

ARTICLE

Self-Reliance and Pig Husbandry in Los Angeles Chinatown (1880–1933): New Evidence from Dental Calculus Analysis and Historical Records

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Abstract

This study explores the pig-raising practices of Chinese migrants in Los Angeles Chinatown during the Chinese Exclusion Era. Chinese butcher shops sold pork meat, and previous research indicates that they likely sold the more profitable parts outside of Chinatown for additional income while consuming cheaper cuts themselves. Using dental calculus analysis and archival research, this study further explores how Chinatown residents relied on pork to thrive in an anti-Chinese environment. Dental calculus results suggest that Chinese migrants raised their own pigs with food waste and by-products from rice fields; this pork was then sold to meat markets or consumed within the community. The analysis of immigration records indicates that Chinese butcher shops provided employment opportunities as well as housing, banking, and immigration support for Chinese migrants. Pig raising, therefore, not only supplied a source of meat for Chinese migrants but also supported a range of social and financial services for a marginalized group that faced everyday discrimination from dominant society. Overall, this study traces the labor and networks that small businesses in the late nineteenth and early twentieth centuries needed to source and distribute pork, and it highlights how a Chinese diasporic community developed a pork production system to resist racism.

Resumen

Este artículo examina las prácticas de crianza porcina utilizadas por migrantes chinos en el Barrio Chino de Los Ángeles durante el periodo conocido como la época de Exclusión China. Estudios previamente realizados indican que las carnicerías chinas probablemente vendían los cortes de cerdo más rentables a compradores fuera del Barrio Chino para generar ingresos mientras reservaban los cortes más baratos para su propio consumo. Este estudio combina un análisis de cálculo dental con la investigación archivística para examinar cómo los residentes del Barrio Chino utilizaban el cerdo para sobrevivir en un ambiente discriminador. Los resultados del análisis de cálculo dental indican que los migrantes chinos alimentaban a los cerdos usando residuos alimenticios y productos secundarios de los arrozales. Estos porcinos fueron vendidos posteriormente a mercados de carne o consumidos por la propia comunidad. El análisis de los registros de inmigración indica que las carnicerías chinas brindaban oportunidades laborales y apoyo en temas de alojamiento, servicios financieros e inmigración para migrantes chinos. La crianza porcina, por lo tanto, no solamente brindaba carne de cerdo sino diversos servicios sociales y financieros para los migrantes chinos, un grupo marginado que enfrentaba bastante discriminación en la sociedad. En conclusión, este estudio describe la labor y las redes utilizadas para obtener y distribuir la carne de cerdo en los siglos diecinueve y veinte, mostrando cómo la diáspora china desarrolló un sistema de producción porcina para resistir al racismo.

摘要

本文探讨了在美国排华法案时期罗省唐人街华人移民养猪的历史。以往的研究表明，华人肉铺销售猪肉，同时为了增加收入，他们将利润较高的猪肉部位贩卖给唐人街以外的社群，而自己则食用较为经济实惠的部分。通过猪牙结石和历史档案的分析，本研究进一步探讨了早期华人移民如何在反华的政治环境中依靠猪的饲养和销售得以生存发展。牙结石分析结果表明，该唐人街的猪遗存很可能是华人自给自足的产物。华人移民们利用厨余残渣和稻糠来饲养猪，然后将部分猪肉在市场上销售，部分在社区内部食用。同时，移民档案和报纸材料表明，华人肉铺不仅给移民创造了就业机会，还为新移民们提供了住房、银行业务和移民支持。因此，养猪不仅为华人移民提供了肉食来源，还为当时备受歧视的社会边缘移民们提供了一系列社会和财务服务。总体而言，本研究揭示了在十九世纪末和二十世纪初，华人劳工和商贩如何通过建立一个猪肉生产销售网络，在反华的社会环境下生存下来。

Keywords: Chinese diaspora; phytolith analysis; immigration; Los Angeles Chinatown; race

Palabras claves: la diáspora china; análisis de fitolitos; inmigración; El Barrio Chino de Los Ángeles; raza

关键词: 海外华人; 植硅体分析; 移民; 罗省唐人街; 种族

The late nineteenth to early twentieth century in the United States was a time of profound social transformations, marked by the emergence of the working class, the abolition of slavery, and substantial waves of immigration (Orser 2011; Susman 2003). Although laborers contributed to the nation's growth during late nineteenth-century industrialization, racialized groups continued to face discrimination and sometimes violence from dominant society. In this environment, marginalized communities employed various means of food acquisition and consumption to build community, negotiate identity, and navigate racism (Mintz 1996; Mullins 1999; Sunseri 2015). Black Americans in Annapolis, Maryland, for example, developed different strategies to participate in the food consumer marketplace while also setting themselves apart from it. Some chose to opt out of the mainstream marketplace and established their own meat acquisition methods, such as raising poultry and fishing, to evade potentially racist vendors and establish their own economic networks (Warner 1998). Meanwhile, Irish immigrants in New York forged a new Irish American identity by embracing new types of meat foods and American-style patterns of tableware and serving forms. Through these practices, they sought to shed the stigma of being perceived as the foreign “other” while expressing their desire for assimilation into mainstream American society (Brighton 2005, 2011).

Amid these broader social and cultural transformations, Chinese diaspora communities in California faced similar challenges. Between the late nineteenth and early twentieth century, approximately 400,000 people from China migrated to the United States. As they settled in urban enclaves such as Chinatowns or in rural areas working as miners, agricultural laborers, and railroad workers, they encountered virulent racism, discriminatory attitudes, and violence at times (Chang 2019; Hsu 2000; Sunseri 2020a). White working-class laborers saw Chinese migrants as a threat to their livelihoods, portraying them as economic competitors. Anti-Chinese sentiment became so widespread that it culminated in the passage of the Chinese Exclusion Act of 1882 (<https://www.archives.gov/milestone-documents/chinese-exclusion-act#:~:text=This%20act%20provided%20an%20absolute,good%20order%20of%20certain%20localities>), which significantly curtailed Chinese immigration because the law barred Chinese laborers from entering the United States (Lee 2003). The Chinese Exclusion Act was continually renewed over the next six decades and would not be repealed until 1943; it was a period of time that many scholars refer to as the Chinese Exclusion Era.

