

THE VORTEX

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Left: May 4th Speaker Dr Marya Lieberman, provided by Elaine Yamaguchi

Bottom Left: May 4th Mosquito and Vector Control Open House, Sonoma Marin Mosquito and
Vector Control

Top Center: May 14th LBNL's Advanced Biofuels and Bioproducts Process Development Unit
Tour

Top Right: BabyBig Vials Image from Center for Disease Control and Prevention

If you have material you think is worthy, submit it to donald.maclea.acs@gmail.com.



Upcoming Events

Julie Mason, Alex Madonik, Jim Postma, and Donald MacLean

1. Saturday May 4 at 11:00 a.m., Zoom – “Got Fakes? Paper microfluidics and the hunt for bad quality medicines”, Dr. Marya Lieberman.
2. Saturday May 4th 11 a.m. to 3 p.m., 595 Helman Lane, Cotati CA 94931 - Sonoma / Marin Mosquito and Vector Control District Open House.
3. Thursday May 14th, In person, see advertisement - LBNL's Advanced Biofuels and Bioproducts Process Development Unit Tour.
4. May 18th- Awards Luncheon @ Skates on the Bay, Berkeley

Section Dues

Paul Vartanian, Section Treasurer

The California Section of the ACS asks its members to pay their Section dues at the same time as they pay their Society dues. About one-half the Section's members take advantage of this solicitation. If you have not paid 2023 California Section dues, please consider sending in your payment of \$19 to the Section office, California Section, ACS, 2950 Merced Street, Suite 225, San Leandro, CA 94577. Thank you for helping support the activities of the Section.

California Section American Chemical Society **About the Speaker**



All are welcome
Saturday, May 4, 2024

Title

Got Fakes? Paper microfluidics and the hunt for bad quality medicines

Time

10:30 – 11:00 am Chatting

11:00 am Talk and Discussion

Reservation

Please visit the CalACS website www.calacs.org to register for this meeting or use Brown Paper Tickets. RSVP here!

Please register before Thursday, May 2, 2024, 12 noon. Your email address is needed to send the ZOOM link, which will be shared with attendees on or before the day of the event via Brown Paper Tickets.

Cost

Free!



Dr. Marya Lieberman enjoys making stained glass, cooking, and solving fiendish cryptic crosswords. She loves chemistry so much she did a chemistry demonstration at her wedding. As a kid in Berkeley, California, she missed all the exciting stuff in the 60's and 70's, although her mother tells her she was gassed in her stroller. She developed an interest in science that was deepened and focused by an undergraduate

degree in chemistry at MIT and a PhD from the University of Washington, Seattle, where Marya Lieberman, PhD she designed and built an artificial metalloprotein. A high point in this project was finally understanding her protein's energy landscape; a low point was sleeping on the floor of the lab during the marathon HPLC kinetics runs required to get to the energy landscape. She received a prestigious NSF Postdoctoral Fellowship to study at Caltech, where she discovered that the NSF had not considered that Fellows might get pregnant and had no maternity leave policy. After the birth of her first child, she and her husband became faculty members at the University of Notre Dame, where they have happily occupied neighboring offices for 28 years. Her second child was born the day before she received tenure. For most of her career, she studied DNA nanostructures and cool molecular electronics with high-vacuum instrumentation and scanning probe microscopes. She took pictures of single molecules sitting on surfaces, knitted DNA into tiny carpets, and studied quantum-dot cellular automata. In 2012, she started a new research program using paper microfluidics to develop technologies for use in low resource settings. For the past 12 years, she has been on the hunt for substandard and falsified medicines with collaborators in Kenya, Tanzania, Malawi, Ethiopia, Cameroon, Palestine, and Bangladesh. This work received coverage by numerous news outlets, including Bloomberg News, Chemical and Engineering News, the Voice of America, and BBC Worldwide.

Abstract

In low- and middle-income countries, about one in ten medicine products is substandard or falsified. In my lab, I have samples of antimalarial drugs made from starch and chalk, antibiotics "cut" with talcum powder, and chemotherapy drugs that were manufactured at half the concentration they should have been. How do these products get into the supply chain, and more importantly, how can chemists help to get them out? This talk will focus on a point-of-use testing device that my group invented twelve years ago, the paper analytical device or PAD. I'll explain how this paper microfluidic device works and how we are implementing it with partners in sub-Saharan Africa to discover bad quality medicines.

Questions?

Please contact Elaine Yamaguchi at eyamaguchi08@gmail.com

Our Open House Event is BACK!

