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Authors

Sadovnikova, Anna

Fine, Jeffrey

Tartar, Danielle M

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Differences in Diagnosis and Treatment of Nipple Conditions of Reproductive-Age Women at a Tertiary Health System

Anna Sadovnikova, PhD, IBCLC, MPH, MA,¹ Jeffrey Fine, MPH,² and Danielle M. Tartar, MD, PhD³

Abstract

Background: Nipple–areolar complex (NAC) conditions affect reproductive-age women, yet it is not known how care of NAC complaints is distributed among medical specialties. There is a need to characterize all NAC conditions, including their treatment and the care team involved in their clinical management, of nonlactating and lactating patients to determine care gaps.

Materials and Methods: This was a retrospective cohort study of reproductive-age females who presented to a large tertiary health system with an NAC complaint between 2015 and 2020. Data about the symptoms, diagnosis, specialty providing care, diagnostic considerations, and treatments were collected.

Results: Nipple pain, dermatitis, and thrush were the most common diagnoses among 407 encounters (215 patients). Lactating patients represented half (204, 50%) of the study sample. Benign breast conditions like obstructed ductal openings, accessory nipples, nipple growth, inverted nipples, and chronic and bacterial infections represented a third of all encounters. Primary care physicians (167, 41%) and obstetricians (105, 26%) provided most of the care and referred a third and quarter of patients, respectively, to another provider.

Conclusion: The care of patients with NAC complaints is not limited to obstetricians. Internal medicine, family medicine, emergency medicine, and obstetrician-gynecology, dermatology, and surgery resident physicians should receive training in benign breast conditions and clinical lactation.

Keywords: areola, breastfeeding, benign breast disease, nipple dermatitis, nipple pain, nipple thrush

Introduction

CONDITIONS SPECIFIC TO the nipple–areolar complex (NAC) affect female patients across their life span. Lactating patients with NAC complaints require specialized care to protect their milk production.^{1–3} While many NAC conditions are unique to the breast, common skin lesions such as eczema and nevi can also present on the NAC. Existing research on NAC conditions is limited to case reports and single-clinic chart reviews focusing on one diagnosis or complaint, such as Paget's disease or nipple discharge.^{4,5} The NAC is an area of the body that has not been assigned to a particular area of medicine, unlike the vagina (gynecology) or the skin (dermatology). It is not known how care of NAC

complaints is distributed among medical specialties. Likewise, the prevalence, characteristics, and care of NAC complaints at a large health system have never been described.

Graduate medical education lacks a breast health curriculum that is informed by *bona fide* NAC complaints physicians manage in clinical practice. This is especially true in specialties that are outside of the traditional women's health setting, such as emergency medicine, family medicine, internal medicine, surgery, and dermatology, despite these physicians being either on the frontline of care or serving as the primary referral specialty for NAC complaints.

Therefore, the overarching goal of this retrospective cohort study was to identify gaps in the care of NAC conditions and provide recommendations for breast health curricular targets

¹School of Medicine, University of California Davis, Sacramento, California, USA.

²Department of Public Health Sciences, School of Medicine, University of California, Davis, Sacramento, California, USA.

³Department of Dermatology, University of California Davis, Sacramento, California, USA.

in graduate medical education. The primary objective of this work was to characterize all NAC conditions of reproductive-age female-identifying patients, including their treatment and the care team involved in their clinical management, of nonlactating and lactating patients.

Materials and Methods

Herein, we present a retrospective cohort study of female-identifying patients who presented to a large academic health system in western United States between January 1, 2015, and December 31, 2019, with a diagnosis that included the word “nipple” or “areola.” Only patients between the age of 18 and 49 were included in the dataset. Patients with breast-limited conditions (*e.g.*, breast lump, mastectomy, mastitis) were excluded from analysis. Electronic medical records were reviewed by one investigator. The University of California, Davis, Institutional Review Board deemed this study exempt from full review (Approval No. 1855043-1).

