Vendor and/or Employee Name
- Transaction Posting Date
- Time Worked
- Transaction Amount

¹ If this information is not on the invoice or summary attachment, it may be included in a detailed transaction ledger.

² For salaries and wages, these elements are anticipated to be included in the detailed transaction ledger. If all elements are not contained in the transaction ledger, then a separate payroll ledger may be provided with the required elements.

Exhibit G – Negotiated Alternate UTC Terms (if applicable)

An alternate provision in Exhibit G must clearly identify whether it is replacing, deleting or modifying a provision of Exhibit C. The Order of Precedence incorporated in Exhibit C clearly identifies that the provisions on Exhibit G take precedence over those in Exhibit C.

While every effort has been made to keep the UTC as universal in its application as possible, there may be unique projects where a given term in the UTC may be inappropriate or inadequate. California Education Code §67327(b) allows for those terms to be changed, but only through the mutual agreement and negotiation of the State agency and the University campus. If a given term in the UTC is to be changed, the change should not be noted in Exhibit C, but rather noted separately in Exhibit G.

1. Harassment Free Workplace

The Department of Pesticide Regulation (DPR) is committed to providing a safe, secure environment, free from sexual misconduct. It is the policy of the Department that employees have the right to work in an environment that is free from all forms of discrimination, including sexual harassment. This policy specifically speaks to freedom from a sexually harassing act that results in the creation of an intimidating, hostile or offensive work environment or that otherwise interferes with an individual's employment or work performance. As a Contractor with DPR, you and your staff are expected to comply with a standard of conduct that is respectful and courteous to DPR employees and all other persons contacted during the performance of this Agreement. Sexual harassment is unacceptable, will not be tolerated; and may be cause for prohibiting some or all of the Contractor's staff from performing work under this Agreement.