This article explores how early Chinese migrants living in urban ethnic enclaves resisted structural racism during the Chinese Exclusion Era by investigating their strategies for food production. More specifically, we examine pig-raising practices and pork distribution in Los Angeles Chinatown by collecting firsthand accounts of Chinese butchers and by analyzing microfossils on pig teeth from archaeological deposits. Through the lens of production rather than consumption, we aim to shed light on strategies of resilience to various forms of structural racism faced by Chinese migrants. Our analyses reveal the establishment of wholly Chinese-owned and operated pork supply networks—from pig raising to butchering—that developed during a time when Chinese laborers were excluded

from immigrating to the United States and pork sold by Chinese butchers was regularly portrayed as inferior.

Food Production, Racism, and Resilience

Historical and archaeological research indicates that Chinese migrants living in urban areas procured and consumed fresh meat, vegetables, and preserved foods imported from China. However, these practices were carried out under structural racism, which imposed discriminatory laws and restrictions on Chinese communities. For instance, the passage of the 1892 Geary Act (<https://immigrationhistory.org/item/geary-act/>) not only renewed the Chinese Exclusion Act but mandated Chinese migrants to register their legal status to remain in the United States, with the failure to possess the required certificate of registration resulting in deportation. Chinese merchants engaging in labor-related activities could also face deportation, as exemplified by the arrests of Riverside Chinatown merchants Wong Fong and Wong Hong in 1895 for driving vegetable wagons to their farms (Lawton 1987). Over time, Chinese migrants became adept at negotiating local, state, and federal laws that were anti-Chinese. In the 1880s, a series of laws was enacted to prohibit Chinese individuals from commercial fishing in California, due to the fact that fishermen of other ethnic backgrounds sought to eliminate competition (Armentrout-Ma 1981). Despite these challenges, Chinese merchants in San Francisco persisted in the fishing industry by securing a key role in salt fish trade, which involved procuring fish from California coasts via Chinese labor, salting it, and distributing it to overseas and urban Chinese communities such as the Market Street Chinatown in San Jose (Kennedy 2017). The California Alien Land Law in 1913 (<https://immigrationhistory.org/item/alien-land-laws-in-california-1913-1920/>) prohibited Chinese from owning property, yet Chinese farmers adapted by forming companies to hold land deeds or purchasing land under the names of their American-born children (Fong 2013:66–67). Amid boycott campaigns targeting Chinese vegetables, Chinese farmers in Riverside thrived by providing home delivery services to White residents who had chosen to plant fruit orchards rather than cultivate their own crops (Lawton 1987). These strategies enabled the survival of Chinese migrants and the establishment of successful vegetable farms across California.

Although previous studies have explored diverse resilience strategies to structural racism among Chinese migrants, the area of pork production remains underexplored. Pork held significant importance in the culinary practices of Chinese diaspora communities, serving as the primary meat staple. Archaeological investigations have frequently examined pork consumption in Chinatown excavations (e.g., Chang 2018; Greenwood 1996; Gust 1993; Kennedy 2016; Langenwaller 1987), but studies specifically focusing on pig husbandry and pork-meat distribution have been relatively scarce. Important research questions remain: How did Chinese migrants obtain and distribute pork for consumption while navigating structural racism during the Chinese Exclusion Era? Did Chinese migrants primarily rely on Anglo-American meat markets for pork, or did they raise their own pigs? This study seeks to address these questions by focusing on Los Angeles Chinatown, an urban community that thrived during the late nineteenth and early twentieth centuries. By examining how Chinese migrants obtained and distributed pork, our research aims to illuminate the labor and networks involved in pork economy within an environment that was vehemently anti-Chinese and, in particular, anti-Chinese labor.

Previous studies have primarily relied on two methods to examine the pork economy in Chinese diaspora communities. The first method involves analyzing butchery marks to differentiate between Chinese- and European-style butchering based on tool marks and bone fragmentation. Butchery mark analyses from urban Chinese diaspora sites demonstrate a predominance of shears on pork bones, suggesting that pork was likely sourced from Chinese butchers (e.g., Kennedy 2016; Praetzellis and Praetzellis 1982). However, identifying the butchers' ethnicity could be complex due to the variation and overlap in the marks made by different tools, and this method does not reveal the origins of pork products. The second method relies on historical newspapers and articles. Some of these documents report instances of complaints about pig raising in Chinese communities, which were often viewed by Anglo-Americans as health hazards (e.g., *Daily Alta California* 1887a). It is unclear, however, whether these complaints reflect a widely adopted practice in Chinese urban residence sites or were invented. Despite these previous studies, little work has been done to investigate

the sourcing and distribution of pork in Chinese diaspora communities (but see Kennedy and Guiry 2022).

This study offers an alternative and previously unexplored approach to investigating the origins of pork products consumed at Chinese diaspora sites. First, we conducted a microfossil analysis of pig dental calculus from a sample of pig teeth in the Los Angeles Chinatown faunal assemblage to trace the sourcing of these animals. Dental calculus is mineralized dental plaque that forms on teeth through a complex interaction between food, saliva, and bacteria, providing valuable insights into dietary patterns (Henry and Piperno 2008; Marcotte and Lavoie 1998; Nava et al. 2021). By examining plant microfossils such as phytoliths and starch in these dental deposits, we can identify specific plants that were consumed, and we can potentially determine the sources of pork. Historical records point to two ways of sourcing pork in nineteenth- and early twentieth-century California. The first is linked to the industrial meat trade and major livestock centers in the Midwest, characterized by reduced dietary variability and standardized feeding protocols focused on maize (Kennedy and Guiry 2022; *Pacific Rural Press* 1917). The second involves smaller-scale, local pig-husbandry practices largely relying on mixed food sources such as human food waste and locally grown feed such as barley, alfalfa, sweet potatoes, and other crops (*Madera Mercury* 1915; *Pacific Rural Press* 1875; *Press Democrat* 1917). These diverse feeding strategies would result in different microfossil assemblages in dental calculus, allowing us to approximate pork sources.

In addition, we investigated Chinese Exclusion Act case files and census records to reconstruct the lived experiences of Los Angeles Chinatown residents who participated in the Chinatown pork economy. The case files contain information regarding the immigration and legal status of Chinese immigrants, transcripts of interrogations, testimonies from Chinese and white witnesses, and identification photographs. These records, evaluated against other lines of evidence, are a resource for illuminating the lived experiences of Chinese immigrants in the United States during the Chinese Exclusion Era.

