

# Hawai'i Journal of Medicine & Public Health

A Journal of Asia Pacific Medicine & Public Health

January 2012, Volume 71, No. 1, ISSN 2165-8218

## **PUBLIC HEALTH HOTLINE**

**The Hawai'i Journal of Medicine & Public Health: Informing Population-based and Individual Health Care Systems**

Loretta J. Fuddy ACSW, MPH

4

## **PUBLIC HEALTH HOTLINE**

**Towards an Integrated Health Sciences Approach: The Hawai'i Journal of Medicine & Public Health**

Jay Maddock PhD

5

## **INCIDENCE OF DOG BITE INJURIES IN AMERICAN SAMOA AND THEIR IMPACT ON SOCIETY**

Don Vargo PhD; John M. DePasquale MD, MPH, DTM&H; and Agnes M. Vargo MS

6

## **AUTOIMMUNE PANCREATITIS IN AN ASIAN-DOMINANT AMERICAN POPULATION**

Chuong T. Tran BA; Owen T.M. Chan MD, PhD; Livingston M.F. Wong MD, FACS; and Linda L. Wong MD

13

## **SHORT SAME-SEGMENT FIXATION OF THORACOLUMBAR BURST FRACTURES**

Jonathan-James T. Eno BSc; James L. Chen MD; and Morris M. Mitsunaga MD

19

## **BETEL NUT CHEWING IN HAWAI'I: IS IT BECOMING A PUBLIC HEALTH PROBLEM? HISTORICAL AND SOCIO-CULTURAL CONSIDERATIONS**

Ann M. Pobutsky PhD and Enrico I. Neri PhD

23

## **MEDICAL SCHOOL HOTLINE**

**Investigating the Joys and Challenges of Rural Medicine: A Student Perspective**

Benjamin D. Greidanus MA, MSII

27

## **UH CANCER CENTER HOTLINE**

**Student Internships at the University of Hawai'i Cancer Center**

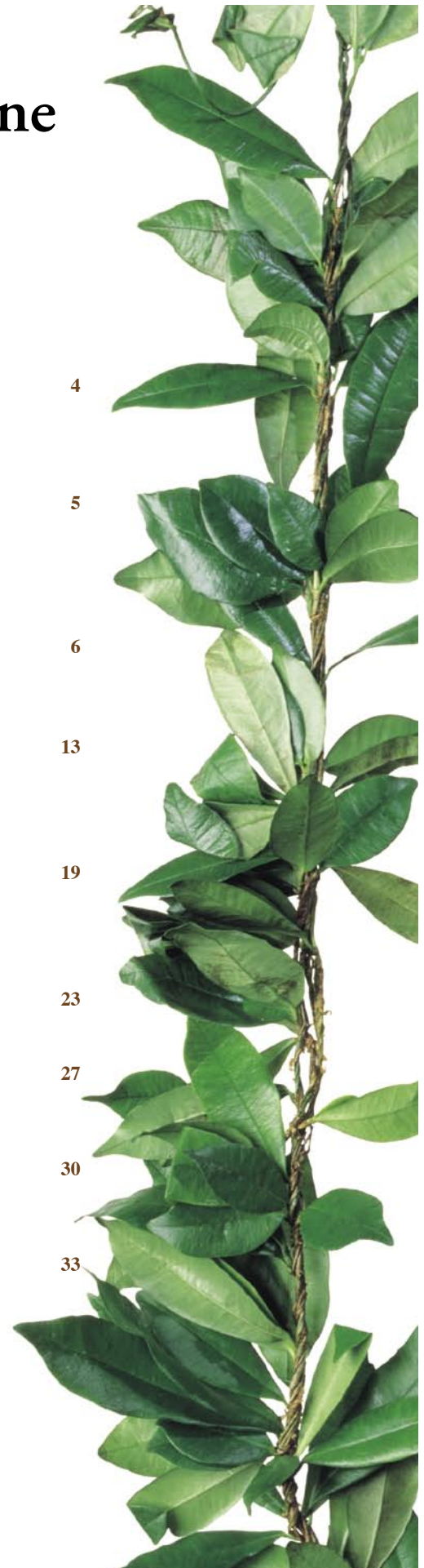
Karin Koga MPH and Gertraud Maskarinec MD, PhD

30

## **THE WEATHERVANE**

Russell T. Stodd MD

33



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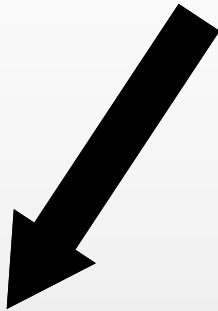
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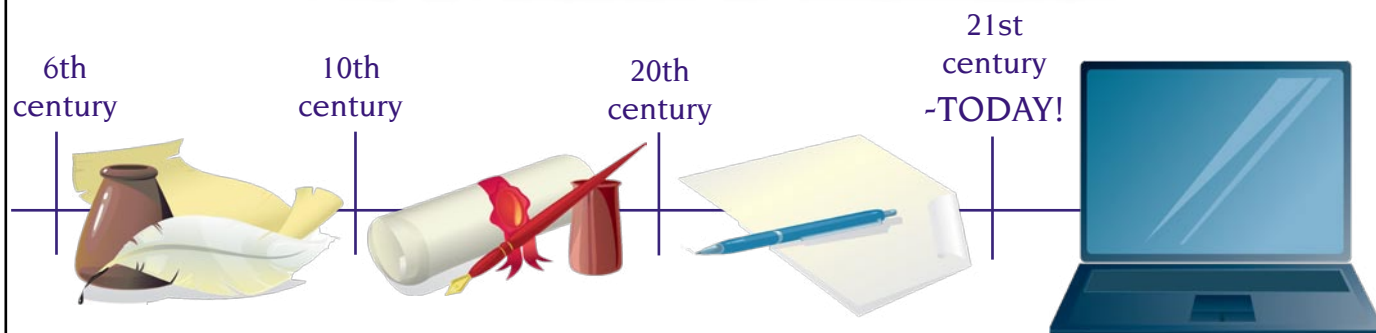


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# Hawai'i Journal of Medicine & Public Health

A Journal of Asia Pacific Medicine & Public Health

ISSN 2165-8218 (Print), ISSN 2165-8242 (Online)

The Journal's aim is to provide new scientific information in a scholarly manner, with a focus on the unique, multicultural, and environmental aspects of the Hawaiian Islands and Pacific Rim region.

Published by University Clinical,  
Education & Research Associates (UCERA)

Hawai'i Journal of Medicine & Public Health  
677 Ala Moana Blvd., Suite 1016B  
Honolulu, Hawai'i 96813  
<http://www.hjmph.org>  
Email: [info@hjmph.org](mailto:info@hjmph.org)

The Hawai'i Journal of Medicine & Public Health was formerly two separate journals: The Hawai'i Medical Journal and the Hawai'i Journal of Public Health. The Hawai'i Medical Journal was founded in 1941 by the Hawai'i Medical Association (HMA), incorporated in 1856 under the Hawaiian monarchy. In 2009 the journal was transferred by HMA to University Clinical, Education & Research Associates (UCERA). The Hawai'i Journal of Public Health was a collaborative effort between the Hawai'i State Department of Health and the Office of Public Health Studies at the John A. Burns School of Medicine established in 2008.

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# PUBLIC HEALTH HOTLINE

JAY MADDOCK PHD AND DONALD HAYES MD, MPH, ASSOCIATE EDITORS  
TONYA LOWERY ST. JOHN MPH AND RANJANI RAJAN MPH, MANUSCRIPT EDITORS

## The Hawai'i Journal of Medicine & Public Health: Informing Population-based and Individual Health Care Systems

**Loretta J. Fuddy ACSW, MPH; Director, Hawai'i Department of Health, State of Hawai'i**

This is the inaugural edition of the *Hawai'i Journal of Medicine and Public Health*. In December, the editorial boards of the *Hawai'i Medical Journal* and *Hawai'i Journal of Public Health* made the wise decision to merge to better manage our resources and foster improved collaboration between the medical and public health communities. Historically, physicians have been encouraged to view the illness of their patients within an environmental, social, and behavioral context.<sup>1</sup> During the 19th and 20th centuries, there were strong collaborative efforts between the fields of public health and medicine to address infectious disease associated with urbanization and industrialization. Public health practitioners worked at the community level to prevent the spread of disease before the development of various immunizations and medical interventions. Physicians, in addition to providing individual care, were also advocates for public health sanitation policies.<sup>2</sup>

Although the landscape of health care has changed dramatically, today there may be an even greater need for our medical and public health communities to forge partnerships to improve health outcomes. We are experiencing unprecedented changes to our health care system and our respective roles are being redefined. Both systems are challenged with ever increasing fiscal constraints and demands to document quality and efficacy. Chronic disease, injury, substance abuse, and behavioral disorders are today's epidemics. Developing strategies to address these areas are perhaps more challenging than other epidemics because of the complex interactions between biological and genetic factors, social marketing, cultural practices, community built environment, and changes in the nature and style of work.<sup>3</sup>

Improving individual and community health is truly complex because of the economic and societal influences on health outcomes.<sup>4</sup> It requires a concerted partnership among all segments of the state, and especially needs a collaborative effort between the medical and public health sectors. Both sectors require data, research, and evaluation on a range of interventions to inform our practice. I encourage everyone to consider submitting articles to *Hawai'i Journal of Medicine & Public Health*. The uniqueness of Hawai'i is one reason to publish practice-related articles; another is the opportunity to influence health care nationally and globally.

The Department of Health has a dual focus of assuring health care for our most vulnerable populations, and preventing morbidity and extending years of productive life statewide, with an emphasis on reducing health disparities. With our broad focus on environmental health, behavioral health, preparedness, chronic and infectious disease prevention, injury prevention, and health care for all ages we have much to contribute to inform practice. I invite my public health colleagues to share their knowledge, experience and research with the *Hawai'i Journal of Medicine & Public Health*.

The success of this journal is dependent upon your contributions and that of your colleagues. I look forward to reading relevant, interesting and quality articles that will help to improve our health care system and the health of our state.

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# PUBLIC HEALTH HOTLINE

JAY MADDOCK PHD AND DONALD HAYES MD, MPH, ASSOCIATE EDITORS  
TONYA LOWERY ST. JOHN MPH AND RANJANI RAJAN MPH, MANUSCRIPT EDITORS

## **Towards an Integrated Health Sciences Approach: The Hawai'i Journal of Medicine & Public Health**

**Jay Maddock PhD; Professor and Director, Office of Public Health Studies,  
John A. Burns School of Medicine, University of Hawai'i at Manoa**

This issue commemorates the merger of the *Hawai'i Medical Journal* and the *Hawai'i Journal of Public Health*. With this merger, the new journal will be better able to cover the complete spectrum of health from community-based prevention through treatment and end of life care. This merger presents a growing trend in health sciences towards integration and cross-disciplinary approaches. Over the course of the 20th century, US life expectancy increased by over 25 years due in large part to advances in vaccines, sanitation and injury prevention.<sup>1</sup> However, large disparities by socioeconomic status and race still exist and some experts predict that life expectancy may decrease over the next 20 years due to the increase in obesity.<sup>2</sup> Meanwhile, health care costs are increasing rapidly, tripling between 1990 and 2008 to over \$2.3 trillion annually.<sup>3</sup> Health care spending now accounts for more than 16% of the US Gross National Product.<sup>3</sup> Clearly changes are needed to ensure the health gains made in the 20th century are realized and improved upon in this one.

The health of populations can be thought of as a complex system.<sup>4</sup> This system is currently fragmented, disconnected and inefficient. An individual's health is comprised of many factors including their genetic make-up, individual psychological and behavioral choices, family and peer influence, living situation, institutional quality and accessibility, community design and policy environment.<sup>5</sup> Yet in education and professional settings, we have become more and more specialized. We need to develop broad thinkers, who are trained across disciplinary lines to examine the larger health system. To truly improve overall health, we need an intersection of medical and clinical skills along with contributions from psychology, sociology, anthropology, political sciences, urban planning, architecture, law and several other fields. Recently, a global independent commission has called for a restructuring of health professional education which crosses medicine, nursing, and public health

and focuses on transformative learning.<sup>6</sup> At the University of Hawai'i, we are in the early stages of exploring an integrated health sciences plan that would focus on integrated education in medicine, nursing, social work, and public health. JABSOM is also launching the combined MD-MPH degree program for the 2012 incoming class. These steps along with this journal merger will help us to better train and equip the current and future workforce to address the emerging health needs of the Hawaiian Islands.

Hawai'i and the Pacific face unique public health challenges. While researchers often face pressures to publish in national or international journals, I would like to encourage everyone to consider publishing their local data here in the *Hawai'i Journal of Medicine & Public Health*. This is our journal and its quality depends on us. Let's make this the premier place for topics in medicine and public health facing Hawai'i and the Pacific. The journal is fully indexed on Medline and available free of charge on-line to anyone to the world. This will help your paper affect the health of our local population as well as being freely available to researchers everywhere. I look forward to reading your work in the upcoming issues of the *Hawai'i Journal of Medicine & Public Health*.