Demographic information, including health insurance status and self-identified race-ethnicity, was collected for each patient. Each interaction between the patient and the health system related to a NAC complaint was coded as a unique encounter. Information about the patient’s lactation status at the time of the encounter was collected. For each encounter, data about the diagnosis, specialty or service providing care, diagnostic considerations, such as culture, imaging, or biopsy, and medical, surgical, and supportive care treatments were collected. For all lactating patients, frequency of breast pump use (no data, only nursing, nursing and pumping, exclusively pumping) and clinical symptoms and physical examination findings associated with the NAC complaint were also collected. Lactating patients were defined as those noted to be breastfeeding, pumping, nursing, or otherwise expressing milk for an infant (*i.e.*, not in the setting of a prolactinoma) in the chart at the time of the encounter for the nipple complaint.

Statistical analysis

All data were analyzed in aggregate and were not stratified by year or age range. Only one diagnosis per encounter was used in data analyses. There were 8 encounters out of 407 where two NAC-specific diagnoses were listed (data not shown) for which only the primary symptomatic diagnosis was included in the data analysis. Results were expressed as a mean with standard deviation (SD) for numerical data, as counts with percentages, and as odds ratios (ORs) with 95% confidence intervals (CI) for categorical data. A logistic regression model with the subject being used as a repeated measure was also used to calculate ORs with 95% CI. Analyses were performed in SAS version 9.4 (SAS Institute Inc.) or GraphPad Prism (Version 9.4). All tests were two-sided, and $p < 0.05$ was considered statistically significant. Missing observations were treated as missing data. Results are presented at the level of the encounter, not patient, unless otherwise specified in the text.

Results

Study population

A total of 215 patients representing 407 encounters were included. The average number of encounters per patient was 1.9 (SD 1.8, range 1–18) and the average number of NAC complaints per patient was 1.2 (SD 0.5, range 1–4). The

majority (117, 54%) of the patients self-identified as non-Hispanic White, and most (203, 94%) had private health insurance (Table 1). Most presented to the health system to discuss a complaint related to the NAC (360, 88%), and for others (37, 12%) a NAC complaint was a secondary reason for the visit or an incidental finding during the encounter. Patients with Medicaid, no health insurance, or unknown health insurance status were not more likely (OR, 3.0; 95% CI, 0.43–21.2; $p = 0.27$) to present to the emergency room than patients with private health insurance.

Of the 407 encounters reviewed, 204 (50%) were for lactating patients. Lactating and nonlactating patients were equally likely (OR, 1.6; 95% CI, 0.67–4.0; $p = 0.28$) to present to the health system for a NAC complaint. Most lactating patients reported sometimes (69, 34%) or only (64, 31%) using a breast pump at the time of the encounter. Breast pump use data were not available for 44 (22%) encounters.

NAC complaints, their diagnosis, and treatment

Nipple pain as a stand-alone diagnosis represented a large proportion of all encounters, where 30 nonlactating patients (38, 19%) and 51 lactating patients (85, 42%) presented to the health system (Table 2). In the majority of encounters (21, 55%), the etiology of pain was presumed to be hormonal among nonlactating individuals. A third (32, 38%) of nipple pain diagnoses among lactating patients was made in the first week postpartum, and a quarter (21, 25%) was made beyond 3 months postpartum. The documented traumatic incidents included bites from nursing children or as part of erotic play with a partner, piercing-related complications, or blunt force trauma from running into a wall and included nipple pain as the presenting symptom. For the lactating patients with nipple vasospasm, a condition that includes nipple and breast pain, the treatment consisted primarily of a combination of heat therapy, optimization of lactation techniques, and oral nifedipine. The most common oral therapy for nipple pain was nonsteroidal anti-inflammatory drugs, where most (11, 79%) of the prescriptions were in encounters for lactating

TABLE 1. PATIENT CHARACTERISTICS

	<i>N</i> patients (%)
Self-identified race-ethnicity	
White (non-Hispanic)	117 (54)
Black	14 (6)
Hispanic/Latinx	26 (12)
Asian	40 (19)
Native American/Alaskan Indian	1 (1)
Other	17 (8)
Health insurance	
Private	203 (94)
Other (Medicaid, none, unknown)	12 (6)
	<i>N</i> encounters (%)
Breast pump use among lactating patients	
No data	44 (22)
Only nursing	27 (13)
Nursing and pumping	69 (34)
Only pumping	64 (31)