SAVE THE DATE!

Marin/Sonoma Mosquito & Vector Control District

OPEN HOUSE



Live Mosquito & Tick Exhibits
Backyard Bugs Contest for the Kids
Bug Tasting Booth
Carnival Games & Prizes
Free Lunch & Much More!!
www.msosquito.org



SATURDAY MAY 4th
11am to 3pm
Marin/Sonoma Mosquito
& Vector Control District
595 Helman Lane, Cotati 94931

DON'T MISS THIS FREE EDUCATIONAL EVENT FOR ALL AGES!

Join us for a fun-filled, educational day at the 2024 Marin/Sonoma Mosquito and Vector Control District Open House! Discover the world of mosquito and vector control while having a blast finding ways to reduce vectors around your home.

This family-friendly event is not only informative but also entirely free, with hands-on activities for both kids and adults, and free lunch provided!

If you are interested in the vector control topic, check out the references below. There are other vector control organizations that hold open house such as San Mateo County (last held in Burlingame in August 2023), Santa Clara County (April 2018), Santa Cruz County (Oct 2018), and Mount Shasta (June 2019). You will have to check out your local area. Last time the Marin / Sonoma Mosquito and Vector Control District event had edible bugs as snacks.

References:

1. Marin Sonoma Mosquito and Vector Control District: <https://www.msosquito.org/>
2. San Mateo County Mosquito and Vector Control District: <https://www.smcvmcd.org/open-house>
3. Alameda County Vector Control Services District: https://www.acgov.org/ehs/vector_control/introduction.htm
4. Greater Los Angeles County Vector Control District: <https://www.glamosquito.org/california-mosquito-awareness-week>
5. Sacramento-Yolo Mosquito and Vector Control District: <https://www.fightthebite.net/>

Donald MacLean

LBL's Advanced Biofuels and Bioproducts Process Development Unit Tour

May 14th

Cal ACS invites you to join us for a unique tour of LBNL's Advanced Biofuels and Bioproducts Process Development Unit ([ABPDU](#)) in Emeryville, CA on Thursday, May 14th, 2024. Program Manager James Gardner, Senior Process Engineer Dupeng Liu, and their colleagues will introduce us to this cutting-edge facility, which works with other laboratories and companies to develop the next generation of sustainable manufacturing processes. You will hear from experts about continuous bioprocessing, purification methods, and more.

We will meet at Summer Summer Thai Eatery (5885 Hollis St #50, Emeryville CA 94608), at 5 PM for drinks and a buffet dinner. Tour groups will leave at 5:30, 6:00, and 6:30 PM to visit the ABPDU facility next door. It is essential that you reserve for your preferred tour time, because this is a Federal facility and you must provide your name and citizenship status in advance. Advance payment is also required for tour registration: \$30 for professional members and \$15 for students or unemployed members. Please use the link on the Cal ACS web site to register for this event. Deadline for reservations: Friday, May 3rd.

Note: if you show up without a reservation, you are welcome to join us for the buffet dinner and networking, but it will not be possible to accommodate you on the tour.





Congratulations

California Section
American Chemical Society
Annual Awards Luncheon & Presentation

*Honoring 50-, 60- and 70-Year Members of the American Chemical Society,
Lloyd Ryland Outstanding Teacher Award
Walter B. Petersen Award Presentation*

Date: Saturday, May 18, 2024

Time: 11:30 -12:30, no-host social; 12:30 – 1:45 pm, lunch; 1:45 pm, award presentations

Place: Skates by the Bay, 100 Seawall Drive, Berkeley

Cost: \$60.00 per person, \$30.00 for students and postdocs (award recipients no charge)

Lunch will include entrees, dessert and coffee or tea.

Your choice of entrées is Fresh Grilled Salmon, Grilled New Orleans BBQ Prawns, Open-Faced Crab Sandwich, or Linguini. **Please let us know what you would like to order.** Select one: soup (clam chowder) or salad (Hearst of Romaine Caesar), one entrée, and one dessert (Crème Brûlée or Molten Chocolate Cake).

Please let us know if you will be able to attend no later than **Wednesday, May 8th, 2024,** by emailing office@calacs.org.

Reservations are required: RSVP as soon as possible and no later than **Wednesday, May 8th, 2024,** by emailing office@calacs.org. When making reservations, please indicate your choice of entrée.