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# Incidence of Dog Bite Injuries in American Samoa and Their Impact on Society

Don Vargo PhD; John M. DePasquale MD, MPH, DTM&H; and Agnes M. Vargo MS

## Abstract

**Introduction:** In American Samoa, a US Territory in the South Pacific, over half of reported injuries are attributed to dog bites. Despite years of public outcry, little has been done to adequately address these preventable injuries that affect all age groups of both sexes.

**Objective:** To describe a serious public health hazard in American Samoa that may plague other jurisdictions that tolerate a significant free-roaming dog population.

**Methods:** A limited data set of outpatient records from 2004 through 2010 from the Territory's only emergency department listing an ICD-9-CM E-code of E906.0 ("dog bite") in the primary E-code field provided a record of dog bite injuries. A survey of 437 adolescents documented their experiences regarding unprovoked dog attacks during the 2010/2011 school year.

**Results:** The sex/age group with the highest incidence for dog bite treatment was males 55 to 59 years of age (73.1 per 10,000 population per year) followed closely by males 10 to 14 years of age (71.8 per 10,000 population per year). Males aged 5 to 14 years accounted for 23% of all emergency department visits for dog bites. About one-third of adolescents reported having been bitten by a dog between September 2010 and May 2011. About 10% of males and 16% of females attributed the fear of being bitten as a factor preventing them from getting more physical activity.

**Conclusions:** Children, adolescents, and the elderly are the most vulnerable to dog bite injuries. Emergency room records may reflect only about a quarter of all such injuries.

**Implications:** Unprovoked attacks by aggressive, free-roaming dogs degrade quality of life by placing an untenable burden on the health care system and imposing physical and psychological barriers toward a more healthful lifestyle that includes walking, jogging, and bicycling.

## Keywords

American Samoa, dog bite, obesity, physical activity

## Introduction

American Samoa is a US-affiliated Territory in the South Pacific with a 2010 population estimated at 79,644.<sup>1</sup> Each year since 1998 over half of reportable injuries were attributed to dog bites.<sup>1,2</sup> This statistic most likely goes back much earlier. In a 1983 decision against the Government of American Samoa for failing to enforce its dog license law, the High Court Chief Justice described the Territory's dog population as "...scrawny, emaciated, mangy, in-bred, flea-bitten, diseased. Sophisticated world travelers usually refer to the dogs of Mexico and China as the worst looking dogs in the world. Compared to the dogs of American Samoa, the dogs of Mexico and China could qualify as best of their class at Madison Square Garden."<sup>3</sup> Furthermore, the number of reported dog bites may represent only a small proportion of all dog bites; published estimates of this proportion in the United States range from 10% to 50%.<sup>4</sup>

Although American Samoa is rabies-free, its free-roaming dogs impact human health in several ways. Their incessant barking and occasional fighting throughout the night interfere with restorative sleep. Infected dogs spread hookworm and roundworm in their feces and leptospirochetes in their urine. Worm

larvae can penetrate the skin of barefooted children who may also inadvertently ingest worm eggs or larvae in dirt. Hungry dogs tip over garbage cans in their search for food, scattering trash which attracts rats—another vector of leptospirochetes—and littering the environment. In addition to inflicting pain, dog bites lead to a risk of infection and sometimes result in a permanently disfiguring wound. Perhaps most traumatizing of all is the risk of psychological scarring. The victim may develop a heightened fear while walking or may be deterred from walking at all. This is particularly disconcerting given the high prevalence of overweight and obesity and corresponding high incidences of obesity-related non-communicable diseases.<sup>5-9</sup> Consequently, intervention strategies that call for increased outdoor physical activities such as walking, jogging, or bicycling may be challenging to implement.

Yet little official action against the large population of roaming dogs was taken until 2005 with the creation of a Task Force on Stray Animal Prevention and Remediation.<sup>10</sup> Members of seven government departments, working with other departments and community organizations, were tasked with decreasing the stray dog population, dog-bite injuries, and spread of diseases—such as leptospirosis<sup>11</sup> and intestinal worms—from dogs to humans. Moreover, they were to increase public awareness in regard to the responsible management and care of pets. But these objectives proved to be intractable. The Task Force leader responded to complaints of roaming stray and sick dogs, raised by businesses and organizers of a Pacific Arts Festival, in the 7 June 2008 issue of *Samoa News*, a local newspaper. He retorted that without the cooperation of village mayors to help identify strays from owned dogs, efforts to carry out the mandate were being met with resistance and even threats by residents. Although owners are required to provide their dog with a license—a \$5 fee—few do. As a consequence, it is difficult to distinguish owned dogs from strays. An observational canine population study conducted at that time by the American Samoa Humane Society estimated the probable dog population on Tutuila Island at 2,025.<sup>12</sup> Nearly nine of ten were freely roaming owned dogs and only about 9% strays.<sup>12</sup> Of the owned dogs, only 3% were licensed.<sup>12</sup>

The local Department of Agriculture spays and neuters dogs each Wednesday for \$25. On a typical day about eight to 10 females and four or five males are serviced and a half-dozen sick, aged dogs are euthanized at its veterinarian clinic (Leoleoga Leituala, telephone conversation with DV, 20 June 2011). Since 2005 clinic staff euthanized 1,925 dogs brought in by the owner, captured by the stray dog Task Force, brought in by the police because of their vicious behavior, or collected by staff (Leoleoga Leituala, telephone conversation with DV, 20 June 2011).

In February 2010, following a magnitude 8.1 earthquake and tsunami on 29 September 2009 that claimed 34 lives in American Samoa and another 149 in the independent nation of Samoa, a team of visiting veterinarians sterilized 432 cats and dogs on American Samoa and 584 on Samoa.<sup>13</sup> They reported that stray dogs on both islands were generally not socialized to humans and had formed packs. Most were dehydrated and malnourished, many of them limping or with open wounds from fights. About 70% had severe sores caused by debilitating transmissible venereal tumors.<sup>13</sup>

A feature article in the 16 October 2010 *Samoa News* addressed the rising population of roaming canines. Residents in the port village of Fagatogo were especially concerned about the image the Territory was presenting to the thousands of cruise ship passengers who visit annually. Pedestrians had to step over or walk around sickly, mangy, disease-ridden dogs that sat in front of stores and along the road, most of which were actually “owned” dogs. The story was followed by a spate of articles attesting to people’s fear of dogs and its deterrence to walking, jogging, and bicycling. One youngster mentioned his need to carry a stick in order to go to the bus stop. But perhaps the most aggrieved of all are meter readers for the local power and water utility. They often fall behind on their reading routes because they have to spend time combating dogs (Ryan Tuato’o, personal communication to DV, 20 November 2010).

Between January 2010 and February 2011, the American Samoa Community College conducted eight focus groups with Samoan adults in order to identify culturally acceptable supports for healthy living in the Territory.<sup>14</sup> Among the many suggestions by the 74 participants was the need for local government to enforce a vicious dog law enacted in 1988.<sup>15</sup> To that end, in May 2011 the first known case of a local resident to be prosecuted under the vicious animal law was sentenced to two years probation for an unprovoked attack on an 8-year-old boy in October 2007. At the time, the defendant owned 23 dogs.<sup>16</sup>

## Methods

We obtained de-identified data from the Lyndon Baines Johnson Tropical Medical Center (LBJTMC) Vista Computerized Patient Record System of emergency room (ER) visits recorded between 7 January 2004 and 29 December 2010 having an *International Classification of Disease, Ninth Revision, Clinical Modification (ICD-9-CM)* E-code of E906.0 (“dog bite”) in the primary E-code field. The limited data set comprised only the sex, age, village, and date of service of 1,873 patients, meeting specifications stipulated in Title 45 of the Code of Federal Regulations, Section 164.514(e).<sup>17</sup> Coding was performed by uncertified Billing Department staff based on the diagnosis registered on an encounter form by the ER physician. We estimated incidences (that is, the number of ER visits per 10,000 population by sex and age group per year) using population projections for the year 2005.<sup>1</sup>

To understand what impact the fear of dogs may have on adolescents, we surveyed 220 males and 217 females aged 13 to 18 years between 23 May and 1 June 2011. This sample

represented a population estimated at 6,000 adolescents in this age group,<sup>1</sup> allowing for a 5% margin of error at the 95% confidence level. All were students from four widely dispersed public elementary schools and three public high schools on the Territory’s main island of Tutuila. The survey was designed to measure knowledge, attitudes, and practices regarding nutrition and exercise. It was conducted under the auspices of the American Samoa Department of Education for an Institutional Review Board-approved collaboration between the American Samoa Community College and Brown University, Providence, RI. Among 35 questions were four regarding dogs (Table 1). Space was allotted to allow students to explain their responses.

Data from LBJTMC and the public schools were entered into and queried using Microsoft Access 97 database software. Chi-square tests were performed using SigmaStat 3.1. The curve smoothing algorithm, *lowess*, was from SigmaPlot 9.0. Both SigmaStat and SigmaPlot are from Systat Software, Inc.

## Results

### Emergency Room Visits

From 2004 through 2010, 1,873 visits to the ER were directly attributable to dog bites. Males accounted for 1,106, or 59%, of those visits. The number of visits varied significantly from month-to-month and year-to-year with no clear season when dog bite-related ER visits either peaked or plunged (Figure 1). But significantly less visits occurred on Sundays (138 visits) and significantly more on Mondays (310 visits) than during the rest of the week, which ranged from 224 to 248 visits ( $P < 0.001$ ).

Males 5 to 14 years of age were most likely to be bitten, accounting for 23% of all visits for both sexes (Figure 2). Girls between the ages of 5 and 19 accounted for 46% of dog bite-related visits for females. But the highest incidence rate, 73.1 per 10,000 persons per year, was for males aged 55 to 59 followed closely at 71.8 per 10,000 males aged 10 to 14 (Figure 3). Average incidence rates per 10,000 were 44.7 for males, 33.5 for females, and 40.1 overall. Except for females below 5 years of age, incidence rates for all age groups of both genders exceeded the average incidence rate of 12.9 reported in the United States.<sup>18</sup>

### Adolescent Survey

Of the 220 males who were asked what prevented them from getting more exercise, 23 (10.4%) responded that it was their fear of being bitten by a dog. For females, 36 (16.6%) selected this response. Only “lack of time” (195 responses) and “lack of energy” (109 responses) elicited a greater number of responses than did the fear of being bitten (Table 1). During the eight-month period on which the students were asked to report, 75 (34.1%) males and 68 (31.3%) females reported being bitten by a dog. One male reported being bitten three times. Family-owned dogs accounted for 40% of all bites while other-owned dogs and strays accounted for 34% and 26%, respectively. Several students wrote that the family dog belonged to a relative who lived in a different village, and that they were bitten while visiting. In most instances, nothing was done about the dog. But 11

**Table 1. Dog bite-related questions on survey of American Samoan adolescents**

1. Do any of the following keep you from exercising more than you currently do?

- The cost of the activity
- Lack of time
- Lack of energy
- Lack of Transportation
- Fear of being bitten by a dog
- Fear of being teased or bullied
- Other: \_\_\_\_\_

2. Since school began last September, have you been bitten by a dog?

- No
- Yes-by my family's dog
- Yes-by a dog whose owner I know
- Yes-by a dog whose owner I do not know or that may be a stray dog.

3. If you answered YES to the above question...

- I did not seek medical attention
- I or a family member treated the wound
- A traditional healer treated the wound
- A doctor treated the wound

If you answered YES to [Question 2], what happened to the dog(s)?

- Nothing
- The owner confined the dog
- The owner destroyed the dog
- The police took the dog away
- Not sure/don't know

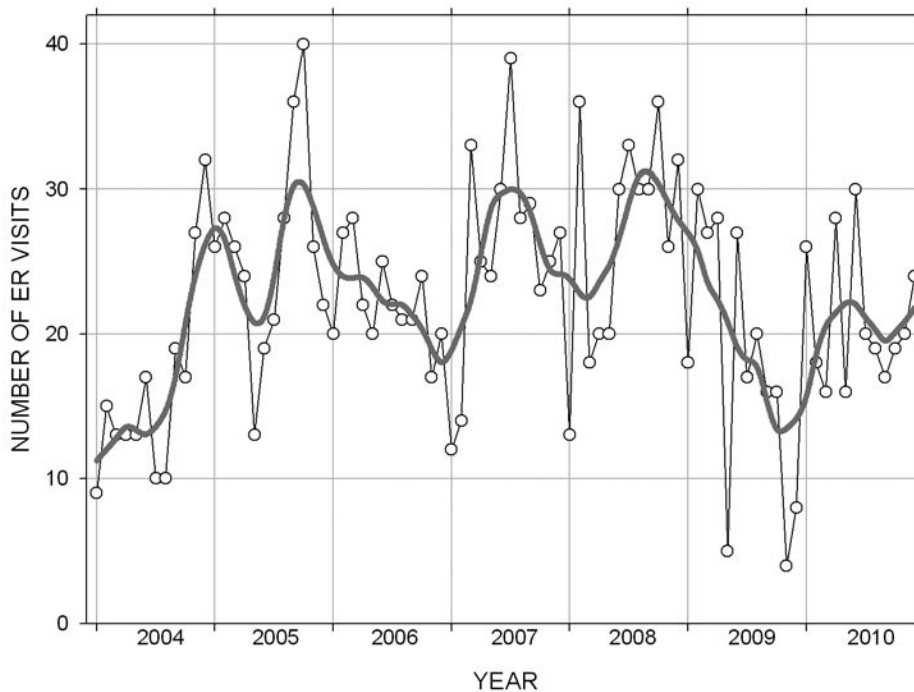


Figure 1. Distribution of 1,873 ER visits to the LBJ Tropical Medical Center for dog bite injuries from 2004 through 2010 by year and month. The continuous curve is the result of smoothing the data using the *lowess* algorithm.