Historical and Archaeological Background of Los Angeles Chinatown

By 1880, a discernable Chinese ethnic enclave known as Chinatown appeared on Calle de Negros Street, south of the Los Angeles Plaza (Figure 1; Greenwood 1996). The community, made up of male laborers and some families, steadily grew during the decade, with residents moving into vacant adobes surrounding the plaza. By the late 1880s, most of the growing Chinese community had settled in a new tract to the east of the plaza, which was centered on two east–west streets: Apablasa Street and Marchessault Street. This new Chinatown area was home to a host of Chinese-owned businesses, including stores, laundries, herbalists, and vegetable peddler operations. The Chinese population was anywhere between 5,000 and 15,000 based on different historical sources, and a *Los Angeles Times* article from 1933 noted that it had reached its peak at the turn of the twentieth century before beginning a gradual decline (Greenwood 1996:37). The decline was attributable to several factors, including the success of the Chinese Exclusion Act and the city's purposeful neglect of the area, with little to no municipal services being provided to the densely populated neighborhood due to its private property status (Greenwood 1996:18). The city's housing codes were intentionally unenforced, which resulted in unsanitary conditions, and these were later cited as a pretext for the city to raze Chinatown. In 1934, most of the new tract of Chinatown was destroyed to make way for the construction of Union Station, a new railroad passenger terminal. In response to this destruction, Chinese business leaders established another Chinese community approximately a mile away from the original location in 1938, which they called New Chinatown.

It was not until the late 1980s that a team of cultural resource management archaeologists, led by Roberta Greenwood, excavated a portion of the Los Angeles Chinatown site during the construction of the Los Angeles Metro Rail at Union Station, revealing remnants of the Old Chinatown that had been hidden for decades. The excavation focused on a portion of Apablasa Street and uncovered thousands of artifacts that included ceramics, glass, metal, and plant and animal remains (Greenwood 1996). A total of 59 cultural features from four loci were excavated, with each locus representing a specific excavation zone. The project successfully relocated deposits, structures, and roads that were previously considered destroyed. This allowed for the correlation of many features with specific addresses and

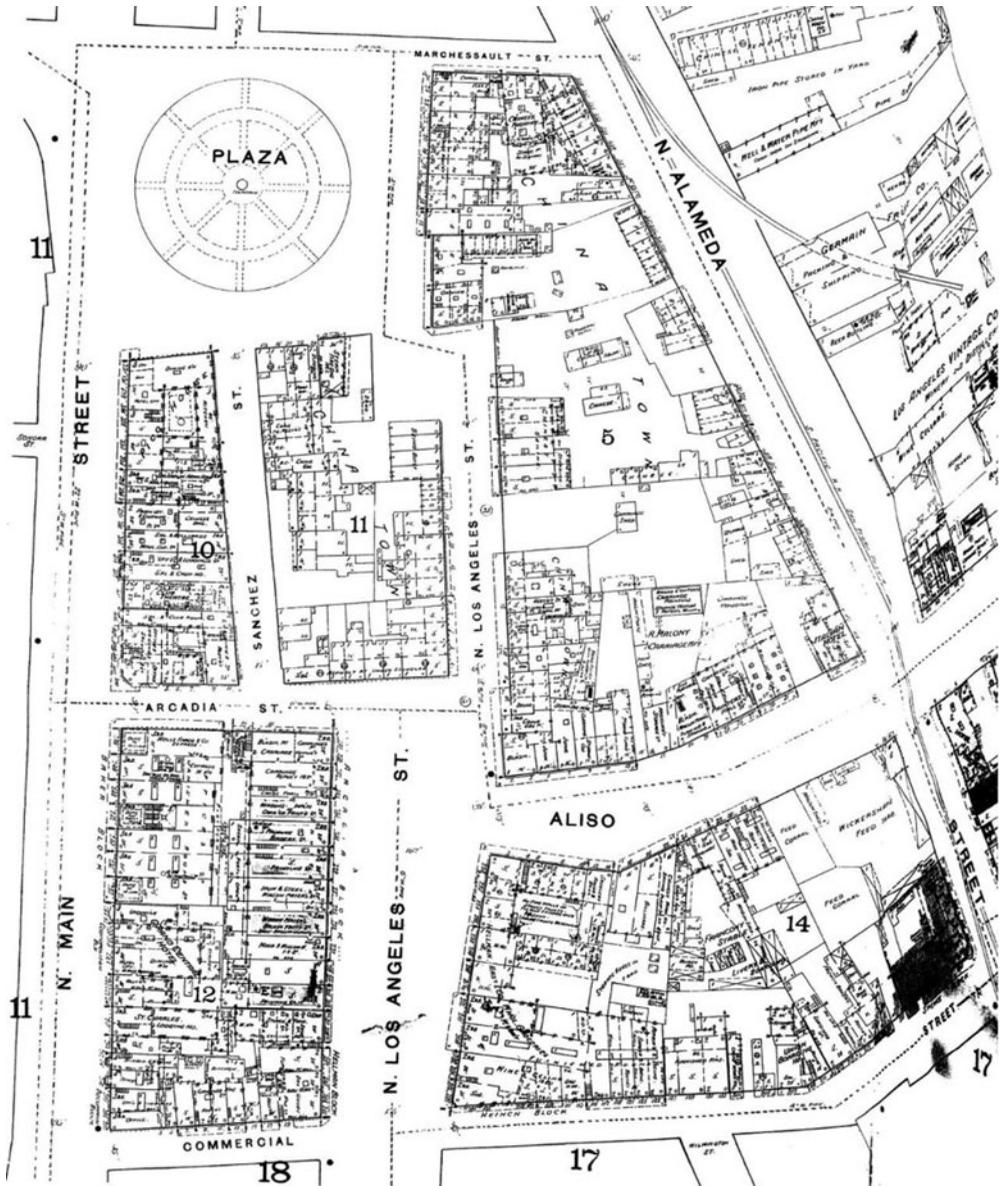


Figure 1. Sanborn Fire Insurance map of Los Angeles Chinatown, 1888. (Photo courtesy of Sanborn Digital Maps.)

functions, providing valuable data for interpreting the way of life in a limited section of the Los Angeles Chinatown. Some features, such as portions of a vegetable peddler wagon shed, were correlated with historic Sanborn fire-insurance maps. The sheer number of features present in every area accessible to excavation is a testament to the density of occupation, indicating that numerous other features remain present on the Union Station property.