TABLE 2. PREVALENCE AND ODDS OF NIPPLE–AREOLAR COMPLEX DIAGNOSIS BY ENCOUNTER BY LACTATION STATUS

NAC diagnosis	Total, N (%)	NL, n (%)	L, n (%)	OR	95% CI
Nipple pain	123 (30)	38 (19)	85 (42)	3.00	1.92–4.64
Nipple dermatitis	67 (16)	53 (26)	14 (7)	0.21	0.13–0.39
Fungal infection	66 (16)	1 (0)	65 (32)	94.46	17.16–959.90
Obstructed ductal opening	36 (9)	23 (11)	13 (6)	0.53	0.26–1.06
Nipple anatomical variant	23 (6)	20 (10)	3 (1)	0.14	0.042–0.46
Chronic nipple infection	19 (5)	19 (9)	0 (0)	0.00	0–0.17
Trauma-related complication	18 (4)	16 (8)	2 (1)	0.12	0.03–0.48
Bacterial infection	16 (4)	4 (2)	12 (6)	3.11	0.99–8.93
Nipple retraction	14 (3)	14 (7)	0 (0)	0.00	0–0.25
Nipple growth	11 (3)	11 (5)	0 (0)	0.00	0–0.35
Nipple vasospasm	7 (2)	0 (0)	7 (3)	Infinity	1.85–infinity
Accessory nipple	5 (1)	2 (1)	3 (1)	1.50	0.30–8.52
Viral infection	2 (0.5)	2 (1)	0 (0)	0.00	0–2.15

Nonlactating patients are the referent group. OR and 95% CI were calculated at the level of the encounter without adjusting for repeated visits. NAC diagnoses listed by prevalence order.

CI, confidence intervals; L, lactating; NAC, nipple–areolar complex; NL, not lactating; OR, odds ratio.

patients. The most common topical therapy recommended for nipple pain in lactating individuals was lanolin; many were told to use topical antibiotics, breast milk, or a food grade butter, cream, or oil. Most lactating patients with nipple pain also received lactation technique education.

While nipple dermatitis was the most common diagnosis representing over a quarter (53, 26%) of all encounters among nonlactating patients (Table 2), it was exceedingly rare among lactating patients. Only 9 lactating patients received a diagnosis of dermatitis compared to 32 nonlactating patients. Across all encounters with a diagnosis of dermatitis, the skin findings were often (26, 38%) bilateral and occasionally (13, 19%) only involved the areola. Nipple dermatitis was most often treated with a topical steroid with or without the use of nonfragrant emollients and a recommendation to change the bra type or size. Topical antifungals, combination steroid-antifungal, lanolin, and tacrolimus were prescribed less frequently for dermatitis. Notably, lactating patients were never told to change their bra for management of dermatitis or any other NAC complaint.

Nipple thrush (65, 32%) was the second most common diagnosis among lactating individuals, where 42 individual patients received this diagnosis (Table 2). By contrast, only one nonlactating patient was diagnosed with a fungal infection. As was reported elsewhere,⁶ the presumed infectious microorganism in all fungal infections among lactating patients in this cohort was *Candida spp.* and breast pump use was positively associated with a nipple thrush diagnosis, suggesting that the symptoms of NAC irritation and pain may be secondary to mechanical friction and inflammation from the breast pump. As a case in point, some patients with a diagnosis of a nipple thrush presented up to nine times for treatments consisting of over a dozen oral and topical agents, as well as a myriad of conservative and supportive care strategies. Oral antifungals, all-purpose nipple ointment, and topical antifungals were the most common medical therapies. Notably, oral pain medications and topical gentian violet were sometimes prescribed. Lactating patients with nipple thrush were also recommended to optimize breastfeeding or pumping technique, keep the nipple dry, and clean breast pump parts or change nursing pads.

Nonfungal NAC infections were rare (Table 2). Chronic nipple infections were either diagnosed or suspected periductal

mastitis with recurrent abscesses or fistulas at the nipple base. Only one patient presented with a viral infection (herpes simplex virus) of the NAC which was thought to be auto-inoculated from the perianal region. Bacterial infections were usually diagnosed clinically (15, 94%). Bacterial and viral infections were most often treated with oral antibiotic or antiviral medications, respectively. Occasionally, topical antibiotics were prescribed for bacterial or chronic nipple infections and surgical procedures were performed. Only lactating patients with bacterial infections were given conservative management recommendations, including mastitis precautions, applying warmth, optimizing lactation technique, using a nipple shield, or limiting/stopping breastfeeding.