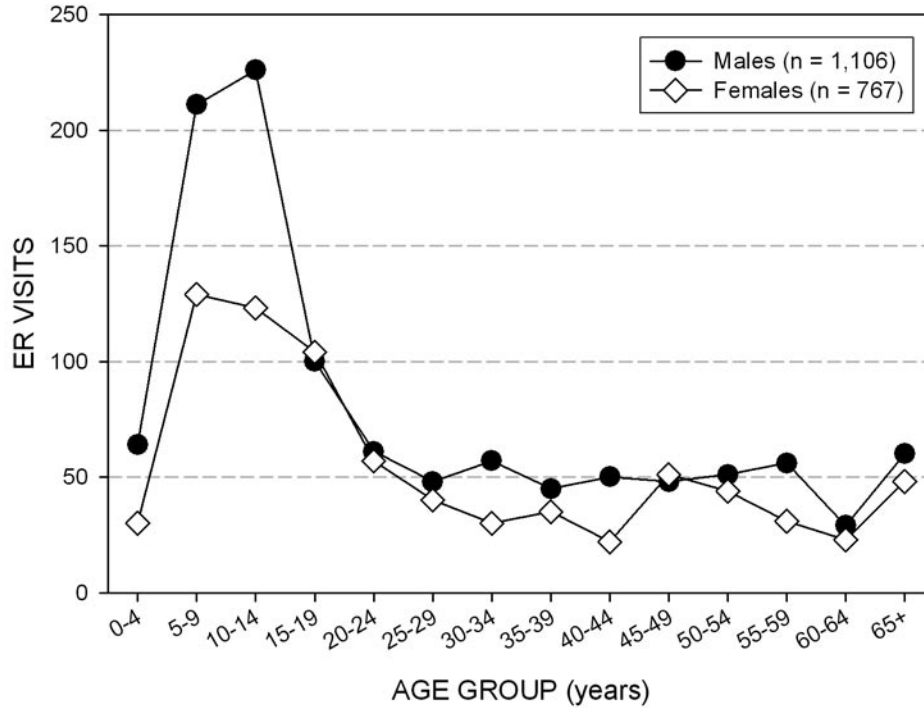


Figure 2. Distribution of 1,873 ER visits to the LBJ Tropical Medical Center for dog bite injuries from 2004 through 2010 by sex and age group.

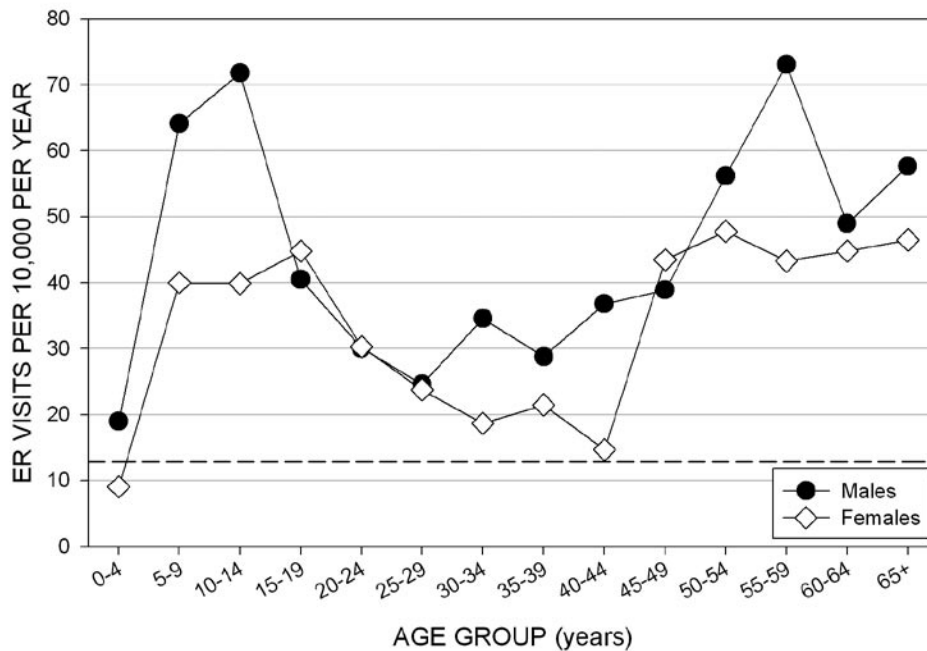


Figure 3. Incidences of dog bite-related injuries treated at the LBJ Tropical Medical Center ER based on 1,873 visits from 2004 through 2010, by sex and age group. Incidence is the average yearly number of ER visits per 10,000 individuals in each age group for each sex based on population estimates for 2005. The dashed line at 12.9 ER visits per 10,000 is the average incidence of annual dog bite-related injury visits to emergency departments in the United States from 1992 to 1994.<sup>18</sup>

students (8%) reported that the family-owned dog was either destroyed by the owner or taken away by the police. This same pattern was reported for dogs owned by others in the village and for strays, that is, generally nothing was done about the dog. Survey responses did not differ significantly by sex.

Only 25% of the students reported being treated by a doctor. This is in accord with an estimated 20% of dog bite victims in the United States that sought medical attention.<sup>19</sup> Fully 30% of the bites were not treated at all, while 37% were treated by a family member (usually the mother) and 8% by a traditional herbal healer.

The 37 students who commented on their experiences generally related the circumstances surrounding the bites or they expressed their outrage toward the dog or its owner. Typical comments were:

“I was walking on the road and the dog bit me.”  
(Male, age 15)

“I was just walking and suddenly the dog bit me.”  
(Female, age 14)

“I stoned the stupid dog.”  
(Male, age 15)

“I want to kill that dog.”  
(Female, age 18)

“They never did anything about their dog and it is not right.”  
(Female, age 14)

“The owner of the dog just sat there doing nothing.”  
(Female, age 17)

“The cop said they were going to put it down, but I still see it around.”  
(Male, age 14)

## Discussion

The disparity in the number of dog-bite-related visits to the ER between Sundays and Mondays, compared with the rest of the week, may be owing to the absence of public transportation on Sundays rather than to the actual number of injuries occurring on either day. Alternatively, in the Samoan culture, Sundays are devoted to church followed by a large family meal, or *toanai'i*, with sports and other noisy activity frowned upon. Therefore, the decreased number of ER visits on Sundays might also be owing to decreased contact with dogs. But this would not explain the increased number of ER visits on Mondays. Because the increased number of ER visits on Mondays is about equal to the decreased number of ER visits on Sundays, a significant proportion of dog bite victims bitten on Sunday appear to delay visiting the ER until Monday. Most residents cannot afford to own cars. Although taxi service is available at all times, it is much more expensive than privately owned buses that operate Monday through Saturday and serve as the chief means of public transportation.

The number of actual dog bite injuries may be four or five times greater, or more, than the number recorded by the hospital ER, since not all victims seek medical attention. Furthermore, patients who visit the ER for a dog-bite-related infection rather than for the dog bite per se may have the visit listed under a different *ICD-9-CM* E-code. In any case, the incidence of dog-bite injuries for nearly all age groups of both sexes far exceed the average annual incidence of 12.9 visits per 10,000 reported in the United States.<sup>18</sup>

Although dog bite injuries are the most frequent of reportable injuries in American Samoa and are largely preventable, efforts to address this perennial problem have had little impact. Unlike in the United States, where dog owners are usually covered by homeowners or renters insurance policies, most dog owners in American Samoa have no coverage for dog bite claims. Consequently, victims are rarely compensated for their injuries because dog owners are rarely held accountable for their pets. Besides pain and suffering directly attributable to the bite, victims may suffer life-altering emotional trauma that goes undiagnosed and untreated.

Medical attention is provided “free of cost” by the American Samoa Government to all citizens,<sup>20</sup> with only a \$10 user fee for each visit and each prescription filled. Funds for medical care are primarily from the US Medicaid program together with one-to-one matching funds from the American Samoa Government. For fiscal year 2011, federal Medicaid spending was capped at \$11.5 million (Michael Gerstenberger, e-mail to DV, 22 July 2011). Yet the current economic recession makes it difficult for the American Samoa Government to meet its mandated contribution.<sup>21</sup> Like other US-affiliated insular areas, the Territory has no individual eligibility process for Medicaid, so these funds are used to supplement the costs of services for all users, not just the genuinely poor or low income.<sup>22</sup> Furthermore, the State Children’s Health Insurance Program (CHIP) allows children who have medical diagnoses to be treated as individuals regardless of parental income. American Samoa received only 1.2%, or \$630,000, of available CHIP allotments to US insular areas in 2008.<sup>22</sup> Consequently, U.S. and local taxpayers absorb the costs for treating dog-bite victims. American Samoa reports only aggregate spending for health care because its program is not designed to track spending by service.<sup>22</sup> Therefore, the cost for treating victims of dog bite cannot be accurately determined. The public, uninformed of the financial impact of dog bite injuries, are thereby unaware of the extent this highly preventable injury diminishes the limited pool of health care resources for all.

Free medical service might, ostensibly, account for a proportionately greater number of people visiting the ER for dog bite treatment compared with the United States. But user fees and long waiting times to see a physician deter visits to the ER for trivial ailments, especially for over 61% of the population who live below the Federal Poverty Level<sup>23</sup> and rely upon dawn-to-dusk only public transportation.

But the negative impact of dog bites goes beyond physical injury and psychological distress. A 2007 report of non-com-



municable disease risk factors found that 93.5% of the American Samoan adult population aged 25 to 64 was overweight or obese, and 74.6% were obese.<sup>5</sup> Moreover, 47.3% were diabetic—one of the highest rates in the world. Childhood obesity rates are equally alarming. In the early 1980s, 4% of boys and 8% of girls were obese.<sup>6</sup> By 2005, the obesity rate for both sexes was about 33% with an additional 29% overweight.<sup>6</sup> Because obesity is the driving force behind several non-communicable diseases that require extremely expensive long-term treatment, the health and financial wellbeing of individuals, families, and government will require that the obesity epidemic be brought under control.

Making communities safer for pedestrians, joggers, and bicyclists will not, of itself, reduce obesity. Opportunities for increased physical activity must coincide with prudent dietary habits by individuals who choose to follow a healthful lifestyle. Given that most students in our survey listed ‘lack of time’ and ‘lack of energy’ as the overriding reasons for not engaging in more physical activity, intervention must also focus on motivational strategies. Yet physical activity is an indispensable part of the solution. The current recommended minimum level of physical activity for adults 18 to 64 years old is 150 minutes a week of moderate-intensity aerobic physical activity.<sup>24</sup> Children and adolescents six to 17 years old should do 60 minutes or more of moderate- to vigorous-intensity aerobic physical activity daily.<sup>24</sup> The simplest, quickest, and least expensive way to meet these guidelines is through brisk walking. Proven intervention strategies such as *Safe Routes to School* and *Walkable Communities* stand little chance of succeeding while aggressive dogs—owned or otherwise—are free to prowl. In an environment where aggressive dogs are the norm, residents may have become inured to the situation. In contrast, visitors to the Territory become acutely aware of the problem within a day or two. The problem might be summarized in the words of Thomas Paine who, in referring to another objectionable situation, stated: “A long habit of not thinking a thing wrong gives it a superficial appearance of being right.” We believe that dog-owners who are indifferent to the harm their animals inflict on people using the public right-of-way must be made to feel the full brunt of the law.<sup>15</sup> Likewise, well-meaning individuals who feed and shelter abandoned dogs must also accept responsibility for neutering males that display dominance aggression, spaying females, and confining or euthanizing any dog involved in an unprovoked attack.

In his 1983 decision against the American Samoa Government cited at the beginning of this paper, the Chief Justice referred to the dog situation as a “disgrace” that was not always so. He noted that “During the Naval Administration [before July 1951] a dog license law was strictly enforced and any dog without a collar was quickly disposed of by the Fita Fita guard.”<sup>3</sup> Dog bite prevention is an intangible quality of life issue that ultimately must be confronted by the community at large. An existing guide<sup>25</sup> for achieving this goal might be modified to accommodate cultural sensitivities and economic constraints. Unless and until society is made fully aware of the costs associated

with the problem—in terms of physical and mental health as well as in dollars—there will be little incentive for action.

## Conclusions

The United States considers an annual incidence of 12.9 dog bite treatments per 10,000 individuals to be a major public health problem. During the seven year period from 2004 through 2010 the average annual incidence in American Samoa, 40.1 per 10,000 individuals, was over three times the US incidence, which underscores the necessity to address this issue. One-third of adolescents reported being bitten by a dog during the eight-month period of the last school year. Of these, 10.4% of males and 16.6% of females cite a fear of dogs as the reason for not getting more physical activity. Unprovoked dog attacks can cause physical and emotional injury and may deter residents from engaging in outdoor exercise. Changing the social norm will require a broad based approach involving communities and government working together.