The excavation revealed a significant number of faunal remains, with a sample of 6,964 bones from Features 2, 2B, and 3 analyzed at the Zooarchaeology Laboratory at the University of California, Los Angeles (Greenwood 1996:127–129; Sandefur 1990). The analysis indicated that pork was the most preferred meat of the Chinatown residents, with occasional consumption of food such as beef and local wild fauna. Among the identified animal species, pig bones show the highest number of identified specimens (NISP) and minimum number of individuals (MNI). Most of the pig bones belonged to juvenile animals aged between one and two and a half years, which were frequently cleaved into

2.5–7.6 cm (1–3-inch) lengths using Chinese butchering techniques, suitable for being picked up with chopsticks. All parts of the pig were present in the faunal assemblage, suggesting on-site butchering. The collection of pig remains, however, showed a noticeable underrepresentation of meatier parts such as femurs (Sandefur 1990:17). This suggests that residents consumed less-expensive pork cuts from the pig they raised and probably sold more profitable parts to customers outside Chinatown for additional income. The strategy closely resembles that of low-income African American and immigrant families in the early nineteenth-century New York, who also relied on pig husbandry for sustenance because they sold the meat to butchers and the offal, fat, and bones to local manufacturers who created marketable products from those parts of the pig (McNeur 2014). Peabody's (1871) descriptions of San Francisco Chinatown provision shops in the late nineteenth century further highlight the resourcefulness of Chinese migrants in their ability to maximize pigs for profit. He notes that "every part of the swine, even the coagulated blood is utilized" (Peabody 1871:661).

Pig Dental Calculus Analysis: Rice-Fed Pigs from Chinatown

To explore the sourcing of the Chinatown pork, we analyzed 12 faunal specimens, which included teeth from 10 pigs and two rib bones (Figure 2; Table 1). The two pig rib bones were included for analysis because they were recovered from the same depositional environment and curated together with the tooth samples. Consequently, they can serve as control samples to detect potential contamination from postdepositional and curation processes. These faunal remains are curated at the San Bernardino County Museum, a federally recognized archaeological repository in Redlands, California, and were recovered from two distinct features in the Chinatown area: Feature 18 and Feature 21 in Locus 2. These two features are trash deposits that are likely associated with a wagon shed and vegetable peddlers' shed that were erected sometime between 1900 and 1925 based on the date ranges of diagnostic artifacts and an analysis of historic maps (Greenwood 1996:54–55). It is likely that there are pig teeth in other features, but Features 18 and 21 were randomly selected for this study. Feature 18 was a trash pit estimated to be 102 cm in diameter and 57 cm in depth, with vertical walls, which indicated that it was specifically dug for refuse. This pit contained various Chinese artifacts, including fragments of bottle glass, Chinese porcelain and stoneware, amorphous metal, and a metal pipe (Greenwood 1996:51). Our analysis included three pig jaws and one rib bone from this

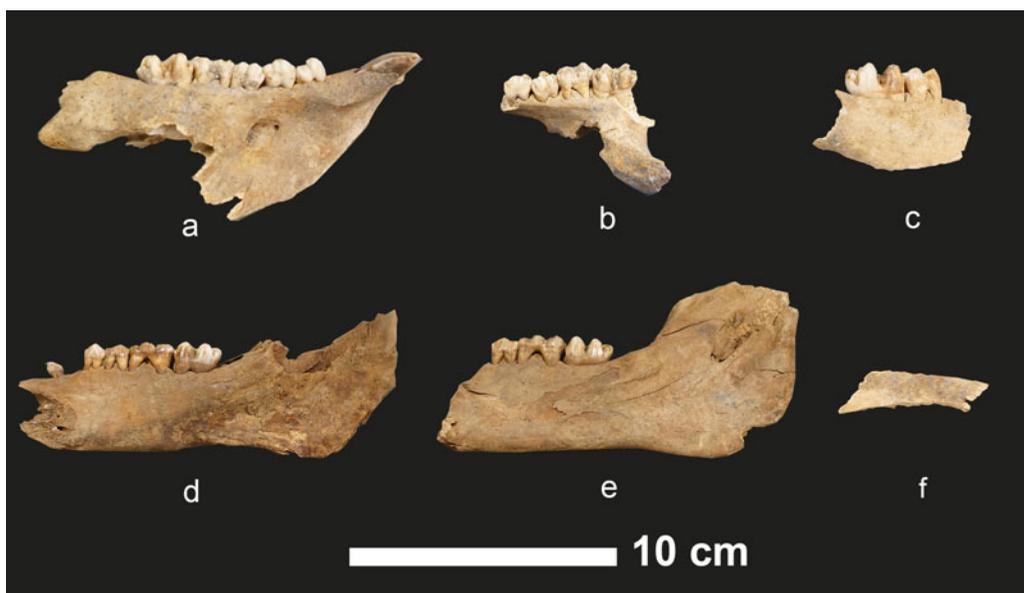


Figure 2. A selection of faunal samples analyzed in this study: (a–e) pig jaw specimens; (f) a rib bone (control sample 1). (Color online)

Table 1. Microfossils from Dental Calculus and Control Samples.