To pre-pay: Please mail checks made out to "California Section ACS" to the California Section office, 2950 Merced St. #225, San Leandro CA 94577 no later than May 8th, 2024 or you may pay using PayPal by going to <http://www.paypal.com> send payment to office@calacs.org. You may also pay at the door with a check or cash (we do not accept debit/credit card at the door).

Abstract (for awards):

The American Chemical Society honors those members who attain 50, 60 and 70 years of membership. The list of those in the California Section who have attained these honors this year includes:

50 Years	60 Years	70 + Years
Susan F. Barquist Richard Behrens, Jr. Lyle M. Bowman, Jr. Michael W. Burgett Alan R. Case David E. Enas Fred A. Hajduk Frances A. Houle W. Douglas Hounshell Karen K. Jernstedt Daniel S. Lent David S. Lingenfelter William K. Mainquist George Malone Rich B. Meyer Douglas C. Moore Gregory P. Morris George H. Robertson Charles B. Ungermann Do Y. Yoon	Orm Aniline Bruce N. Ames Denis J. Bogan Wayne M. Camirand Rosalind P. Clark Richard P. Cotter Michael J. Fluss Urban S. Kern Judith P. Klinman Ronald E. Leone William J. McKinney Alexander Mihailovski Joanne Myers Kenneth E. Osborn Roger W. Phillips Nathaniel S. Prichesky Kenneth N. Raymond Kenneth K. Rice Edward T. Sabourin Robert L. Stevenson Marvin N. Yudenfreund	Charles R. Bertsch Elton J. Cairns Dennis M. Fahey Henry Y. Lew Scott Lynn James W. McFarland

The Walter B. Petersen Award is made annually to a California Section member for outstanding service for an extended period to the Section. This year's recipient is Robert "Bob" Bussey.

The Lloyd Ryland Award will be presented by the California Section to honor outstanding high school chemistry teachers within the California Section of ACS. The 2024 Lloyd Ryland Awards recipient is Rochelle Morris from Foothill High School in Pleasanton.

Volunteer of the Year presented by the California Section to honor outstanding volunteers in our local section. The recipient is Vanessa Marx.

Position Open

The California Section, ACS, has a five-member Board of Trustees who oversee the trust funds held by the Section. The Section is seeking a qualified individual to assume an unexpired term that is now open.

The Trustees meet about four times a year to discuss investments held in the trust fund. Each member is expected to be familiar with basic investments and be able to offer informed discussion to help the Trustees reach good decisions.

The California Section Board of Directors appoints the Trustees. If you would like to be considered for an appointment, or would like additional information about the Trustees, please contact Paul Vartanian, California Section Treasurer, at pfvartanian@gmail.com or (510) 763-0195.

2024 Lloyd Ryland Outstanding High School Chemistry Teacher

Eileen Nottoli

Rochelle Morris, Foothill High School in Pleasanton, is our 2024 Lloyd Ryland Outstanding High School Chemistry Teacher.

Member Profile in Industry Matters Newsletter

Chevron's [Atefeh Taheri](#) shares the story behind her passion for chemistry and offers advice to her younger self is published in Industry Matters Newsletter, May 2, 2024. You can read the full interview here: <https://www.acs.org/industry/industry-matters/what-i-learned/meet-atefeh-taheri.html>

California Has An Unusually High Rate of Infant Botulism While Alaska Has High Rate of Foodborne Botulism

Donald MacLean

California accounted for 47% of the USA reported infant botulism cases during 1974 to 1996.¹ Since that time California's contribution has dropped to 30ish percent of the National botulism cases.² Considering that California has about 10% of the USA population, this is still an outsized phenomenon. In the United States an average of 145 botulism cases are reported each year. Of these, roughly 65% are infant botulism, 20% are wound botulism, and 15% are foodborne, with the remaining from other sources such as cosmetic or medical overdoses.^{1,3} This is a surprising statistic since the general population associates botulism with improper canning. Infant botulism occurs sporadically and is not associated with epidemics, but has geographic variability with infecting strain location and occurrence rates.¹ Foodborne botulism outbreaks tend to cluster at events or location, with Alaska being the center of continual outbreaks due to Alaskan native food preparation and storage methods. Whereas infant and food borne incidences have remained unchanged, wound botulism has increased because of the use of black tar heroin, especially in California in the 1990s.¹

The federal testing and monitoring is done by the [CDC Botulism Consultation Service \(Atlanta\)](#). 2 states have their own botulism testing facility, the [Alaska Division of Public Health \(Anchorage\)](#), and the [California Department of Public Health \(Richmond\)](#).^{3,4,5,6} The unusually high cases of infant and foodborne botulism cases are responsible for Alaska and California having their botulism monitoring programs.