## Conflict of Interest

None of the authors report any conflict of interest.

## Acknowledgements

We thank staff of the LBJTMC MIS office for providing outpatient records of dog bite-treated injuries; American Samoa Department of Education for allowing us into their classrooms, and especially students who shared their experiences and opinions with us; Sharon Fanolua and Marie Chan Kau for their excellent technical assistance; Cheryl Morales Polataivao, Ashley M. Stokes, and two anonymous reviewers for critiquing the manuscript; and Eileen Herring for locating references unavailable to us. Financial support was provided by a US Department of Agriculture National Research Initiative grant, CRIS Accession No. 216929, administered by the American Samoa Community College.

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# Autoimmune Pancreatitis in an Asian-dominant American Population

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## Abstract

*Autoimmune pancreatitis is a rare type of chronic pancreatitis that occurs predominantly in males and was first described in the Asian population. The following study seeks to characterize autoimmune pancreatitis in Hawaii's Asian-dominant population through a retrospective review of 65 pancreaticoduodenectomy cases performed between 2000 and 2010. Three of the 65 pancreaticoduodenectomies were diagnosed with autoimmune pancreatitis, and 3 additional cases were diagnosed prior to surgery. All six patients were males and presented with obstructive jaundice, 5 with weight loss, and 4 with epigastric pain and elevated serum lipase. All six patients showed elevated serum IgG4. Imaging revealed findings typical of pancreatic malignancy: distal bile duct stricture and pancreatic head mass. However, no nodal involvement and vascular invasion were found. In conclusion, autoimmune pancreatitis should be considered in patients presenting with obstructive jaundice. Elevated serum IgG4, normal serum carbohydrate antigen CA19-9, a benign fine needle aspiration/core biopsy, and a therapeutic response to corticosteroid are typical findings of autoimmune pancreatitis. Serum IgG4 measurement is a useful tool to help differentiate autoimmune pancreatitis from most pancreatic cancers. It is important to consider autoimmune pancreatitis as a differential diagnosis of pancreatic malignancy to avoid unnecessary surgery.*

## Introduction

Autoimmune pancreatitis (AIP) is a chronic fibroinflammatory condition of the pancreas originally described by Sarles and colleagues in 1961.<sup>1</sup> It occurs more commonly in men and is an emerging disease in Asian populations. In 1995, the concept of AIP was proposed by Yoshida and colleagues, and it was described as a condition of chronic pancreatitis with hypergammaglobulinemia and response to corticosteroid therapy.<sup>2</sup> Patients with AIP usually present with obstructive jaundice, with or without abdominal discomfort and indigestion. Elevated serum lipase and amylase are common findings, and imaging [eg, magnetic resonance imaging (MRI), computed tomography (CT), endoscopic retrograde cholangiopancreatography (ERCP)] often reveals biliary duct and pancreatic duct narrowing and a mass effect at the head of the pancreas.<sup>3</sup> Although serum immunoglobulin G4 (IgG4) has been shown to be a good marker of AIP,<sup>4</sup> definitive diagnosis of AIP often requires pathologic examination of a pancreatic biopsy or resected tissue. There are several proposed diagnostic criteria for AIP worldwide, all of which include histologic, imaging, and serologic factors. Table 1 outlines the HISORt (histology, imaging, serology, other organ involvement and response to therapy) criteria from the Mayo Clinic and the Asian Diagnostic Criteria for AIP, a consensus from Japanese and Korean institutions.

Autoimmune pancreatitis has been subdivided histologically into two types, type 1 and type 2.<sup>5,6</sup> Type 1 AIP, also known as lymphoplasmacytic sclerosing pancreatitis (the subtype described in this manuscript), has four histopathologic characteristics: (1) a dense infiltrate of lymphocytes and plasma cells,

typically around the ducts; (2) stroma with a storiform pattern of growth; (3) venulitis; and (4) abundant IgG4-positive plasma cells. The lymphocytic and plasma cell infiltrate is typically florid and periductular (Figures 1a and 1b). Also, eosinophils and rare neutrophils may be seen among the inflammatory cells. The pancreatic stroma exhibits a swirling or storiform fibrosis from reactive fibroblasts/myofibroblasts (Figure 1a). The lymphoplasmacytic infiltrate in the stroma is usually prominent; and there is usually associated pancreatic acinar atrophy (Figure 1a). Veins, usually small or medium-sized, also demonstrate prominent lymphoplasmacytic inflammation (Figure 1c), which often leads to obliteration (Figure 1d). Recognition of obliterative phlebitis can be aided by identifying its accompanying artery. In type 1 AIP, IgG4-positive plasma cells are characteristically prominent (>10 cells per high-power field) (Figure 2).<sup>7</sup> In addition to the infiltrative pattern of inflammation, scattered lymphoid aggregates with germinal centers also can be observed in the pancreas and extrapancreatic adipose tissue.

Type 2 AIP is also known as idiopathic duct-centric pancreatitis and has some histologic overlap with type 1 AIP. However, type 2 AIP is characterized by granulocytic epithelial lesions, which demonstrate neutrophilic inflammation in the duct epithelium and/or duct epithelial damage, occasionally in the form of duct ulceration or neutrophilic abscesses.<sup>8</sup> Type 1 AIP has no to only rare, intraepithelial neutrophils in the pancreatic ducts. Also, obliterative phlebitis is seen almost exclusively in type 1 AIP. Finally, in type 2 AIP, IgG4-positive plasma cells are fewer (<10 cells per high-power field) than seen in type 1.

The clinical presentation of AIP resembles pancreatic cancer and may lead to unnecessary surgical resection. Abraham et al, in a series of 442 pancreaticoduodenectomies performed for suspected malignancy, demonstrated that 9% of their cases revealed non-neoplastic disease. AIP accounted for 23.4% of these non-neoplastic processes.<sup>9</sup> The current study seeks to characterize AIP in an Asian-dominant American population and to contribute to the clinical knowledge about AIP and its differentiation from pancreatic malignancy.

## Methods

The study involves a retrospective review of 65 pancreaticoduodenectomies performed by a single surgeon (LW) between 2000 and 2010 to identify cases of AIP. From the cases diagnosed with AIP, patient demographics and clinical findings were collected and analyzed, including patient age, gender, race, presenting symptom(s), signs and symptoms of pancreatic/biliary obstruction, markers of pancreatic cancer (serum

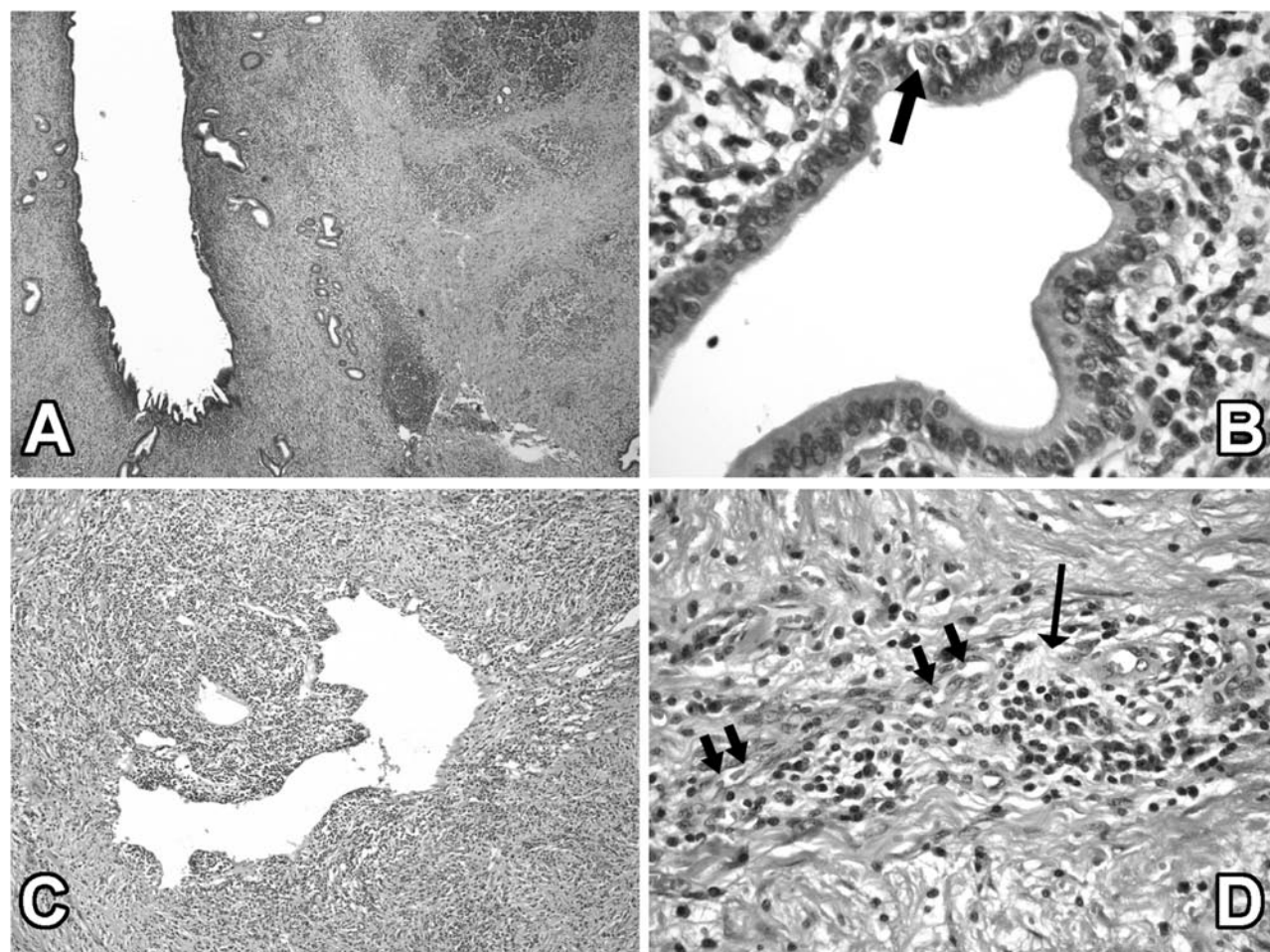


Figure 1. Histologic features of type 1 autoimmune pancreatitis. (A) Dense periductal inflammation (left) with chronic pancreatitis and areas of storiform fibrosis (right) (hematoxylin and eosin, original magnification x 40). (B) Periductal lymphoplasmacytic inflammation with focal infiltration into the ductular epithelium (arrow) (hematoxylin and eosin, original magnification x 600). (C) Venulitis and perivenulitis by a prominent lymphoplasmacytic infiltrate (hematoxylin and eosin, original magnification x 100). (D) Obliterative venulitis. This small vein (erythrocytes in lumen indicated by short arrows) shows perivenular lymphocytes and plasma cells. Focal damage and obliteration is indicated by the long arrow (hematoxylin and eosin, original magnification x 400).

CA 19-9) and of AIP (serum IgG4), results of various imaging techniques, and treatment. The study population's mean age was 63 years (range 29-88 years). There were 41 males and 24 female patients, and races include Asian (44), Caucasian (12), Hawaiian (3), and mixed (6). The diagnoses for the 65 pancreaticoduodenectomies included the following: pancreatic carcinoma (16), cholangiocarcinoma (17), cystic tumors (11) [cystadenomas (1), cystadenocarcinomas (1) and intraductal papillary mucinous tumors (1)], ampullary carcinoma (4), neuroendocrine tumors (4), duodenal carcinoma (3), AIP (3), duodenal polyps (2), and 1 case each of high-grade ampullary dysplasia, pancreatic stone, duodenal villous adenoma, mucinous adenocarcinoma, and acinar cell carcinoma. Three additional cases of AIP were identified that did not undergo any type of surgery. All 6 cases were also analyzed for the above data.