| Microfossil Type | Taxonomic Attribution | Pig 1 | Pig2 | Pig 3 | Pig 4 | Pig 5 | Pig 6 | Pig 7 | Pig 8 | Pig 9 | Pig 10 | Control 1 | Control 2 |
|--|----------------------------|------------|------|-------|-------|------------|-------|-------|-------|------------|------------|-----------|-----------|
| Archaeological Context | | Feature 18 | | | | Feature 21 | | | | Feature 18 | Feature 21 | | |
| <i>Phytolith silica skeletons</i> | | | | | | | | | | | | | |
| Interdigitating type | Paniceae inflorescence | 1 | | | | | 1 | | | | | | |
| Elongate dendriform | Poaceae inflorescence | 1 | | | | | 1 | | | | | | |
| Elongate crenate | Poaceae inflorescence | 3 | | 1 | | 1 | 1 | | | | | | |
| Elongate columellate | Poaceae inflorescence | | | 1 | | | | | | | | | |
| Elongate psilate/sinuate | Poaceae leaf/stem | | 2 | | | 1 | 1 | | 1 | 2 | | | |
| Elongate irregular and others | Poaceae | 1 | | | | | | | | | | | |
| Stoma sheet | Monocot | | 1 | | | | 1 | | | | | | |
| Undetermined multicell | | | 1 | | | 1 | 1 | | | | | | |
| <i>Phytolith single-cell morphotype</i> | | | | | | | | | | | | | |
| Double peak | <i>Oryza</i> inflorescence | 3 | | | 2 | 17 | 55 | | | 3 | 5 | | |
| <i>Oryza</i> -type bulliform | <i>Oryza</i> leaf | 2 | | | | | | | 7 | | 2 | | |
| Parallel scooped bilobate | <i>Oryza</i> leaf | 4 | | | | 1 | | | | | | | |
| Bilobate | Poaceae | 4 | | | | 1 | | | 1 | | | | |
| Cross/quadra-lobate | Poaceae | 2 | 1 | | 1 | | | | | | | | |
| Saddle | Poaceae | | | | | | | | | | | | |
| Rondel | Poaceae | | | | | 2 | | | | | | | |
| Common bulliform | Poaceae leaves | | | | | 1 | | | | | | | |
| Elongate dendriform/echinate/crenate/columellate | Poaceae inflorescence | 2 | | | | | 2 | 1 | | | 1 | | |
| Elongate psilate/sinuate | Poaceae leaf/stem | | 4 | | 1 | 15 | | | 5 | | 1 | 1 | |
| Phytolith total counts | | 23 | 9 | 2 | 4 | 40 | 63 | 1 | 14 | 5 | 9 | 1 | 0 |
| <i>Parasite egg</i> | | | | | 4 | | 8 | | | 2 | | | |

feature. Seven pig jaws and one rib bone were recovered from Feature 21, a dense deposit of refuse under Feature 17A, which was a compact trash scatter resulting from the demolition of Los Angeles Chinatown. Feature 21 was a trash pit that had sloping walls and no internal stratigraphy, indicating opportunistic use for a short period (Greenwood 1996:52). Among notable artifacts from Feature 21 were ink bottles, gaming pieces, and several medicine bottles.

For the extraction of microfossils and control samples, we used a method involving sonication, EDTA decalcification, and heavy liquid separation. Acidic chemical treatments, which could potentially damage microfossils (Piperno 2006:100), were not used in the process. Before sampling, each animal specimen was rinsed with distilled water to eliminate surface contaminants. Dental calculus samples were then collected from each specimen, placed in a sterile centrifuge tube filled with distilled water, and then sonicated in an ultrasonic bath for six minutes. This process disrupted the calculus structure and facilitated the release of microfossils (Radini et al. 2019). After sonication, microfossils were extracted using 0.5M EDTA (Tromp et al. 2017), followed by sodium polytungstate separation at a density of 2.35 g/ml. Control samples were obtained by sonicating the rib bones and following the same microfossil extraction procedure.

Our analysis revealed two types of microfossils: phytolith and parasite egg (Figure 3). The phytolith assemblage primarily consisted of morphotypes derived from grasses, which can be identified to different taxonomic levels. The most abundant and ubiquitous phytolith types are from rice, including double peak (rice husk), *Oryza*-type bulliform (rice leaf), and parallel scooped bilobate (rice leaf), which are present in seven of the 10 pig specimens. Another notable type is articulated elongate dendriform, observed in two pig specimens. Dendriforms are produced in the epidermal long cells of the inflorescence bracts of various grass taxa, including several economically important crops such as wheat, barley, oats, and rye (Ball et al. 2017). Additionally, interdigitating type phytoliths typical of Paniceae grass husk were identified in two samples. Of note is that none of the samples contain typical rondel phytoliths from maize, a common animal feed in Midwest industrial pig-husbandry practices.

Overall, the phytolith assemblage suggests a significant reliance on rice-based foods. Among the three types of rice phytolith recovered, double-peak phytolith from rice husk accounts for the highest ubiquity¹ and quantity (ubiquity = 60%, $N = 85$), followed by bulliform (ubiquity = 30%, $N = 11$) and parallel scooped bilobate (ubiquity = 20%, $N = 11$)—both from rice leaf. This indicates the inclusion of both rice husks and straws in the pigs' diet, with rice husks being the relatively predominant food source. It is unclear whether the pig feed includes whole grains, given that no rice starch granules have been recovered. The absence of starch granules might be attributed to certain Cantonese culinary practices, which involve roasting pig heads for communal feasting events for special occasions or ceremonies (Greenwood 1996:32). The high temperature during roasting could have caused the degradation of starch granules.

Another noteworthy finding was the recovery of *Ascaris* eggs—a type of parasitic roundworm—from three pigs. The parasite lives in the intestine and lays eggs that are then released in the feces of infected humans and animals. These eggs can survive in soil for several months. The finding of *Ascaris* eggs from the pig teeth could be attributed to the animal's consumption of feces or of soil that contained eggs (see Discussion section).

The quantity of phytoliths in the control samples was much lower than that of the calculus samples, with only one phytolith recovered from the two control samples (0.5/sample) compared to 19 phytoliths per sample in the calculus samples. This suggests that the calculus samples were unlikely to have been contaminated by postdepositional or curation activities.