Nipple inversion or retraction, NAC growth, and accessory nipples were uncommon diagnoses in this study population (Table 2). Chronic nipple anatomical variants were present since childhood and included flattened nipples, truly inverted nipples, or inverted nipples that everted with stimulation. A newly retracted nipple, usually unilateral, was a diagnosis often made in the setting of inflammatory breast cancer, granulomatous mastitis, periductal mastitis, breast mass, or history of bilateral breast reduction. Four patients had new nipple retraction without associated clinical findings or diagnoses. The NAC growths were unilateral and benign in this sample population. Accessory nipples sometimes secreted milk and were identified in the axilla, pelvis, lower chest, and superior breast. Patients with NAC anatomical variants, NAC growths, and accessory nipples were usually reassured that their findings were benign.

The diagnosis of obstructed ductal opening was the only diagnosis that was similarly common among lactating and nonlactating patients (Table 2). An obstructed ductal opening was almost always unilateral (34, 94%) and included new or chronic milk bleb, nipple cyst, plugged nipple orifice, or blocked Montgomery gland in the areola. Conservative treatment consisting of warm compress was common, although surgical procedures were also performed.

Most of the diagnoses were made clinically (363, 89%) without diagnostic techniques such as culture, microscopy, biopsy, or imaging. At the level of the encounter, lactating patients were less likely (OR, 0.2; 95% CI, 0.07–0.43; $p < 0.0001$) to receive a diagnosis solely made clinically than

TABLE 3. DIFFERENCES IN NIPPLE-AREOLAR COMPLEX COMPLAINT MANAGEMENT BY PHYSICIAN SPECIALTY OR SERVICE

Specialty	Tx per encounter		Reassurance			Diagnostic work up			Referral out		
	None	Range	Total, N (%)	NL, n (%)	L, n (%)	Total, N (%)	NL, n (%)	L, n (%)	Total, N (%)	NL, n (%)	L, n (%)
Primary care	70	0-7	41 (40)	34 (83)	7 (17)	19	14 (74)	5 (26)	57 (54)	38 (57)	19 (33)
OBGYN	21	0-9	21 (21)	14 (67)	7 (33)	5	5 (100)	0 (0)	26 (25)	9 (34)	17 (66)
Breast health	12	0-5	15 (14)	14 (93)	1 (7)	4	4 (100)	0 (0)	3 (3)	3 (100)	0 (0)
Surgery	7	0-2	7 (7)	7 (100)	0 (0)	10	10 (100)	0 (0)	1 (1)	1 (100)	0 (0)
Emergency medicine	6	0-6	4 (3)	3 (75)	1 (25)	3	2 (67)	1 (33)	7 (7)	4 (57)	3 (43)
Dermatology	4	0-4	11 (10)	9 (82)	2 (18)	3	2 (67)	1 (33)	0 (0)	0 (0)	0 (0)

OBGYN, obstetrician-gynecologist; Tx, treatment.

nonlactating individuals. The NAC diagnoses most likely to require imaging or biopsy were anatomical variant, new retraction, and growth. The infrequent use of wound culture, biopsy, and microscopy for the diagnosis of fungal (3%) and bacterial (2%) infections of the NAC, especially in encounters for lactating patients, may suggest differences in care provided between specialties.

Differences in NAC diagnoses and their treatments by specialty

There were significant differences in diagnostic evaluation, NAC management, and patient population by physician specialty (Table 3). The majority (167, 41%) of encounters for NAC complaints were seen by the family or internal medicine physician (primary care physician [PCP]) or obstetrician-gynecologist (OBGYN; 105, 26%). A larger proportion of patients seen by surgeons (10, 50%), emergency medicine physicians (3, 20%), and dermatologists (3, 15%) received additional diagnostic evaluations (Table 3), such as microscopy, culture, biopsy, or imaging, than those seen by PCPs (19, 11%) and OBGYNs (5, 5%). Lactating patients were less likely (OR 0.46; 95% CI, 0.31-0.68) to be seen by a PCP and more (OR, 3.2; 95% CI, 1.9-5.1) likely to be seen by an OBGYN than nonlactating individuals. In fact, breast health, surgery, and dermatology departments were more likely to be involved in encounters with nonlactating compared to lactating patients, including for the top three diagnoses of pain, dermatitis, and fungal infection (Table 4). Other health professionals were also involved in the care of