## Results

In 6 cases of AIP, all were male with a mean age of 58 years (range 27-73 years). Three patients were Caucasian, and three were Asian. All patients presented with obstructive jaundice and other manifestations of biliary obstruction, such as dark colored urine, light colored stool, elevated serum total bilirubin, and alkaline phosphatase. Five of 6 presented with weight loss, and 4 had epigastric pain and elevated serum lipase. Each patient received various types of imaging techniques, including CT, MRI, ERCP, and magnetic resonance cholangiopancreatography (MRCP). Imaging results showed distal bile duct strictures in 3 patients and pancreatic head masses in 5 patients (mean 3.48 cm, range 3.15-4.30 cm); dilated bile ducts were seen in 2 patients. No nodal involvement or vascular invasion was identified. Fine needle aspiration was done on 3 patients; and

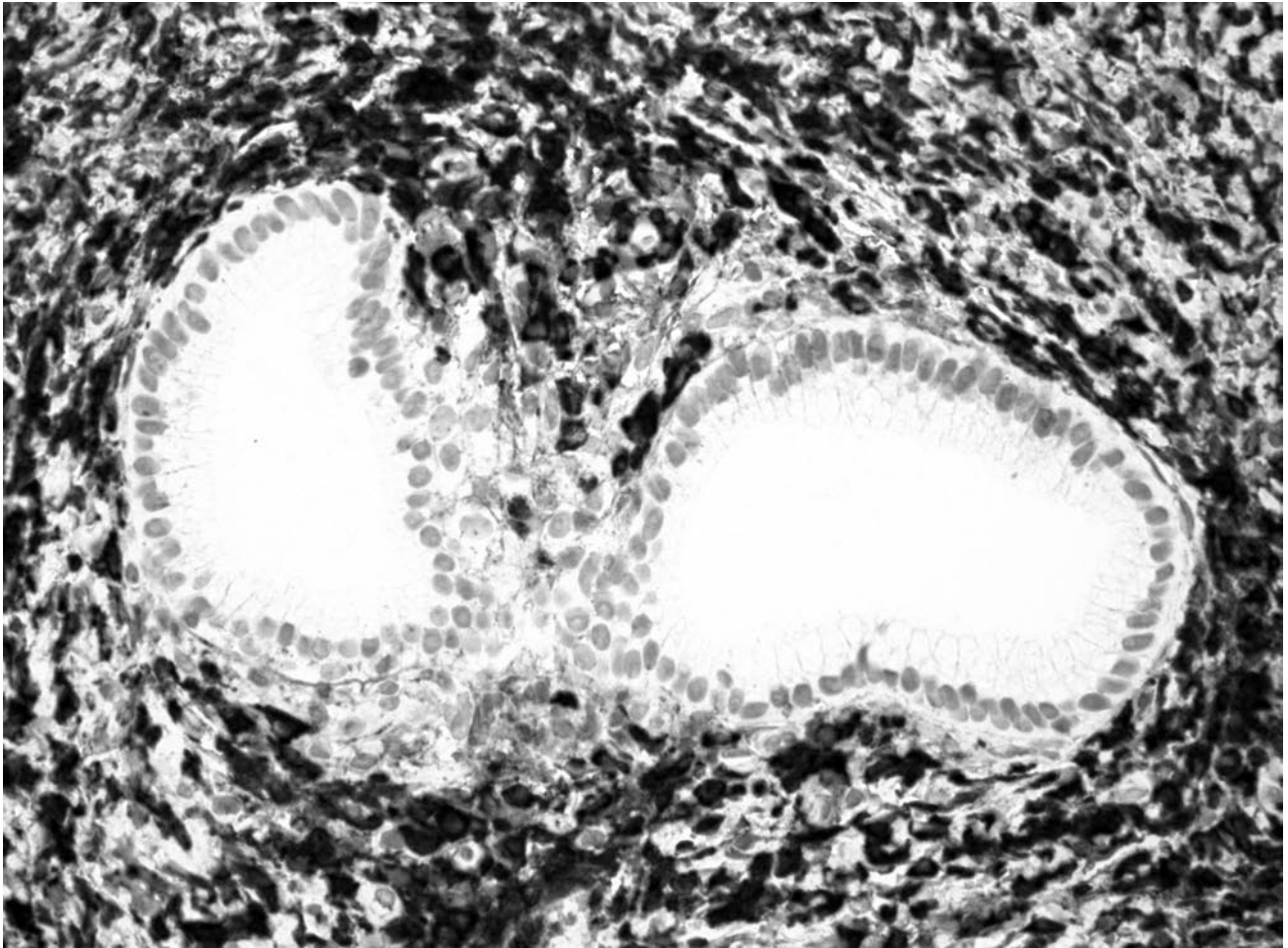


Figure 2. Periductal lymphoplasmacytic inflammation with numerous IgG4+ plasma cells (dark cells) (IgG4 immunostain, original magnification x 400).

major duodenal papilla core biopsy was done on 1 patient, all of which revealed no malignancy. All patients had elevated serum immunoglobulin G4. Serum CA 19-9, a marker of pancreatic cancer, was measured in 5 of 6 patients and found to be elevated in 1 patient. In three patients a diagnosis of post-pancreaticoduodenectomy was made, when pathology revealed lymphoplasmacytic pancreatitis. Histologic examinations were also consistent with type 1 AIP. Three non-operative cases were diagnosed on the basis of elevated serum IgG4 (with normal CA19-9); fine needle aspiration and/or core biopsy with findings of inflammation and atypia, with no evidence of neoplasia; and response to corticosteroid therapy. Response to corticosteroid therapy in these patients were characterized by the resolution of abdominal discomfort and jaundice, and the normalization of bile duct and pancreatic structures on subsequent imaging studies. Table 2 summarizes these findings.

### Conclusion

Of the 65 pancreaticoduodenectomies reviewed, there were 3 cases of AIP, resulting in a prevalence of 4.6% in our study population. Three additional cases were subsequently diagnosed without surgery. The patients were exclusively males with a mean age of 58 years, closely resembling previous reports of gender distribution (male/female ratios from 2:1 to 8:3)<sup>9,10</sup> and mean age at diagnosis (56 – 57 years).<sup>9,11</sup> Although the concept of AIP was originally proposed in Japan, incidences of AIP have been reported in many regions in the world. Despite the Asian-dominant sampling population in this study, 3 of 6 (50%) AIP patients were Caucasian; and the remaining 3 were Asian (Filipino, Japanese, and Chinese).

In agreement with previous analyses,<sup>12,13</sup> the AIP cases in this study mimic pancreatic malignancy in clinical presentation, from signs and symptoms of biliary obstruction (jaundice, dark



	HISORt criteria	Asian criteria
I. Imaging	<p>Typical features:</p> <ul style="list-style-type: none"> <li>• ERCP - Irregular, narrowing of main pancreatic duct</li> <li>• CT/MRI – diffusely enlarged gland with rim enhancement</li> </ul> <p>Atypical features:</p> <ul style="list-style-type: none"> <li>• Pancreatitis, focal mass, atrophy, calcification, stricture</li> </ul>	<p>Requires both:</p> <ul style="list-style-type: none"> <li>• Pancreatic parenchyma – diffuse/focal enlargement with or without mass or hypoattenuation rim</li> <li>• Pancreaticobiliary ducts – diffuse/focal duct narrowing, bile duct stenosis</li> </ul>
II. Serology	Elevated IgG4 level	<p>One required:</p> <ul style="list-style-type: none"> <li>• Elevated serum total IgG or IgG4</li> <li>• Detection of autoantibodies</li> </ul>
III. Histology	<p>Diagnostic:</p> <ul style="list-style-type: none"> <li>• Lymphoplasmacytic sclerosing pancreatitis</li> <li>• Lymphoplasmacytic infiltrate with &gt;10/hpf of IgG4+ cells</li> </ul> <p>Supportive:</p> <ul style="list-style-type: none"> <li>• Lymphoplasmacytic infiltrate with &gt;10/hpf of IgG4+ cells in extrapancreatic organs</li> <li>• Pancreatic fibrosis</li> </ul>	Lymphoplasmacytic infiltration, fibrosis, & abundant IgG4+ cells
IV. Other organ involvement	Hilar, intrahepatic, & distal biliary stricture, parotid & lacrimal glands, mediastinal lymphadenopathy, retroperitoneal fibrosis	Not included
V. Response to steroid therapy	Resolution or marked improvement with steroid therapy	Response to steroid is an optional criterion
<b>Diagnosis</b>	<p>A. Diagnostic histology alone</p> <p>B. Typical imaging features &amp; IgG4 elevation</p> <p>C. Unexplained pancreatic disease + response to steroid + serology or other organ involvement</p>	<p>A. Histology shows lymphoplasmacytic sclerosing pancreatitis in resected pancreas</p> <p>B. Imaging + either serology or biopsy with histology shown above</p>

Patient	Age/Sex	Race	Presenting Signs & Symptoms	Serum alkaline phosphatase (35-129 U/L)	Weight loss (lbs)	Serum lipase (13-60 U/L)	Serum CA 19-9 (0-35 U/L)	Serum IgG4 (7-89 mg/dL)	Intervention	Current Status
1	73M	Chinese	Anorexia Jaundice	315	15	*	34	322	Corticosteroid therapy	Alive, 8 months
2	58M	Caucasian	Abdominal pain Jaundice	222	25	108	15	121	Corticosteroid therapy	Alive, 6 months
3	27M	Caucasian	Epigastric pain Jaundice	156	0	876	6	117	Corticosteroid therapy	Alive, 8 months
4	70M	Filipino	Epigastric pain Jaundice Pruritus	318	25	1165	23	219	Pancreaticoduodenectomy	Alive, 12 months
5	51M	Caucasian	Abdominal & chest pain Anorexia	230	15	132	147	344	Pancreaticoduodenectomy	Alive, 43 months
6	69M	Japanese	Jaundice	*	30	*	*	411	Pancreaticoduodenectomy	Unknown, but survived 36 months

\* = Not evaluated/no data

urine, light-colored stool, elevated bilirubin) to imaging results of biliary ductal stricture and pancreatic head mass. Serum CA 19-9, which has been reported to have a sensitivity of 93% and a specificity of 85% for pancreatic cancer,<sup>14</sup> was elevated in 1 patient. Indeed, Hardacre and colleagues in their study found no statistically significant difference between CA 19-9 levels in AIP patients and those in pancreatic cancer patients; CA 19-9 levels were elevated in both groups.<sup>12</sup> This serologic marker, therefore, may not be a reliable differentiating factor between pancreatic cancer and AIP.

Serum IgG4 has been accepted worldwide as a useful serologic marker of AIP. Diagnostic criteria proposed worldwide include a combination of imaging, serologic and histologic criteria, and response to steroids.<sup>15-18</sup> Despite slight variations in the fulfillment of these criteria, IgG4 remains the primary serologic marker. Serum IgG4 has been shown to be elevated in between 63% to 94% of AIP patients.<sup>19</sup> In this study, serum IgG4 proved to be a consistently sensitive marker in diagnosing AIP; it was elevated in all 6 AIP patients studied. Although IgG4 is currently the most sensitive and specific marker for AIP, it has been shown to be elevated in a small number of patients with pancreatic malignancy.<sup>20,21</sup> Therefore, it may be very difficult for physicians to decide whether or not surgical resection is indicated. Nevertheless, the results of this study suggest that IgG4 serology is a useful diagnostic tool and should be considered in male patients presenting with obstructive jaundice when imaging, serology, and fine needle aspirate or core biopsy do not provide a definitive diagnosis of pancreatic malignancy.

Steroid responsiveness may also play an important role in diagnosing AIP. Although steroid responsiveness is a diagnostic criterion for the HISORt system, it is listed as an optional criterion in the Asian criteria. In regards to excluding response to steroid as a diagnostic criterion, Otsuki and colleagues reasoned that steroidal effects are not considered in diagnosing other autoimmune disorders, and they did not want the Asian criteria to encourage use of corticosteroid therapy, which may delay the treatment of pancreatic malignancy.<sup>18</sup> And although there are no current guidelines on the use of steroid therapy in suspected AIP cases, a study from South Korea showed that a two-week

corticosteroid therapy (0.5 mg/kg/day of prednisolone) did not affect the outcome of complete resection of pancreatic cancer; of the study's 7 patients who did not respond to 2 weeks of prednisolone, all 7 were subsequently diagnosed with pancreatic cancer and 6 underwent successful resection of the malignant tissue (1 patient refused surgery).<sup>22</sup> Nevertheless, the use of a steroid trial as a diagnostic tool remains a controversy because it is unclear whether or not the steroidal effects on and the delay in surgical removal of pancreatic cancer will alter the outcome of patients' prognoses.

Histologic examination of the 3 AIP cases that were diagnosed post-pancreaticoduodenectomy revealed features consistent with type 1 AIP. The clinical presentation of types 1 and 2 are similar, and both types are responsive to treatment with corticosteroids. However, they have dissimilar patient demographics, IgG4 serologies, other organ involvement, and rates of disease relapse. Differentiation between these two entities will serve as a foundation for future research that may result in more effective patient care.<sup>5</sup>

In conclusion, although AIP is a relatively uncommon entity, it should be considered as part of the differential diagnosis of pancreatic malignancy, not only because AIP may be indistinguishable from pancreatic cancer in its clinical presentation, but also because its management is quite different from pancreatic cancer. Proper diagnosis with IgG4 and biopsy may avoid unnecessary pancreatic resection.

## Disclosure Statement

There was no funding for this report, and none of the authors identify any conflict of interest.

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# Short Same-Segment Fixation of Thoracolumbar Burst Fractures

Jonathan-James T. Eno BSc; James L. Chen MD; and Morris M. Mitsunaga MD

## Abstract

*Introduction:* Minimizing the number of vertebral levels involved in fusion of a spine fracture is a common goal of internal fixation. This is achievable by utilizing traditional short-segment posterior fixation (SSPF). However, in SSPF there is reported up to a 54% incidence of instrument failure or unfavorable clinical outcome. Short-segment posterior fixation with pedicle fixation at the level of the fracture (short same-segment fixation) suggests biomechanical advantages toward maintenance of kyphosis correction and reducing failure rates. However its clinical efficacy is largely unknown.

*Methods:* The team conducted a retrospective review of 25 thoracolumbar burst fracture patients who were treated with short same-segment fixation between September 2005 and April 2009. The primary outcome measure was incidence of reoperation and loss of kyphosis correction within the follow-up period. Long-term functional status and pain was also assessed.