Evidence from the Documentary Record: Butcher Shops and Pig Ranches

Immigration records, business directories, and previous archival research conducted by Greenwood (1996) reveal that Los Angeles Chinatown was home to at least four Chinese-owned butcher shops. One Chinese butcher shop was the Ong Quong Yee on 802 Alameda Street, owned by Way Lee in the mid-1890s (National Archives and Records Administration–Pacific Region (Riverside) [NARA–PR], Records of the US Immigration and Naturalization Service [INS], Record Group 85; Chinese Exclusion Act Case Files [CEACF], 1892–1944; Los Angeles District Office; Loo Yok interview, File

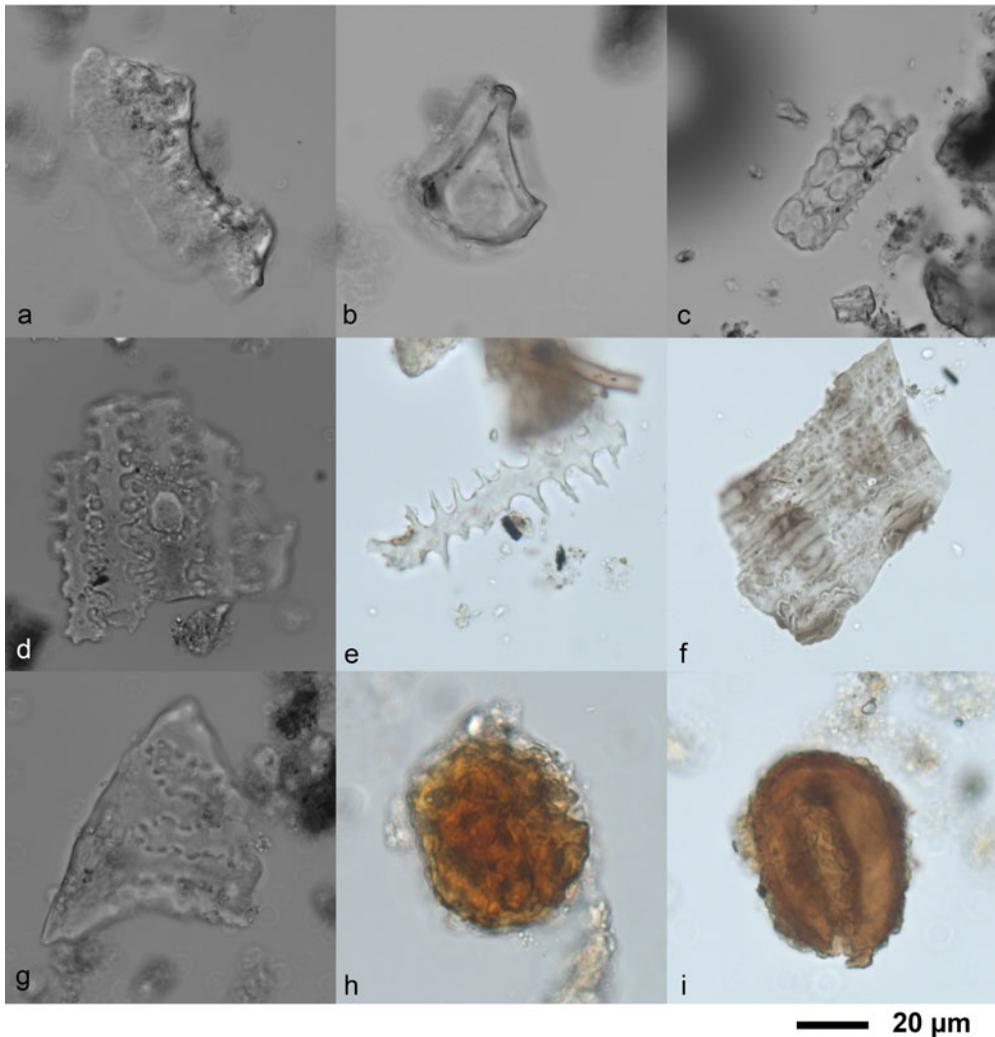


Figure 3. Microfossils recovered from dental calculus of pigs from Los Angeles Chinatown: (a) double peak (rice husk); (b) *Oryza*-type bulliform (rice leaf); (c) parallel scooped bilobate (cf. rice leaf); (d and e) dendriform elongate (cf. Triticeae grass husk); (f) epidermal sheet with stoma (grass leaf); (g) interdigitating type (Paniceae grass husk); (h) parasite egg (*Ascaris*, unfertilized); (i) parasite egg (*Ascaris*, embryonated). (Color online)

145, 1896; Perris, California); another was the Quong Yee Lung Chinese grocery and butcher shop on 761½ Alameda Street, owned by Loui Low in the mid-1890s and listed in the 1913 edition of the International Chinese Business Directory of the World ([NARA-PR][INS][CEACF] Loui Tip interview, File 338, 1897; Wong 1913); there was an unnamed butcher shop owned by Wong On, located on 427 North Los Angeles Street, that was in operation by at least 1896 ([NARA-PR][INS][CEACF] Wong On interview, Wong Fung, File 116, 1896); and there was the Sam Sing & Company butcher shop, a store that dated back to at least 1890 and was located on 418 North Los Angeles Street by 1899 ([NARA-PR][INS][CEACF] Wong Done interview, Wong Ton, File 668, 1899). Of these, the Sam Sing & Company butcher shop has the most extensive historical documentation.

The Sam Sing butcher shop was first located in Los Angeles Old Chinatown and was already firmly established by 1890. Between the 1890s and 1930s, it had several addresses but was always located on the 400 block of North Los Angeles Street (Figure 4). The shop was operated by people with the surname Wong, and one of the butchers was named Wong Done, who was from the Gom Benn village cluster in Toisan County, Gwongdung Province, China (Figure 5; [NARA-PR][INS][CEACF] Wong



Figure 4. The Sam Sing Butcher Shop (lower-right storefront with white banner) on North Los Angeles Street in Old Chinatown, circa 1900. (Photo courtesy of the Security Pacific National Bank Collection/Los Angeles Public Library.)

Done interview, File 3905, 1910). The butcher shop would continue to be operated by people from Gom Benn through the late twentieth century, although it would eventually move to Spring Street below New Chinatown (Wong 1980).

The immigration files provide additional information regarding Chinese butcher business practices and pig processing in Los Angeles Chinatown. Wong Coon, also known as Wong Bing Sai, worked in the Sam Sing butcher shop for at least three decades starting in 1902 (Certificate of Admission of Alien



Figure 5. Photo of Sam Sing butcher Wong Done in 1910 from his Chinese Exclusion Act case file. (Photo courtesy of the National Archives.)