patients with nipple complaints. Lactation consultants provided care to only lactating patients in 37 encounters, and an advice nurse provided support *via* telephone to 16 patients. An advice nurse alone was more likely to give advice (OR, 6.4; 95% CI, 3.1-13.6; *p*<0.0001) to a lactating patient compared to a nonlactating patient. PCPs and obstetricians made the most referrals (Table 3), with a third (57/167) and a quarter (26/106), respectively, of their patients being sent to another provider for evaluation of the NAC complaint. Dermatologists, surgeons, and breast health specialists rarely referred (Table 3) to another provider.

Given that PCPs and OBGYNs were responsible for the majority of NAC care for diagnoses of pain, dermatitis, and fungal infection (Table 4), we next sought to determine the differences in NAC diagnosis and management for the three most common NAC complaints between these two specialties. Most encounters (55, 79%) for concurrent breast and nipple pain were managed by either PCP or OBGYN, where they were equally likely (OR, 1.8; 95% CI, 0.6-5.3) to diagnose a patient with a fungal infection. However, OBGYNs were more likely (OR, 5.4; 95% CI, 2.9-10.3) than PCPs to diagnose nipple thrush in general and when lactating patients presented with burn or itch symptoms (OR, 9.3; 95% CI 1.7-41.2).

Interestingly, PCPs were more likely (OR, 5.2; 95% CI, 2.1-12.0) than OBGYNs to diagnose nipple dermatitis. The treatments provided by OBGYNs and PCPs for NAC complaints differed. OBGYNs were more likely (OR, 2.9; 95% CI, 1.7-4.7) to provide two or more treatments per encounter compared to PCPs. Likewise, OBGYNs were more likely to prescribe oral antifungals (OR, 6.7; 95% CI, 2.8-16.5) and all-

TABLE 4. THREE MOST COMMON NIPPLE-AREOLAR COMPLEX DIAGNOSES BY PHYSICIAN SPECIALTY BY LACTATION STATUS

		PCP	OBGYN	Breast health	Surgery	Derm	EM
Pain	Total, N (%)	44	29	3	1	2	3
	NL, n (%)	22 (50)	8 (28)	2 (67)	1 (100)	2 (100)	2 (67)
	L, n (%)	22 (50)	21 (72)	1 (33)	0 (0)	0 (0)	1 (33)
Dermatitis	Total, N (%)	40	6	9	0	11	1
	NL, n (%)	31 (77)	5 (83)	9 (100)	0 (0)	8 (73)	0 (0)
	L, n (%)	9 (23)	1 (17)	0 (0)	0 (0)	3 (27)	1 (100)
Fungal infection	Total, N (%)	17	40	2	0	0	1
	NL, n (%)	1 (6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
	L, n (%)	16 (94)	40 (100)	2 (100)	0 (0)	0 (0)	1 (100)

NAC diagnoses are presented by prevalence order with *N* representing the number of encounters. Derm, dermatology; EM, emergency medicine; PCP, primary care physician.

purpose nipple ointment (OR, infinity; 95% CI, 10.8–infinity), but equally likely to prescribe topical antifungals (OR, 1.0; 95% CI, 0.5–2.1). By contrast, PCPs were more likely than OBGYNs to prescribe a topical steroid, consistent with the more common diagnosis of nipple dermatitis by PCPs (OR, 10.3; 95% CI, 1.7–109.5).

Discussion

In accordance with previous literature, the most common diagnoses given were NAC pain, dermatitis, and thrush.^{2,7,8} We demonstrated that NAC care is not limited to the traditional women's health field of OBGYN, with over a third of all NAC care provided by family practice or internal medicine physicians (*i.e.*, PCPs). PCPs often referred their patients to OBGYN, surgery, breast health, or dermatology, while OBGYNs referred a quarter of their patients with NAC complaints to breast health specialists, surgeons, and dermatologists. Most treatments provided by physicians in our study for NAC complaints of lactating patients are no longer considered evidence-based or effective. For example, recent evidence suggests that nipple thrush is mis- and over-diagnosed and thrush treatments such as those described in this study cause or exacerbate eczematous skin reactions.^{7,9,10} Combined, our work highlights the importance of a benign breast health and clinical lactation curriculum across undergraduate and graduate medical education, with a special emphasis on building competence in breast health diagnosis and management among physicians in internal medicine, family medicine, and OBGYN.