This article is going to concentrate on infant botulism with an emphasis on California. Infant botulism cases peak in summer-fall with no gender preponderance. Breast-fed patients (83%) were more than twice as old at onset as formula-fed patients.⁷ Honey seems to be a contributing factor for infant botulism, but... There is literature which shows a correlation between several patients' botulism strain and their home environment's soil and/or climatic conditions botulism spores.⁸ It seems the Central Coast counties have a disproportionate share of cases. Because annual infant botulism cases are low, cases are siloed into incidence counties, then each county is grouped into a region. How California is divided up into regions is confusing when comparing literature to how the California Public Health Department (CDPH) defines regions. CDPH divides the state into 5 regions, Rural North, Greater Sierra Sacramento, Bay Area, Central California, Southern California and Los Angeles. Regions of California were defined by aggregating counties with similar geography, demography, and economic conditions as described by the Public Policy Institute of California.⁹ In an Epidemiologic Summaries technical note there are 9 total regions in California in two regional groups, Northern California or Southern California.

Northern California = Far North, Sacramento Metro, Sierra, Bay Area, San Joaquin Valley, and Central Coast (Monterey, San Benito, San Luis Obispo, Santa Barbara, and Santa Cruz counties).

Southern California = Inland Empire, South Coast, and San Diego regions.

One publication has California with 8 designated geographic regions. The Central Coast counties showed 3 times the statewide incidence in both 20-year time periods (1976-1996, 1997-2016) compiled in the publication [Figure 1].⁷ However, the Central Coast counties are not all inclusive to the CDPH Central California or Southern California Regions. The Central

Coast Counties are Santa Cruz, Monterey, San Benito, San Luis Obispo, and Santa Barbara in the 8-region illustration [Figure 1].

When looking at CDPH technical summary reports, San Luis Obispo and Santa Barbara counties have high rates, but their low numerical incidences create high statistical uncertainty [Figure 2]. Los Angeles and San Bernardino counties have high incidence rates.

Botulism Chemistry, Biology, and Physiology

Botulinum neurotoxin is a 150 kDa protein that comprises a 100 kDa heavy chain and a 50 kDa light chain linked by a single disulfide bridge [Figure 3].¹⁷ There are seven main strains of botulinum toxin named A to G (A, B, C1, C2, D, E, F and G).¹¹ Interestingly, foodborne and infant botulism cases have shown different root cause strains [See Tables 1A, 1B, and 1C]. *Clostridium botulinum* is an anaerobic, gram positive, spore-forming rod. Botulinum toxin is one of the most powerful known toxins: about one microgram is lethal to humans when inhaled. It acts by blocking nerve function [Figure 4]. This causes paralysis. An interesting fact is that foodborne botulism strains have no geographical variance within the USA, but infant botulism has regional differences.

For infant botulism, the California ratio of BoNT/A to BoNT/B is different than the area east of the Mississippi River as noted by the USA BoNT/B outweighing the BoNT/A testing results.⁸ Table 1A shows infant botulism makes up the majority of botulism cases in the USA. Table 1B shows that California accounts for a disproportional number of infant botulism cases. Also of note is the botulism strains in California is weighted toward strain BoNT/A, whereas in the USA strain BoNT/B strain is more common. Table 1C shows the foodborne botulism strains distribution for the USA. For foodborne botulism strain BoNT/A is the majority detected strain, followed by strain BoNT/E. Note for foodborne botulism there are more detected strains, and their appearance is not regionally differentiated.

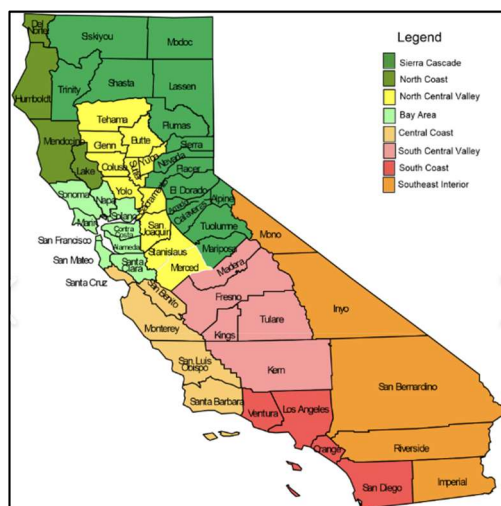


Figure 1. Map above is from Descriptive Epidemiology of Infant Botulism in California: The First 40 years.⁷