*Results:* Average duration of the most recent follow-up was 21.64 months (range 3 to 42 months). Two patients (8%) required reoperation due to either hardware failure or pseudoarthrosis. Mean pre-operative kyphosis was 14.49°. Average post-operative kyphosis was -0.74° (lordosis). Average follow-up kyphosis of all cases was 10.78°. Excluding failures, average follow-up kyphosis was 8.67°. A mean of 15.23° of kyphosis correction was attained from pre-operation to post-operation ( $P < 0.0001$ ). Average loss of kyphosis correction from immediate post-operation to most recent follow-up was -11.51° and -9.51° excluding the two failures ( $P < 0.0001$ ). Average pre-operative to most-recent follow-up kyphosis correction was 3.72° ( $P = 0.067$ ) and 5.51° excluding failures ( $P = 0.0024$ ). At initial one-month follow-up, average disability score was 52.63% (range 16% to 84%). At most recent follow-up, average disability score was 5.5% (range 0% to 16%). One patient was lost to long-term follow-up. Mean difference from one-month follow-up to most recent follow-up (excluding failures) was 47.27% ( $P < 0.0001$ ).

*Conclusions:* Short same-segment fixation decreases implantation failure rate and reoperation rate compared to traditional SSPF, however long-term kyphosis correction was not maintained. Despite this loss of kyphosis correction, clinical pain and disability improved at long-term follow-up.

## Keywords

short-segment posterior fixation, thoracolumbar burst fracture, kyphosis correction

## Introduction

Burst fractures are the most common type of fracture of the thoracolumbar spine, accounting for greater than 50% of all thoracolumbar trauma.<sup>1</sup> Minimizing the number of vertebral levels involved in fusion of a spine fracture is a common goal of internal fixation. This is achievable by utilizing traditional short-segment posterior fixation (SSPF). SSPF is the use of pedicle screw instrumentation one level cephalad to and one level caudad to the fractured vertebra. It has become an increasingly popular method of treatment of thoracolumbar burst fractures, providing the advantage of incorporating fewer motion segments in the fixation.<sup>2</sup> However, a review of literature demonstrated that SSPF led to 9%-54% incidence of implant failure and long-term loss of kyphosis correction, and up to 50% of patients with implant failure had moderate to severe pain.<sup>3-8</sup> Failure of SSPF

can be attributed to instrumentation failure (ie, bending and/or breaking of the screws), vertebral factors (ie, primary osseous collapse or secondary to osteoporosis), or a combination of both.<sup>8</sup> Other possible factors include inadequate fixation points on the vertebrae and insufficient anterior column support.<sup>7</sup>

A cadaveric study of short-segment posterior fixation with pedicle fixation at the level of the fracture (short same-segment fixation) showed that short same-segment fixation provides more biomechanical stability than traditional SSPF.<sup>9</sup> A recent study also clinically confirmed the increased stability provided by short same-segment fixation in maintenance of kyphosis correction.<sup>10</sup> The team conducted a retrospective review of thoracolumbar burst fracture patients that were treated with short same-segment fixation. The team hypothesized that short same-segment fixation would provide successful kyphosis correction with a low rate of instrumentation failure.

## Materials and Methods

A retrospective chart review was done involving 25 single- or two-level thoracolumbar burst fracture patients between September 2005 and April 2009 in a Level-2 trauma center (Figure 1A). The project was approved by the institutional review board and the ethics committee. Inclusion in the study required confirmed thoracolumbar fracture by plain radiographs, computed tomography, and magnetic resonance imaging. Mechanism of injury and treatment course were recorded. Each patient was treated with short same-segment fixation for thoracolumbar burst fractures between levels T11 and L4. Plain radiographs were evaluated preoperatively and postoperatively for kyphotic angulation using the traditional Cobb method.<sup>11</sup> Fractures were scored based on the Gaines load-sharing classification.<sup>12</sup> Patients were also graded preoperatively and postoperatively based on the Frankel Scale.<sup>13</sup> Patients were evaluated at one-month intervals following surgery. Clinical outcome was measured using the Oswestry Disability Index.<sup>14,15</sup>

## Surgical Technique

The senior author performed all surgeries in this study. Posterior spinal approach was made one level above and below the fracture (Figure 2). If trans-pedicular decompression was done, unilateral same segment screw fixation was performed (Figure 1B). Bilateral screws were used above and below the fracture (Figure 2). All patients were surgically treated with short same-segment fixation and posterolateral fusion with allograft bone matrix using a posterior surgical approach with transpedicular instrumentation. Pedicle screws were placed at one level above and below the fracture site. Additionally, pedicle screws were also inserted at the level of the fracture.

Table 1. Patient Demographics	
	<b>Short-Same Segment Fixation (n = 25)</b>
<b>Age at time of surgery, years</b>	42.92 ± 14.25 (range 18-74)
<b>Gender</b>	<b>n (%)</b>
Male	14 (56)
Female	11 (44)
<b>Fracture Level</b>	<b>n</b>
T11	1
T12	2
L1	9
L2	7
L3	3
L4	3
<b>Preoperative Gaines load-sharing score<sup>12</sup></b>	5.80 ± 1.38
<b>Follow-up duration, months</b>	21.64 ± 11.32
<b>Frankel scale grade<sup>13</sup></b>	<b>n</b>
A	1
B	1
C	9
D	6
E	8

## Results

Fourteen men and 11 women with an average age of 42.92 years (range 18 to 74 years) comprised the study. Mechanisms of spinal injury included motor vehicle accidents (seven patients), fall from a height (16 patients), bicycle accident (one patient), and crush injury (one patient). Pre-operative Gaines scores averaged 5.80 (range 3 to 8). Preoperative Frankel grades were as follows: one grade A, one grade B, nine grade C, six grade D, and eight grade E patients comprised the study (Table 1).

## Radiographic and Clinical Review

Average duration of the most recent follow-up was 21.64 months. Average duration of the most recent follow-up was 21.64 months (range 3 to 42 months). Mean pre-operative kyphosis was 14.49° (range 6.25° to 24.40°). Average post-operative kyphosis was -0.74° (lordosis) (range 6.97° to -18.40°). Average follow-up kyphosis of all cases was 10.78° (range 0.85° to 35.00°). Excluding failures, average follow-up kyphosis was 8.67° (range 0.85° to 25.00°).

A mean of 15.23° of kyphosis correction was attained from pre-operation to post-operation ( $P < 0.0001$ ). Average loss of kyphosis correction from immediate post-operation to most recent follow-up was -11.51° and -9.51° excluding the two failures ( $P < 0.0001$ ). Average pre-operative to most-recent follow-up kyphosis correction was 3.72° ( $P = 0.067$ ) and 5.51° excluding failures ( $P = 0.0024$ ).

Table 2. Kyphosis Correction and Clinical Outcome	
Pre-operative kyphosis, degrees	14.49 ± 5.89
Post-operative kyphosis, degrees	-0.74 (lordosis) ± 6.59
Follow-up kyphosis, degrees (excluding failures)	8.67 ± 7.15
Loss of kyphosis correction, degrees (excluding failures)	9.43 ± 8.19
Follow-up Oswestry Pain/Disability Score, <sup>14,15</sup> %age	5.5 ± 4.32
Reoperation rate (due to hardware failure or pseudoarthrosis), %age	8.0 (2 of 25)

At initial one-month follow-up, average Oswestry disability score was severe at 52.63% (range 16% to 84%). At most recent follow-up, average Oswestry disability score was minimal at 5.5% (range 0% to 16%). One patient was lost to long-term follow-up. Mean difference from one-month follow-up to most recent follow-up (excluding failures) was 47.27% ( $P < 0.0001$ ).

## Reoperation Rate

Two patients (8%) required reoperation due to either hardware failure or pseudoarthrosis.

## Discussion

Short segment pedicle screw fixation, involving one vertebra above and one vertebra below the fracture level, has become the most common method in the treatment of thoracolumbar burst fractures. It provides the benefit of decreased involvement of motion segments than fixation with longer instrumentation. However, many studies have reported loss of kyphosis correction and implant failure following short-segment fixation.<sup>3-8</sup> As loss of kyphosis correction progresses, more anterior stress is placed on the pedicle screws, which can eventually lead to breaking and dislodging of the screws. At the cost of involvement of more motion segments, longer instrumentation provides decreased anterior stress on each pedicle screw, thus decreasing the chance of failure.

A cadaveric study by Mahar, et al, reported increased biomechanical stability of short-segment fixation with additional pedicle fixation at the level of fracture (short same-segment fixation).<sup>9</sup> A subsequent study by Guven, et al, also showed increased stability and long-term maintenance clinically with short same-segment fixation.<sup>10</sup> The present study showed that short same-segment fixation decreased implant failure and reoperation rate compared to traditional SSPF, however statistically significant long-term loss of kyphosis correction occurred. Despite loss of kyphosis correction, however, this study showed significant clinical improvement of patient disability over long-term follow-up.

In this study, immediate kyphosis correction was successfully attained through short same-segment fixation, with a mean post-operative angulation of 0.74° of lordosis compared to 14.49° of kyphosis pre-operatively as measured by the traditional Cobb method. At mean 21.64-month follow-up, however, patients had suffered statistically significant loss of kyphosis correction (11.46°,  $P < 0.0001$ ), with two patients requiring reoperation due



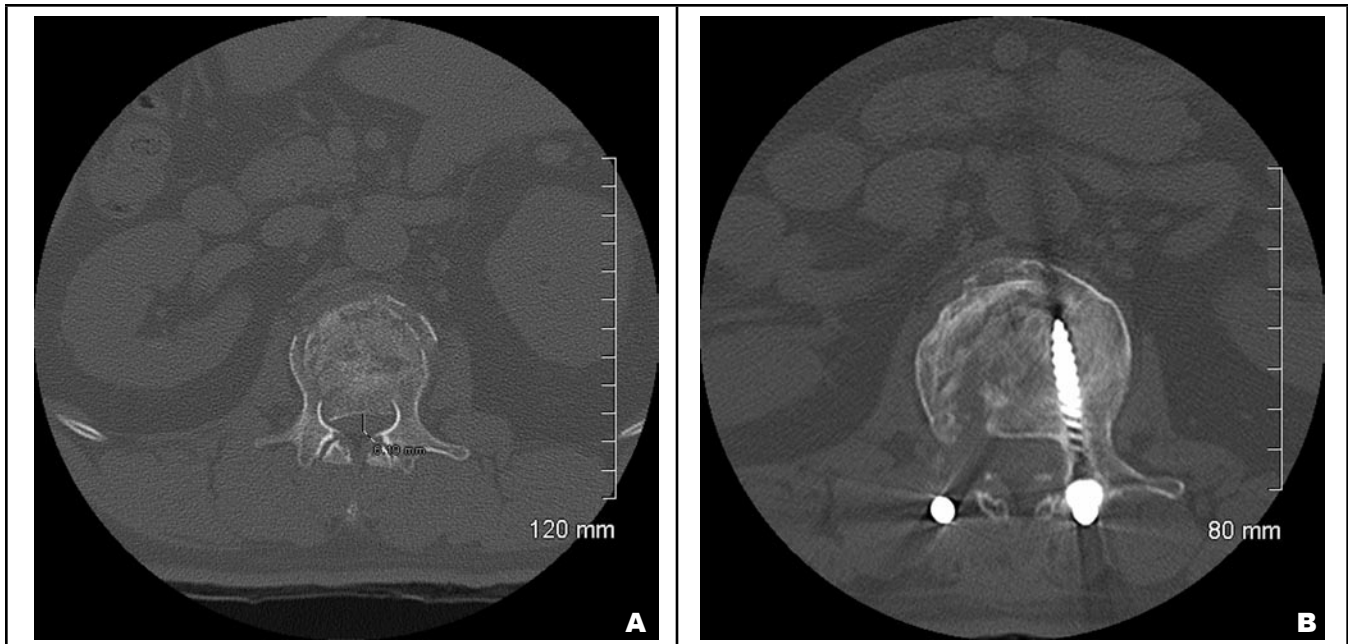


Figure 1A. L1 burst fracture with retropulsion of fracture fragment. Figure 1B. Pedicle screw insertion at level of fracture (L1).



Figure 2. Pedicle screw insertion at level of fracture (L1) and adjacent levels

to hardware failure or pseudoarthrosis. Excluding failure cases, 5.51° of kyphosis correction remained at most recent follow-up compared to pre-operative kyphosis ( $P=0.0024$ ).

Despite loss of kyphotic correction, the patients in this study showed clinical improvement in pain and disability. After an initial Oswestry Disability Index score of 52.63% at one-month follow-up, patients experienced a mean absolute decrease of 47.27% in disability ( $P<0.0001$ ), with a most recent follow-up average score of 5.50%. Importantly, although statistically significant kyphosis correction loss occurred, the absolute loss of kyphosis correction was relatively small, which may account for the improved clinical and functional status of patients despite loss of kyphosis correction. Furthermore, implant failure rate (8%) was lower than with short same-segment fixation compared to previous studies of traditional SSPF.

In conclusion, this study indicated that short same-segment fixation decreases implantation failure rate and reoperation rate. However long-term kyphosis correction was not maintained. Despite this loss of kyphosis correction, clinical pain and disability improved at long-term follow-up. More clinical studies regarding the efficacy of short same-segment fixation versus traditional SSPF are needed to explore the contrasting findings of recent studies.