It is not clear how diagnosis and management of benign breast conditions are integrated into graduate medical education. Internal medicine physicians are aware of this discrepancy in their training and report that management of benign breast disease is of high importance, with management of postpartum and breastfeeding complications rated as moderately important.^{11,12} Other authors have hypothesized that the fact that pregnancy and postpartum-related topics were not identified by one expert panel as highly important for internists is because perinatal care is most likely to be provided by maternal-child health specialists.¹¹ Yet, in our cohort, a quarter of patients with NAC complaints who sought help from their OBGYN were also referred elsewhere. Unfortunately, even when referred to subspecialists in surgery, breast care may not be optimal. As a case in point, surgery and family medicine residents selected the wrong treatments for breast diseases and struggled with identifying the “normal nipple-areolar complex” in a university-based residency program.¹³

Our findings may help explain the steep decline in U.S. breastfeeding rates after hospital discharge, where most (>90%) women initiate breastfeeding after birth, but less than half continue breastfeeding beyond 3 months.¹⁴ Nipple pain is a primary reason for breastfeeding cessation and was the most common diagnosis in our cohort.² Premature breastfeeding cessation is associated with increased maternal hypertension, heart disease, and diabetes and pediatric gastrointestinal and respiratory infections.¹⁵ As such, it is critically important that the correct cause of nipple pain is identified and evidence-based management is initiated promptly. Unfortunately, breastfeeding training in residency programs is limited to a few hours of didactic education per

year in traditional maternal-child health fields of OBGYN, family medicine, and pediatrics.^{16,17} Didactic education is passive learning, which is less likely to translate to retention of knowledge, translation to patient care, or improvement in patient health outcomes.^{18–20} Recent advances in simulation-based training in breast and skin assessment and clinical lactation have the potential to support higher level learning, improving competence and translation of skills to patient care.^{21–23} Medical educators can use the NAC diagnoses identified in this cohort study as a framework for building a case-based, potentially multidisciplinary, active-learning curriculum for resident physicians in internal medicine, family practice, and OBGYN.

A strength of this work is that it provides the first estimation of the number and diversity of encounters for nipple complaints among female-identifying patients of reproductive age at a large tertiary health system. Likewise, this study provided the first description of medical specialties, diagnostic considerations, and treatments involved in the care of nipple complaints for reproductive-age, female-identifying patients. Finally, a noteworthy element of this study is the comparison in specialty-specific diagnosis and treatment of nipple conditions of patients who were nonlactating and lactating. This study is not without several noteworthy limitations. First, generalizability is limited given that this is a single institution study. Second, this dataset does not represent the totality of nipple complaints at our institution as identification of relevant patients for the study is limited by the way in which diagnoses are coded in the electronic medical records.

Conclusion

This is a retrospective cohort study at an academic health system where all NAC complaints, treatments, and the specialists responsible for NAC care were characterized for nonlactating and lactating female patients over a 5-year period. The most common diagnoses given were nipple pain, dermatitis, and nipple thrush. PCPs and OBGYNs were involved in two-thirds of the encounters, where patients in third and a quarter of the encounters, respectively, were referred to subspecialists for further management. This study provides information about NAC conditions that PCPs and OBGYNs often manage and highlights the importance of breast health and clinical lactation training within internal medicine, family practice, and OBGYN graduate medical programs.

Authors' Contributions

A.S.—Conceptualization, methodology, investigation, data curation, writing (original draft), writing (Review and editing).

J.F.—Formal analysis, writing (review and editing).

D.M.T.—Supervision, writing (review and editing).

Disclaimer

The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH.

Author Disclosure Statement

No competing financial interests exist.

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Address correspondence to:
 Anna Sadovnikova, PhD, IBCLC, MPH, MA
 School of Medicine
 University of California Davis
 4610 X Street
 Sacramento, CA 95817
 USA

E-mail: asadovnikova@ucdavis.edu