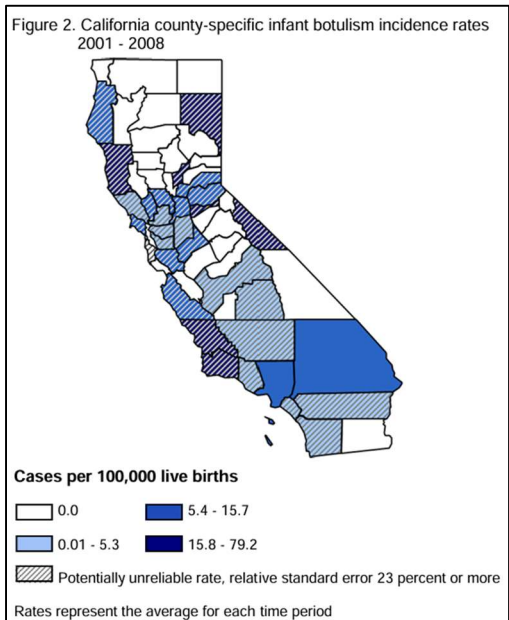


Figure 2. 2001-2008 Incidence Rate for Infant Botulism by California County.¹⁰

Table 1A. Compilation Table for Botulism cases in the USA and California for 2015 to 2019.

Year	Source		Strain		
	Total confirmed cases in USA	Total infant cases in USA	Infant as total	Food to total	Wound to total
2019	215	152	71%	10%	19%
2018	242	162	67%	7%	25%
2017	182	141	77%	10%	10%
2016	205	150	73%	14%	12%
2015	199	141	71%	20%	8%

Table 1B.

Only strain A and B are displayed. Others Ba, Bf, Af, Ab, and F are no greater than 2% each in a given year. For the period 1976-2010 the strain in California was 56% BoNT/A, 32% BoNT/B.⁸

Year	Source			Strain	
	Total Infant Bot cases in USA ²	Infant California		Infant USA	
		Total Infant Bot cases in CA	Percent from California	BoNT/A	BoNT/B
2019	152	43	28%	33%	64%
2018	162	38	23%	43%	54%
2017	141	48	34%	37%	62%
2016	150	47	32%	36%	59%
2015	141			43%	56%

Table 1C.

Note the heavy occurrence of BoNT/A strain with Foodborne Botulism.

Year	Food USA				
	Confirmed Cases food USA ²	BoNT/A	BoNT/B	BoNT/E	BoNT/F
2019	19	68%		26%	5%
2018	17	35%	18%	35%	12%
2017	19	79%		21%	
2016	29	83%	3%	10%	
2015	39	87%		13%	

Botulinum toxin causes weakness and loss of muscle tone because it blocks the nerve ending's ability to signal the linked muscle to contract [Figures 4, 5]. Recovery results from regrowth of the nerve endings that then are able to signal the muscles to contract. In infant botulism the swallowed botulism spores activate and produce botulinum toxin inside the baby's large intestine. In foodborne botulism the botulism spores activate and produce botulinum toxin in the food. Children and adults get foodborne botulism by eating the food in which the botulism bacteria have produced botulinum toxin. Wound botulism is found most often among those who inject street drugs.

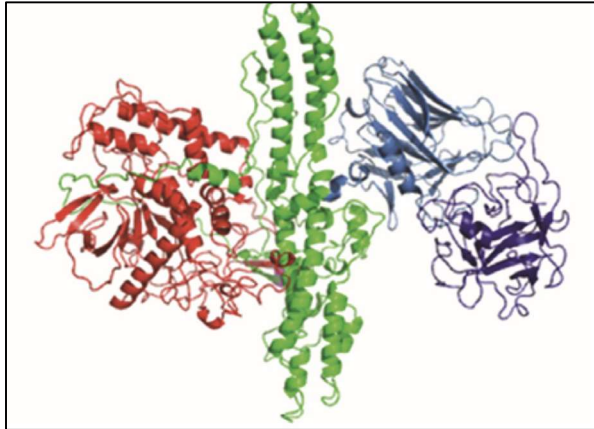


Figure 3. Crystal structure of BoNT/A (PDB:3BTA). The light chain (red) is connected by single disulfide to the N-terminal Translocation domain (green) and a C-terminal Binding domain (blue) that make up the heavy chain.¹¹

or by irradiation.