## Conflict of Interest Statement

None of the authors identify any conflict of interest.

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# Betel Nut Chewing in Hawai'i: Is it Becoming a Public Health Problem? Historical and Socio-Cultural Considerations

Ann M. Pobutsky PhD and Enrico I. Neri PhD

## Abstract

*This article examines the socio-cultural significance of betel nut use among Micronesians, in light of the recent migration of Micronesians to Hawai'i. The different ways of chewing betel nut are the result of historical changes within Micronesia over time due to Spanish and US colonialism as well as the introduction of tobacco. These divergent ways of chewing may have different risks or impacts on health and it remains to be seen whether or not betel nut will become a significant public health problem in Hawai'i.*

## Introduction and Background

The purpose of this article is to describe the socio-cultural significance of betel nut among some of the peoples of Micronesia and the island of Guam and to explicate the differential betel nut chewing practices, in light of recent migration of Micronesians to Hawai'i. These differential betel nut chewing practices are divergent because of historical changes due to both Spanish and US colonialism, as well as the introduction of tobacco, among United States current and former colonial possessions in the Pacific. These divergent practices may have different risks or impacts on oral health, and especially oral cancer.

Betel nut/Areca nut (*Areca cathecu*) chewing is prevalent in South Asia (eg, India, Pakistan and Nepal), Southeast Asia (eg, Cambodia, Vietnam, Taiwan, Malaysia, Indonesia, Papua New Guinea, and the Philippines) and the Western Pacific islands.<sup>1</sup> Betel nut is used in parts of Melanesia (including the Solomon Islands and New Ireland) and in Micronesia (eg, Guam, Yap, Belau, and Pohnpei).<sup>2</sup> The traditional way to chew betel nut in the Pacific islands is by betel nut chewing alone, or in combination with pepper leaf (Piper betle) and/or slaked lime,<sup>3</sup> and/or various forms of tobacco (originally introduced by the Spaniards). Recently, the practice of betel nut chewing has been spreading in some Asian and Pacific areas (such as coastal Papua New Guinea), while declining in other areas (fast-growing cities in mainland South and South East Asia).<sup>4</sup> In Indonesia, Strickland states there is "...persuasive historical evidence that tobacco smoking by men displaced areca use almost completely in Sulawesi in the half century following 1900, while in Java, Bali and Sumatra the process was less rapid." Strickland also cites evidence from Thailand where legislation prohibiting area betel nut use in 1942 led to a decline in urban use.

There has been recent interest in Hawai'i and other Pacific public health circles about the link to oral cancers by betel nut chewing alone, or in combination with pepper leaf (Piper betle) and/or slaked lime, and/or various forms of tobacco, because of the large influx of Micronesian migrants in Hawai'i over the past decade. Micronesians are considered to be Hawai'i's fastest growing population, yet they are dwarfed by the sheer numbers of other immigrants from Asia, especially the Philippines. If the number of migrants from Micronesia is up to 25,000 people (double the US Census estimates from the 2008 Compact of

Free Association (COFA) census and close to the 2006-2008 American Community Survey's (ACS) estimates of 22,192), they still would constitute only 1.5% of the state's population. Micronesians, mainly Marshallese and Chuukese, have been migrating in large numbers to Hawai'i for employment, health, and educational opportunities.<sup>5-7</sup> Many of the recent Micronesian migrants have adopted "Yapese style" or traditional betel nut chewing and a small market niche has developed so that betel nuts, pepper leaf, and lime are available for purchase at certain stores on O'ahu.<sup>8</sup>

In light of this recent interest, it is important to understand both the important cultural role of betel nut chewing in Guam and Micronesia as well as the way it is chewed or consumed (which may impact potential oral cancer or other risk). Knowing the importance of betel nut chewing in both of its main forms (modern "Chamorro" style and traditional "Yapese" style) (1) provides information to determine if any interventions are necessary and (2) could also be a key to understanding urbanization and modernization patterns, along with out-migration trends in Micronesia.

## Betel Nut Chewing Practices in Micronesia

Betel nut is called *bu* in Yap, *bu*a in Belau and *poc* in Pohnpei and *pu* in Chuuk.<sup>1</sup> In Micronesia betel nut is chewed in the traditional way with young, immature nuts with slaked lime, and Piper betle (pepper leaf). When the green, immature betel nut is chewed, it is chewed (depending on the size) either whole or sliced in half. The young immature nuts include the husk and when the leaf, lime (or tobacco) is added and chewed, this forms a so-called "quid" or "betel quid." It is the husk that forms the structure of the large "quid." The husk is not swallowed, only chewed. When chewing the immature, green nut with leaf and lime, this resulting mixture turns red and the juice is usually spit out in various quantities during the chew. For an added effect, after chewing for awhile, one can take out the quid and add a few more sprinkles of lime and keep chewing (learned from Yapese acquaintances).<sup>9</sup>

In the Marshall Islands, Bhandry and Bhandry report increasing use of betel nut and chewing tobacco among Marshallese for whom this is not a traditional practice<sup>10</sup> but rather a recently adopted one.<sup>11</sup> There is also increasing evidence that other Micronesian groups from the Federated States of Micronesia have taken up chewing betel nut (eg, Chuukese or other Marshallese migrants) in Hawai'i (personal observation). This recent adoption of "Yapese style" betel-nut chewing by Micronesians and Micronesian migrants as a form of ethnic regional identity as Micronesians may pose additional obstacles to "stamping out" the practice regardless of potential adverse health effects (ie, possible oral or other cancer in the far distant future).

## **Betel Nut Chewing Practices on Guam and the Philippines**

On Guam, betel nut is called *pugua*, the leaf *pupulu* and the lime *afok*. If one chews betel nut mixed with lime, pepper leaf and tobacco, this is called *mama'* or *mama'on*. *Mama'* in Chamorro can refer to something becoming or turning liquid. This is the same in the Visayan islands in the Philippines, where chewing betel nut is called *maman*: to chew it is *mama'*. Also in the Visayan islands, betel nut is called *bunga*, the leaf *buyo* and the lime *apog*.<sup>12</sup> The Chamorros of Guam and the Mariana Islands previously chewed betel nut in the traditional way, with immature nuts, leaf, and lime.<sup>13</sup> After centuries of Spanish colonialism and especially after another century of American military colonialism, the Chamorro people of Guam altered their betel nut habit to chew mainly mature nuts so that it is an acceptable part of modern, urban life and continues as a cultural practice. Betel nut chewing is an integral part of socializing on Guam and in Micronesia. Chamorros on Guam will offer the hard, mature nut usually by itself (and occasionally with leaf) at work, at fiestas, and when socializing. In the Philippines, another Spanish colony (and where Guam was administered via Manila under Spanish rule), traditional betel nut use (also like “Yapese” style) is now prevalent only among Muslims in rural areas.

## **Betel Nut Chewing Practices in Hawai'i**

In Hawai'i, since Micronesian migrants are a small proportion of the total population,<sup>14</sup> their numbers are similarly small in national and state health surveillance surveys. However, in 2009 questions about betel nut use with tobacco were added on the Hawai'i Youth Tobacco Survey (YTS), a survey administered to Hawai'i middle and high school students to determine tobacco use. The results show that “ever use” of betel nut among high school students was very low at 3.1%, while “current use” of betel nut with tobacco (within the past 30 days) was even lower at 1.3% for middle school students and 2% for high school students.

Since there was a scarcity of data about betel nut use among adults in Hawai'i, the Tobacco Prevention and Education Program (TPEP) and Bilingual Health Services Program (BHS) at the Department of Health gathered data among Asian and Pacific immigrants and migrants to Hawai'i, using a survey. Clients utilize BHS translators to access needed services. The survey was administered with the usual intake forms and included questions on existing chronic diseases, smoking, betel nut use and possible tobacco cessation intervention strategies to clients in 2008-2009, with a total sample of N=2,350. The smoking data showed that limited and non-English speaking Filipinos and Vietnamese comprised the largest part of this client sample and they also reported the highest current smoking at around 30%. However, Micronesians also reported current smoking in this sample at 16%. BHS clients were also asked about betel nut use. The total number reporting current betel nut use in this sample was very low at less than 1% (n=103 out of 2,350). However, among Micronesians, it was 1 in 5 adults in this sample (20.6%). Overall, those reporting using betel

nut alone were more likely to also report smoking than those chewing betel nut with leaf, lime, and plug or other chewing tobacco.<sup>15</sup> Although the numbers are small, this pattern illustrates the divergent patterns that have occurred in Micronesia, with plug or other tobacco being used along with traditional or “Yapese” style betel nut chewing and use of betel nut alone with cigarette smoking.

Chewing betel nut on O'ahu can be an expensive habit, particularly if cigarettes are used for tobacco. The cheapest generic cigarettes are \$6.50 per pack. Fresh young immature betel nut is \$5.00 for eight pieces, with leaf included, but slightly cheaper are frozen nuts at \$6.00 for 15 pieces.<sup>8</sup> Micronesians may harvest betel nut in areas throughout the state where there is enough rainfall for betel palms to grow, but, betel nut is not very commonly grown in Hawai'i.

## **Betel Nut Use and Oral Cancer**

The habitual, long term (chronic) chewing of betel nut is known to have health effects, including oral lesions and oral cancer,<sup>16-17</sup> and recent research suggests it may be an independent risk factor for oral cancer when used without tobacco.<sup>18,19</sup> However, few studies differentiate the use of lime as the possible culprit.<sup>14</sup> The question of whether it is the tobacco that is the problem or the added caustic effect of the lime has not been adequately answered. The addition of lime aggravates the gums and oral cavity, and tobacco is a known carcinogen, so it could be a synergistic effect.<sup>20</sup> Research in the Solomon Islands showed that the prevalence of oral cancer was highest for those who smoked tobacco and chewed betel nut and for those who chewed the highest numbers of betel nut quid per day.<sup>21</sup>

## **Betel Nut, Smoking and Cancer**

Since tobacco was introduced in the Pacific, it has been smoked and or chewed with betel nut. Smoking rates are high in both Guam and Micronesia; people on Guam report the highest smoking rates in the nation on the Centers for Disease Control and Prevention (CDC) Behavioral Risk Factor Surveillance Survey (2008) at 27.5% for adults<sup>22</sup> and 23.1% for youth on the Youth Risk Behavior Survey. Lung cancer and oral cancers follow these patterns in smoking and betel nut use. The oral and lung cancer incidence rates for Hawai'i (2000-2005) and Guam (2003-2007) by gender are presented in Table 1. Guam's men and women have lower oral cancer rates than Hawai'i's men and women, but Guam's lung cancer incidence rates are higher; men's rates are higher than women's. The current practice of chewing mature betel nut with leaf only among Chamorros on Guam does not seem to have as harmful oral health consequences as “Yapese style” chewing. However, betel nut chewing is addictive and there is evidence of an independent risk for deleterious oral health results even by betel nut chewing alone.<sup>17</sup> Unfortunately smoking risk has replaced traditional betel nut chewing risk in Guam. In Guam, it is also not uncommon for Chamorros to smoke and chew mature betel nut at the same time, just as Yapese will add tobacco to their betel quid. In Taiwan, chewing betel nut and smoking when combined led to multiple-site cancers.<sup>20</sup>

Table 1. Oral and lung cancer incidence rates per 100,000 population (age-adjusted to the US population) in Hawai'i and Guam.		
	Hawai'i (2000-2005)	Guam (2003-2007)
Oral cancer rate	Men 15.9 Women 6.7	Men 11.1 Women 2.4
Lung cancer rate	Men 67.7 Women 38.8	Men 85.4 Women 40.6

Data Sources: Hawai'i Cancer Facts & Figures 2010; Guam Cancer Facts and Figures, 2003-2007.

Table 2. Annualized oral and lung cancer prevalence (number of cases per 100,000 population).						
	Federated States of Micronesia:				Republic of the Marshall Islands	Republic of Belau
	Yap	Kosrae	Pohnpei	Chuuk		
Oral cancer (age-adjusted to the US population)	31.8	13.1	7.7	4.2	16.2	16.1
Oral cancer (age-adjusted to the WHO world standard population)	22.1	7.9	6.2	3.8	12.6	12.4
Lung cancer (age-adjusted to the US population)	53.7	8.6	28.4	32.5	52.7	46.5
Lung cancer (age-adjusted to the WHO world standard population)	39.6	8.7	21.3	3.8	41.1	34.6

Data Sources: Katz, Palafox, Johnson et al.<sup>26</sup>

The annualized oral and lung cancer prevalence for the Micronesian jurisdictions from 1985-1998 are presented in Table 2, although data are not available by sex. It is important to note that these data are annualized cancer period prevalence estimates, which the authors noted is a less than optimal way to ascertain cancer. However, even though the numbers/cases are small, the pattern of high oral cancer among the Yapese is apparent when age adjusted to the US standard population or the WHO world standard population (Table 2). On the island of Yap, which has the most traditional and persistent betel nut practices, the oral cancer rate is quite high at 31.8 per 100,000, followed by the Republic of the Marshall Islands and the Republic of Belau. Lung cancer rates are also highest in Yap, followed by the Republic of the Marshall Islands, the Republic of Belau, Chuuk and Pohnpei. Kosrae had the lowest rates of lung cancer and Chuuk had the lowest rate of oral cancer. On Guam, oral cancer rates from 1997-2003 were found to be highest among Micronesians and lowest among Filipinos.<sup>23</sup>

### Betel Nut Use and Social Change

Betel nut chewing in the Pacific is still more of a rural habit than an urban one. It is much easier to chew the immature nuts with pepper leaf and lime and be able to spit with impunity in sparsely populated rural areas. With urbanization, in places such as Pakistan and India, the mature nuts are sliced, sugared and packaged like candy and the candied nut is chewed and swallowed. There is recent historical evidence in Indonesia that tobacco smoking displaces betel nut use and that use may decline

with urbanization.<sup>3</sup> However, Strickland provides examples of where betel nut use has been spreading in places like Papua New Guinea and that there is regional variation even within countries in South Asia and Southeast Asia. Strickland notes that social pressures due to migrant status may contribute to betel nut use, but no research has examined this phenomenon in detail.<sup>4</sup>

The important questions that need to be pursued regarding betel nut chewing in Hawai'i are: (1) are current practices of betel nut chewing a public health threat? or (2) are they just a new interesting phenomenon to explore because of the influx of Micronesian migrants who have recently adopted "Yapese style" betel nut chewing (eg, the Chuukese and Marshallese)?