1946; [NARA-PR][INS][CEACF] Wong Coon interview, Wong Done, File 3905, 1910). He noted in a 1902 immigration interview for his employee Wong Done that three partners were active in the store, whereas the fourth worked primarily at the slaughterhouse. Specifically, he mentioned that Wong Done was the person who “slaughters the hogs at the ranch for our store” ([NARA-PR][INS][CEACF] Wong Coon interview, Wong Done, File 1210, 1902). Although the location of the ranch is unknown, a recently digitized photograph from a collection of photos taken in Los Angeles Chinatown around the turn of the twentieth century provides further evidence of pig raising and pig slaughtering in or near Chinatown. The photo shows three Chinese men holding down a pig by its back legs (Figure 6). It is possible that other Chinatown butchers purchased their pigs from Sam Sing’s pig ranch, or that the ranch was a cooperative between different butcher shops. This is supported by a statement made in 1896 by Wong On, who owned a butcher shop on the same street as the Sam Sing butcher shop. An English transcription of Wong On’s interview in Chinese noted that he “killed hogs and retailed the meat” and that he carried some beef in his shop, but “not much” because “Chinamen² like hog meat best” ([NARA-PR][INS][CEACF] Wong On interview, Wong Fung, File 116, 1896).

In late nineteenth- and early twentieth-century California, ranches and farms were commercial ventures that involved the raising of livestock or crops for sale rather than self-sufficiency (Fogelson 1993). Although farms typically comprised land that was originally a part of large ranches, the term “ranch” and “farm” appear to have been used interchangeably without regard to acreage. Hog ranches advertised for sale in Los Angeles newspapers during this time period could range from 7.7 ha to over a hundred. Although the size of Chinese pig ranches is unknown, Chinese butcher shops with their own livestock had a stock of pigs that fluctuated; for example, butcher Loui Low told immigration officers, “Sometimes I have fifty hogs and sometimes twenty” ([NARA-PR][INS][CEACF] Loui Low interview, Li Seed, File 47, 1896). The Chinese pig ranches mentioned in the historical record were likely small scale.

The historical record also reveals that stores such as Chinese-owned butcher shops provided important social and financial services to Chinese migrants during the Chinese Exclusion Era. For example,



Figure 6. Chinese men holding a pig down in a fenced area in or near Los Angeles Chinatown, circa 1881–1910. (Photo courtesy of the Lisa See Collection/Huntington Digital Library.)

the Sam Sing butcher shop assisted Chinese immigrants, especially those with the surname Wong, living in Los Angeles and as far inland as Riverside, California. Wong Chet (also spelled Wong Chit), the store's manager in 1895, was formerly a merchant in Riverside, and he provided testimony verifying the identities of several Chinese migrants seeking to obtain return certificates to ensure that they could enter the United States after visiting China ([NARA-PR][INS][CEACF] Wong Chit interview, Wong Jong, File 41, 1895). One of these migrants was Wong Yee, a vegetable farmer in Riverside who kept his money at the Sam Sing store, which indicates that the butcher shop provided some banking services ([NARA-PR][INS][CEACF] Wong Yee interview, Wong Yee, File 213, 1897). Like most Chinese businesses, employees lived in the stores in which they were employed, and the 1900 census listed Sam Sing butchers Wong Nuen and Wong Done as residents at their place of employment (United States Census 1900). Two additional people on that census, Wong Tue and Wong Chew, were recorded as lodgers at the same address, an indication that the Sam Sing butcher shop also served as a boarding house. Indeed, farmer Wong Tue of Los Angeles testified to immigration officials that he lived at the Sam Sing store and paid \$1.25 a week for meals and a bed ([NARA-PR][INS][CEACF] Wong Tue interview, Wong Tue, File 859, 1900). These examples show how reliant Chinese migrants were on Chinese-owned stores for surviving in a society that was vehemently anti-Chinese.

Overall, the historical record has revealed that Chinese butcher shops provided not only a source of meat for Los Angeles Chinatown residents but also economic opportunities that helped them navigate a racially discriminatory environment. Butcher stores employed laborers who worked for the meat shop, and they allowed for multiple Chinese migrants to become partners in the business, which gave partners merchant status so that they were exempted from the Chinese Exclusion Act. In addition, some Chinese butcher shops such as Sam Sing provided room and board for a fee, financial services, and testimony from employees on behalf of friends and clansmen. Historical documents also indicate a close connection between Chinese-operated butcher shops and pig raising, given that there is evidence that some butchers had their own hog ranches where they kept a stock of pigs and had employees slaughter them.

Discussion

During the latter half of the nineteenth century, the completion of the Transcontinental Railroad and the rapid industrialization of the meat industry led to the development of refrigerated rail cars, which facilitated the expansion of meat products to distant locations. These developments opened new markets for Midwest livestock and maize producers in the American West. The large Midwest meatpacking company Cudahy also looked westward and established a meatpacking plant in Los Angeles at the end of the nineteenth century. Despite these changes, Chinese migrants in Los Angeles appear to have continued to engage in small-scale, local pig husbandry. Our analyses of pig dental calculus, archaeological data, and immigration files suggest the existence of a self-reliant network of pork supply and distribution among Los Angeles Chinatown residents. This network may serve as a microcosm of the larger Chinese pork economy among Chinese communities in the area.

The phytolith assemblage indicates that the pigs in Los Angeles Chinatown mainly relied on rice, with minor contributions from Triticeae and Paniceae plants that potentially included wheat, barley, and other locally available grasses. This result is in line with stable isotope data of pigs in northern California, which indicates that locally raised pigs primarily consumed C₃ foods (Kennedy and Guiry 2022). Among the main economic crops in North America, maize is classified as a C₄ plant, whereas rice, wheat, barley, alfalfa, and sweet potatoes belong to the C₃ category. In the temperate areas of the American West, C₄ plants are uncommon and floras are C₃ dominated (Olmstead and Rhode 2017). Consequently, pigs with a C₃-rich diet were most likely raised locally in California rather than from major livestock centers in the Midwest, where maize was the main source of feed.

The discovery of rice husk phytoliths from pig teeth strongly suggests that the pigs analyzed in this study were raised by Chinese migrant communities rather than sourced from other local ethnic groups. Late nineteenth-century newspaper reports reveal that American hog farmers in California predominately relied on barley and alfalfa for feeding, with occasional supplements such as skim milk and Indian corn (e.g., *Pacific Rural Press* 1875, 1887). Our phytolith data, however, indicate that the

Chinatown pigs were fed with predominantly rice, with a smaller proportion of other grasses, such as wheat and barley. This pig-rearing method aligns with historical accounts from early twentieth-century China. These accounts describe how farmers combined bran from rice and wheat husks, a by-product of crop milling, with table scraps and water to create a swill for pig feed (Shaw 1938). The practice of using rice bran as pig feed has been especially widespread in the rice-growing regions of southern China, the homeland of early Chinese diaspora communities, where rice farming flourished. Rice was first domesticated in the Yangtze River Valley and became a staple food around 5000 BP, and for thousands of years, rice by-products have been used as pig feed for small-scale pig-raising households and farms (Dong and Yuan 2020; Geng and Jie 2022; Wang et al. 2023). The Chinese term for rice bran, “米糠” (*maihong* in Cantonese), also frequently appears in historical literature related to pig husbandry practices (Geng and Jie 2022).