Honey is the one identified and avoidable food reservoir of *C. botulinum*, the bacterial spore that causes infant botulism. While most cases of infant botulism today are not caused by exposure to honey prior to illness, it is the only avoidable source of exposure to the bacterium that has been linked to infant botulism cases by both laboratory and epidemiologic evidence. By a process of exclusion (testing over the years of hundreds of foods, beverages, and other items placed in infants' mouths with negative results), it was concluded that most infant botulism patients acquired their spores by swallowing microscopic dust particles on which the spores travel.

The spores usually do not cause people to become sick, even when they're eaten. But under certain conditions, these spores can grow and make one of the most lethal toxins known. The conditions in which the spores can grow and make toxin are:

- Low-oxygen or no oxygen (anaerobic) environment
- Low acid
- Low sugar
- Low salt
- A certain temperature range
- A certain amount of water

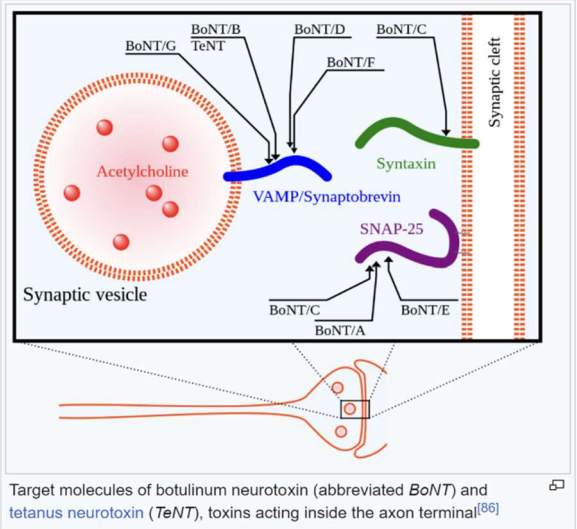


Figure 4. Mechanism Schematic for Botulism. Infant Botulism is predominately strains A and B.¹

Food preservation chemistry uses these principles for improved storage; pickling uses vinegar, jams use sugar, and meat uses high salt. In the pharmaceutical field the use of preservatives has been eliminated by aseptic processing techniques and single use units.

Infant Drug - BabyBig®

BabyBIG®, Botulism Immune Globulin Intravenous (Human) (BIG-IV), is an orphan drug that consists of human-derived anti-botulism toxin antibodies that was approved by the U.S. Food and Drug Administration in 2003 for the treatment of infant botulism strains A and B. It is only licensed in the USA. The product is a solvent-detergent-treated (to kill lipid envelope viruses), sterile, lyophilized powder of immunoglobulin G (IgG), stabilized with 5% sucrose and 1% albumin (human). It contains no preservative. The purified immunoglobulin is derived from pooled adult plasma from persons immunized with recombinant botulinum vaccine for serotypes A and B (rBV A/B) who were selected for their high titers of neutralizing antibody against botulinum neurotoxins strains A and B. All donors were tested and found negative for antibodies against the human immunodeficiency virus, hepatitis B, and hepatitis C viruses (this is the reason that recombinant versions are safer in human origin disease). The pooled plasma was fractionated by cold ethanol precipitation of the proteins according to the Cohn/Oncley method and modified to yield a product suitable for intravenous administration.

Vials have nominal 100 mg ± 20 mg lyophilized immunoglobulin against Toxin A and B which when reconstituted gives 2 mL delivered volume at 50 ± 10 mg (there is an overfill to account for residual volume loss).

To date, use of BabyBIG® has been used to treat more than 2,180 US infant botulism patients. With a \$43000 treatment cost (whether per vial or overall I was unable to determine), on average infant botulism patients spend approximately 3.6 weeks less time in the hospital, resulting in over \$94,000 in avoided hospital costs (when compared to the pivotal clinical trial placebo group).^{1, 13}

The next generation of BabyBIG® will probably replace albumin with a surfactant. The antibody may be a mixture of recombinant immunoglobulins against strain A and strain B since this will reduce the likelihood of animal derived transmissible disease. Note sucrose is a nonreducing sugar (will not add to a protein through the Maillard reaction). Whether the next generation will come as a frozen liquid or liquid solution in addition to the lyophilized form is unpredictable. Most likely there will be only a lyophilized form due to the wide distribution of the product and long-term storage. In a liquid form deamidation would be noticeable in long term storage.

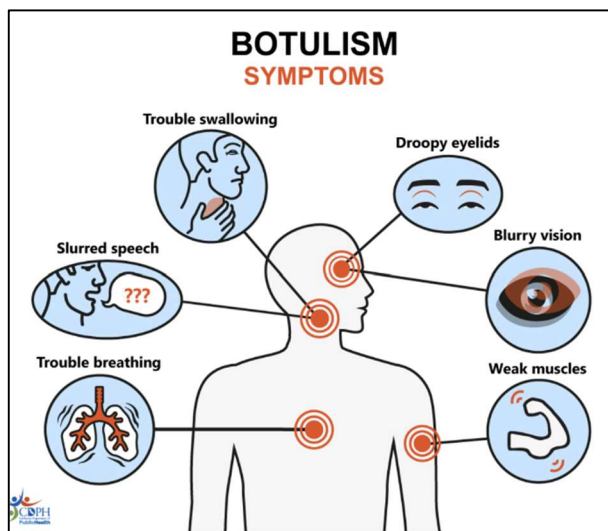


Figure 5. Diagram Showing the Areas that Botulism Affects.¹²

Drug for Foodborne Source

Heptavalent equine serum antitoxin contains antibodies to BoNT/A-BoNT/G. U.S. FDA Approval: 2013.

BAT is a sterile solution of purified F(ab')₂ plus F(ab')₂-related immune globulin fragments derived from equine plasma, containing antitoxin activity to botulinum neurotoxins A, B, C, D, E, F, and G.

BAT® [Botulism Antitoxin Heptavalent (A, B, C, D, E, F, G) - (Equine)] Sterile Solution for Injection – require 1:10 dilution in normal saline and administered by IV administration.

BAT is formulated with 10% maltose (maltose is a reducing sugar that will add to the protein through the Maillard reaction) and 0.03% polysorbate 80 (300 ppm). The formulated bulk material contains approximately 3-7 % (30-70 milligrams/milliliter) protein. This is a simple formulation and is considered a high concentration product. Since the storage lifetime is not greater than 4 years, multiple batches have been produced since the FDA's drug's approval of this drug.

Infant and Foodborne Drug Formulation Comparison

Table 2 shows the comparison between the BabyBig and BAT Botulism treatments.

	BabyBig®	BAT®
Concentration	50 ± 10 mg/mL protein	30-70 mg/mL protein
Stabilizer / Bulking	5% sucrose, 1% albumin	10% maltose
Surfactant	NA	0.03% polysorbate 80
Dosage Form	Lyophilized, reconstitution with sterile water	Solution
Storage	2 - 8 C After reconstitution 2 hours	2 - 8 C, frozen may be stored at 2-8°C (36-46°F) for a maximum of 36 months or until 48 months from the date of manufacture, whichever comes first.
Volume	2 mL / vial	10 to 22 mL / vial
Source	Human polyclonal	Equine polyclonal
Administered by	IV infusion in 0.9% sodium chloride or 2.5, 5, 10, or 20% dextrose	1:10 dilution in sodium chloride IV infusion
Elimination Half-life	28 days	Variable with strain and dose ranges 7 to 59 days
Strength	>15 IU for strain A, >2 IU for strain B	See reference
Manufacturer	CDPH via Baxalta (formerly Baxter International)	Emergent BioSolutions Canada Inc.

Vaccine

There was an investigational formalin-inactivated pentavalent botulism toxoid vaccine against BoNT/A to E that has been discontinued. This vaccine was not available to the general public. There are several other vaccines listed in National Center for Biotechnology Information reference¹⁸ that I would classify as investigational.

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Fair Science Entries

Donald MacLean

This month's science activity is the "Fair". A county fair will emphasize different things based upon their individual interests, environment and the time of year the event is held. In some cases, the fair may be a joint affair (e.g., Sonoma-Marin Fair in Petaluma) or a topic fair (e.g., Citrus Fair in Cloverdale, Harvest Fair in Santa Rosa). Fairs held around the 4th of July, probably have fireworks at dusk (e.g., Marin County Fair in San Rafael).

The science part comes from the exhibition entries. There is science in food prep, arts, the trades, animal husbandry, wine making, etc.. Entries are limited to the fair coverage area with some exceptions. As an example, the entries for the Sonoma-Marin Fair are all limited to Sonoma and Marin Counties, except for the sheep dog trials which are open to all California residents. Alameda County Fair entries are open to all California residences, but individual topics such as 4-H have Alameda County related requirements. The entry qualifications are so varied that one must go to the interested fair site and determine what the requirements for exhibit sections are.