The presence of rice-leaf phytoliths also suggests the existence of a larger Chinese business network in California, possibly involving the local cultivation and transportation of rice plants. The scalloped bulliform phytoliths recovered from pig teeth are produced exclusively by rice leaves (Huan et al. 2015), indicating the presence of rice plants in the region. Historical newspaper reports from the early twentieth century indicate that Chinese individuals owned and operated several successful rice fields in the Sacramento Valley and nearby areas (e.g., *Sacramento Daily Union* 1914; *San Luis Obispo Tribune* 1912). By-products from these fields, such as rice leaves and husks, were likely sold to pig ranchers and Chinatown residents as animal feed. Although it remains unknown whether there were rice farms in the Los Angeles region, the presence of rice-leaf phytolith lends further support that the pigs were raised locally by Chinese migrants.

Additional archaeological data and information from immigration files suggest that the pigs in Los Angeles Chinatown likely came from two sources: Chinatown resident themselves and Chinese pig ranches in or near Chinatown. The architecture and use of space in Los Angeles Chinatown was conducive to animal husbandry, with available space at the rear of dwellings that could have been used to raise vegetables, pigs, and chickens (Greenwood 1996:141). This type of pig husbandry has historical roots in China, where pig pens were commonly attached to human toilets, and pigs were raised on kitchen scraps and human feces (Figure 7; Liu and Jones 2014; Nemeth 1998). Pigs could also feed on crop by-products in fields and gardens, such as leaves, vines, and husks, making small-scale intensive pig husbandry a residential form optimized for households (Itahashi 2022). It is possible that this



Figure 7. Han Dynasty ceramic model showing pig near a privy, probably fed with household food waste. (Photo courtesy of Jiajing Wang.) (Color online)

type of arrangement was present in Los Angeles Chinatown, where residents raised their own pigs for consumption or sale to butcher shops.

Besides raising pigs in their backyards, Chinese migrants might have been incentivized to operate their own pig ranches to sell some of their livestock to Cudahy, a large Midwestern meatpacking company that opened a plant in Los Angeles in 1893 on 803 E. Macy Street, less than a mile from Chinatown. Newspaper advertisements reveal that Cudahy requested that local pig farmers from Los Angeles and Orange Counties sell their pigs to the meatpacking plant; the plant sought to slaughter 500 pigs each day, but they complained that only 200–300 were being brought to them daily (Spitzzeri 2020). Cudahy did not likely compete directly with local Chinese butcher shops who were selling fresh pork meat to consumers, whereas the meatpacking plant was focused on making lard and cured pork products such as ham, bacon, sausages, and tang, a product similar to Spam. Reports in regional newspapers have also mentioned the presence of “Chinese hog ranchers” in the city of Los Angeles, indicating that pigs raised in these ranches may have supplied residents beyond the Chinatown area (e.g., *Los Angeles Herald* 1888).

The discovery of parasite eggs in three pigs suggests that these pigs had ingested feces or soils containing *Ascaris* eggs, which could eventually lead to the development of parasitic worms within a pig’s parental tissues (Dold and Holland 2011). *Ascaris* is among the most prevalent human and pig parasites across various historical times (Miller et al. 2015), and early twentieth-century California newspapers frequently disseminated information on preventative measures and remedies for assisting farmers in the maintenance of their pigs’ health (e.g., *Pacific Rural Press* 1910, 1920). Given the presence of unfertilized eggs (e.g., Figure 3h), the exact status of infection in the pigs in our study remains uncertain, but it is noteworthy that *Ascaris* infection was a common issue in twentieth-century California, causing considerable economic loss annually, regardless of hog owners’ ethnic backgrounds (*Campbell Press* 1930; *Corsair* 1933).

Chinese entrepreneurship in the pork business faced significant challenges due to anti-Chinese sentiment, despite the long-standing practice of Chinese pig husbandry and culinary preferences. Beginning in the 1880s, unionized white butchers orchestrated multiple public events aimed at “taking the pork trade out of the hands of Chinese” (*Daily Alta California* 1886). They boycotted anyone who patronized Chinese dealers, discharged Chinese butchers from pork packing firms, and spread unvalidated claims that Chinese-raised pork was of the poorest quality (*Daily Alta California* 1887a, 1887b). For example, white butchers openly promoted the notion that “Chinese-grade meat” was inferior to the American-style “corn-fed pork,” although such claims largely lacked concrete evidence (*Sacramento Daily Union* 1894). These anti-Chinese pork movements presented significant obstacles for Chinese migrants seeking access to the pork business, leading to a decline in the Chinese pork industry in some parts of California (*San Francisco Call* 1890). At the same time, some Anglo butchers may have refused to sell meat to Chinese customers due to widespread anti-Chinese racism and prejudice that pervaded the region (Sunseri 2020b).

Despite these challenges, our study of Los Angeles Chinatown provides an example of Chinese migrants’ adaptability in establishing a self-reliant network of food acquisition and consumption. This network brought together Chinatown residents, pork butchers, ranchers, rice growers, and business dealers, providing Chinese migrants with the means to secure their own sources of fresh pork while also offering employment, housing, banking, and immigration assistance to their fellow community members. Moreover, this network may have helped Chinese migrants avoid confrontations with anti-Chinese vendors. By overcoming the obstacles presented by anti-Chinese sentiment through this network, Chinese migrants in Los Angeles exhibited their resilience and capacity to survive and thrive even in the face of racism.

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Notes

1. Ubiquity is calculated as a percentage of the number of contexts in which a taxon occurs, divided by the total number of contexts. For example, if rice double-peak phytolith is present in six out of 10 samples, then its ubiquity is 60%.
2. “Chinamen” was a derogatory term used by Whites to describe Chinese men in America, and there was no equivalent in the Chinese language.

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