Judging system:

Awards are based on one of two grading systems: American or Danish. In the American system, the exhibits are ranked against one another and awards one first, one second, etc. place. In the Danish system, each exhibit's own merit is compared to a recognized standard or scorecard. This means first / second place and so on place awards are given to as many as merited. A typical place where the Danish judging system is used is in the wine judging. Considering the commercial use of placement with gold / double gold awards, the Danish award ranking system is very deceptive, and a high placement can be expensive, but also has commercial value with advertisement and labeling claims. Another place where the Danish system comes in practice is in youth livestock judging. The best in show typically has an auction where the livestock is sold as a scholarship fund raiser.

Number of entries:

Photos, art, and displays only require 1 sample submitted. Food preserves require 2 identical submitted containers, one to taste, and one to display. Wine requires 2 bottles per entry for amateurs and 4 bottles per entry for professionals (i.e. Harvest Fair in Santa Rosa). An amateur wine maker must be at least 21 years old. One thing to keep in mind if you are a professional wine maker is if you get a first place or best of class award for wine, you are required to reserve 25 wine cases for sharing at the tasting event that follows.

Entry Classes:

I have selected a few sections that I think are interesting:

1. Agricultural Mechanics – only those objects made in school, using Oxyacetylene welding, shield metal arc welding, and gas tungsten arc welding.
2. Agriculture Sciences – plant displays, agricultural biology
3. STEM – Physical, Life, Earth and Space, Applications to Engineering and Technology
4. Youth Foods

5. Junior Decorated Foods – Baking, Make it with butter, Make it with dairy, Make it with eggs, Make it with cheese
6. Preserved Foods – canned and jarred (no paraffin seals), dried
7. Trash to Treasures
8. Ceramics
9. Fiber work – ply (s), hand and commercial spun
10. Egg laying Contest – five female birds over a 4-day period.
11. Horse – Western, English, Hunter, Ribbon Race, Barrels
12. Wine – professional and amateur - All wines must list percent residual sugar on the entry blank. For the professional, only Best of Class and Gold medal winning wines are required be poured during a tasting event.
13. Home Brew – Beer, mead, or cider - Three (3) clean, otherwise unmarked 12 oz bottles or 12 - 16 oz cans.

Go and see the entries. I like the engineering displays made from toothpicks or clothes pins. The sheep shearing contest and milking contest are entertaining. If you like rabbits and reptiles, this is a place to see species.

References:

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2020 Nobel Prize Winner, Dr. Jennifer Doudna, Zooms Into Chico

Jim Postma

On Monday, April 22, a large crowd (278 in person and at least 145 participants over Zoom connections) gathered on the Chico State campus to hear 2020 Nobel Prize winner Dr. Jennifer Doudna present on her work, "How Bacteria Taught Us to Cure Genetic Disease." Dr. Doudna "Zoomed in" from her office in Berkeley. There was an additional theme to the presentation encouraging women and others to pursue education and careers in STEAM (Science, Technology, Engineering, Agriculture, and Math) fields. The event was jointly sponsored by the California Section of the ACS, California State University, Chico, and CSU Chico's Women in STEM

The session began with three Chico State alumnae describing their career paths, their significant mentors, with perspectives and advice on being a woman in STEM. One was a teacher, one a university lecturer, and one a Quality Project Specialist at Sierra Nevada Brewery.

Dr. Doudna described her career trajectory, how she got connected into RNA research, and finally how CRISPR (clustered regularly interspaced short palindromic repeats) emerged from her work and other's beginning with studies of viruses that infect bacteria. These techniques led to a means for selective editing of DNA, a powerful tool with many emerging and future applications. She talked briefly about successes in curing sickle-cell anemia (not just treating symptoms as was done heretofore.)

After a brief Q&A session with Dr. Doudna, the live Chico group formed breakouts to discuss Overcoming challenges as a person in STEM, Making decisions about one's educational journey, Developing an identity as a scientist, Developing a path to research or to a career, and Integrating work & life as a scientist. These were issues that Dr. Doudna had touched upon but each breakout discussion was also informed and led by CSU Chico faculty and students. The live audience was dominantly Chico State and community college, with significant participation by local high school and middle school students. It was obvious that these were issues of significant importance to this audience.

Awards were distributed that included Dr. Doudna's book and Walter Isaacson's biography of Dr. Doudna (one of each was a signed copy) and dinner coupons with the Women In STEM members.

The live audience came from as far as Shasta College in Redding (85 miles from Chico.) The Zoom audience ranged well into the Bay Area, 100 miles away.