The Yapese have the highest rate of oral cancer in Micronesia,<sup>24</sup> linked to their long standing practice of chronic betel nut chewing (see Table 2). This is a health risk and this should be communicated to people who make it a habit throughout Micronesia. However, given the small total numbers of people reporting chewing betel nut, and the small number of Micronesians in Hawai'i, it does not seem that betel nut chewing is a huge public health threat at this time.

There is no evidence that betel nut use is growing rapidly among young Micronesian immigrants to Hawai'i. It is much more likely that young people are influenced by their peers at school and their present situation NOT to chew betel nut. This is one of the main contentions of this paper, that betel nut chewing will decrease as Micronesians adapt to Hawai'i where the practice may be initially tolerated, but later banished, since



local people do not chew betel nut. And, while betel nut chewing is also initially part of the repertoire of Micronesian migrants to Hawai'i as an identifier, it is our contention that betel nut chewing will wane as Micronesians assimilate. It is much more likely that the Micronesians will drop the habits that make them "peculiar" to others, especially at workplaces and schools. One of the authors has observed two different Belauans' chewing betel nut in secret in Hawai'i, whereby people they work with do not know they even chew betel nut anymore! At the present time, it remains to be seen whether Micronesians will gradually phase out betel nut chewing as they assimilate in Hawai'i, or whether they will continue to use it.

## Conclusions

More research is clearly needed on this topic and to clearly differentiate the practices associated with betel nut chewing in the Pacific.<sup>25</sup> How widespread is betel nut chewing or smoking among Micronesian migrants in Hawai'i? Are younger people not picking up the habit as a result of assimilation and urbanization? Have the Chuukese and other Micronesians in Hawai'i become addicted with a chronic habit for "Yapese style" betel chewing with all its risks, or is this more of a regional identity marker involving sporadic chewing for social reasons to identify themselves and others as Micronesians? Are the practices changing in different jurisdictions of Micronesia or in Guam or the CNMI-Commonwealth of the Northern Mariana Islands? More information also needs to be gathered from the people in the Micronesian jurisdictions about betel nut practices and the use of cigarette or plug tobacco, as well as smoking habits. Has smoking displaced betel nut chewing? Who is chewing? Is it mainly men or women? Do people begin the habit as children, youths, or adults? There is a need to document practices and conduct more research on how—not only whether—betel nut is chewed.

## Conflict of Interest

None of the authors identify any conflict of interest.

## Acknowledgements

Thanks to Danette Wong Tomiyasu, Chief of the Chronic Disease Management and Control Branch at the Hawai'i State Department of Health for reviewing and editing this article. The betel nut questions on the Youth Tobacco Survey were made possible by the efforts of Kathy Koga and Lila Johnson of the Tobacco Prevention and Education Program. The survey data from immigrants and migrants gathered at the Bilingual Health Services Program (BHS) was made possible by the efforts of Lila Johnson and Julian Lipsher of the Tobacco Prevention and Education Program, along with Arnold Villafuerte and the Bilingual Health Services Program staff: Estrellita Lapurga, Nena Kim, Remedios Manangbao, Eliseo Huerbana, Alister Au, Chio Yee Pun Ho, Lang Huynh, Lethu Duong, Mine Lorin, John Ishoda and Tugalei Soa. Thanks to Nia Aitaoto for reading an earlier draft of this article.

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## Investigating the Joys and Challenges of Rural Medicine: A Student Perspective

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### Introduction

Hawai'i has had a difficult time staffing rural areas with physicians. At present, the neighbor islands have a doctor shortage of at least 15-20%.<sup>1</sup> This problem is not unique to Hawai'i. In the United States as a whole, 20% of the population lives in rural environments, but only 9% of physicians practice in rural areas.<sup>2</sup> Internationally, rural communities tend to be underserved by physicians. Currently in rural Canada, an influx of more than a thousand physicians would be needed just to match the physician-per-capita ratio that exists in major centers.<sup>3</sup>

The reasons for rural physician shortages are diverse. Some factors that inhibit physicians from practicing in rural areas include: professional, social, and cultural isolation; the need for a broader skill set and knowledge base in rural contexts; and the increased workloads that rural practices often entail.<sup>4,5</sup> Rural health-care shortages are also compounded by the fact that rural people tend to have lower incomes and poorer health statuses than urban individuals, creating a greater relative need for physicians in rural areas.<sup>6</sup>

Despite these challenges, thousands of rural physicians serve in communities across North America. These doctors have chosen to work in contexts far removed from the specialized personnel and infrastructure enjoyed by practices in urban centers. An attempt is made in this paper to delve deeper into the mindset of rural physicians, ie, to explore why they chose rural medicine, to learn how they negotiate its challenges, and to understand how they would suggest solving the current general shortage of rural physicians. This article will address the lessons learned while shadowing and interviewing a group of rural physicians.

### The Project

As a medical student at the University of Hawai'i, John A. Burns School of Medicine (JABSOM) with a personal interest in rural medicine, I took an opportunity to complete a two-week clinical elective course in a rural community during my second year. While the remote Canadian town of Peace River, Alberta may seem like an odd choice for an elective from JABSOM, the location interested me because it is situated in my home province and because my brother and mentor, Dr. Robert Greidanus, is one of the physicians in that small town. While there are differences between the medical systems, geography, and peoples of Alberta and Hawai'i, the challenge of servicing rural communities with medical care is in many ways similar across the border. Further, it was hoped that even the differences that exist between these contexts may prove to be

analytically fruitful, offering a fresh, outside perspective that could apply to Hawai'i's discourses surrounding the challenges of rural medicine.

Peace River is a quaint community of about seven thousand people located 650 miles north of the US-Canada border. It is isolated from major medical centers. Much like the proximity of Hawai'i's neighbor islands to the capital, Peace River is isolated by over 350 miles from the closest major city of Edmonton, Alberta. The Peace River Community Health Centre is an acute care facility with a 24-hour Emergency Department, an intensive care unit, surgical suites, rehabilitation, palliative care, respiratory therapy, diagnostic equipment such as X-ray and CT scanner, and a laboratory. The health center is the only hospital in town. It draws from the surrounding population of about 18,000 people served by a team of five full-time and four part-time physicians. A uniform questionnaire was used to interview seven of these doctors. In analyzing the interviews, several compelling themes emerged, many of which were consistent across the group. The following sections highlight the main themes.

### Physician Insights: The enjoyable aspects of Rural Medicine

When the doctors were asked to describe their practice, one word sums up all of their responses, "diverse." Each physician described the wide scope of their day-to-day practice. In the course of a single day, a doctor may fulfill the roles of surgeon, obstetrician, family physician, and emergency doctor. This diversity was praised by the group as the most enjoyable aspect of rural medicine. Another aspect that the Peace River doctors enjoyed was the strong sense of community they experienced, both professionally and privately. In Peace River, there is only one group of physicians and they share a common facility. This small-town dynamic was praised as creating a strong sense of comradery among the group. As one doctor said, "you don't have the competition that you get between doctors in the city...we may have different personalities, but we all can work together...none of us is afraid of stopping another in the hall for a consult [sic]...and many of us get together after work to hang out too." Beyond the sense of professional community, the doctors also enjoyed being a contributing part of the town's community. It is common for doctors to see patients with whom they attend church, hunt, or play sports. The group enjoyed the personal relationships they could create in the small town environment and found a greater capacity to provide continuous and holistic care to patients because of these relationships.

## **Physician Insights: The Challenging aspects of Rural Medicine**

Aspects of rural medicine that the physicians found challenging and undesirable included the workload and the lack of support or resources they sometimes experienced. The doctors talked about times when they felt burnt-out and overwhelmed by the number of hours they spent at the hospital away from their families. The group acknowledged that because of their remote location they sometimes missed the conveniences of the city, but it was the professional isolation that was most burdensome. As one surgeon said, "I don't mind being far away from the city conveniences,...[but]sometimes it feels like you're under house arrest, or town arrest, because you're the only one trained in certain procedures, and if there isn't another surgeon to share the work with, it's difficult to leave."

Another challenge that seemed to be a common complaint among the group was a general ignorance about rural medicine in the larger medical community. Several doctors found it frustrating to deal with policy directives that were ordered from administrators in the larger centers. As one doctor questioned, "it seems like some administrators have never been to a small town—how could they know what is best for us?" Several of the physicians also objected to a perceived negativity toward rural medicine that existed in the medical schools. One doctor said, "medical school has got to change the negative vibes given out by specialists in the city who believe you cannot learn anything outside of a tertiary care center...they have never seen medicine in a small town, they have no idea about the kinds of challenging cases we face." This same individual sought to correct this attitude stating, "rural doctors are some of the best trained and most competent physicians I've ever seen, and I've worked in several major centers and rural communities."

## **Physician Insights: Addressing the Physician Shortages in Rural Communities**

When asked who should bear responsibility for training rural physicians, the group generally suggested that three parties are responsible: medical schools, residency programs, and rural physicians themselves. The Peace River doctors consistently placed the most emphasis on the role of medical schools in exposing their students to the nature of rural medicine. They praised the newly-instituted longitudinal integrated clerkship programs at many medical schools which allow students to spend an extended block of time in rural communities while satisfying some of their clinical core rotations.<sup>7</sup> The Peace River group believed such programs give more hands-on training to students while exposing them to the benefits and opportunities of practicing in a rural environment.<sup>8</sup> Many of the physicians predicted that such programs would increase the likelihood that students would choose to practice in rural contexts after the completion of their programs. As one doctor exclaimed, "med students don't know what they're missing out here! The learning opportunities are immense." Another physician recalled, "almost all of the med students I have seen come here leave saying, 'I could see myself doing this.'" Beyond medical school programs,

the Peace River group also believed that residency programs and individual rural physicians were responsible for fostering opportunities to learn and work in rural environments. One physician summed up this attitude, stating, "ultimately, a large part of recruiting people to rural environments is up to us...we have to ensure that we welcome new students and colleagues and support them professionally and personally."

## **Demographic Trends Among the Peace River Group**

In addition to gathering opinions from the Peace River doctors, demographic information was collected to determine if there were any trends in the physicians' personal or professional lives that led them to practice in this remote location. The striking feature among the group was that every physician seemed to have unique and different paths leading them to rural medicine. Of the seven doctors, three were raised in small towns. One grew up in Peace River, four were raised in other towns or cities, and two were adult immigrants to Canada. All seven doctors attended medical school in urban environments, but five chose to complete at least a portion of their post-graduate training in rural areas. This modest sample size of seven physicians is not statistically significant to draw conclusions about the role that demographics play in shaping physicians' choices to practice rurally. Nevertheless, it is interesting to note that among this group, there seems to be no common variable that predisposed them for rural contexts. This may indicate that physicians of all backgrounds may choose to practice rural medicine if they are exposed to it.<sup>10</sup>

## **Conclusion: The Lessons I Learned**

I came to Peace River with an interest in rural medicine, but also ignorant about the specialty. I did not know much about the scope of practice, the capabilities of rural physicians, or the social dynamics that exist in small-town practices. My thought was that rural medicine might be interesting, but I believed that small-town life would be boring. Within the first few days of the elective, with immersion in the lifestyle, I began to develop an affection for rural medicine. While in the hospital, I saw many different people, from newborn patients to those in palliative care; observed medical care from common colds to major traumas; encountered suicidal and abused individuals; witnessed C-sections, vasectomies, colonoscopies, stress-testing, and much more. The diversity of rural medicine was amazing. More impressive were the doctors who practiced it. The wide-range of pathology and procedures were managed by nearly every individual physician with skill and confidence.

Spending two weeks among the Peace River doctors also impressed upon me the value of small-town communities. Compared to previous hospital encounters in the city, relationships in the rural hospital were relaxed and personal. It seemed as though the doctors were friends with each other, with the nurses, and with the patients. It was clear why every doctor interviewed seemed to be so fond of their job—they work in and for a community that they love.

In this brief summer encounter with rural physicians, I learned more about the obvious challenges that they face, including short-staffing, professional isolation, and the ignorance of the larger medical community regarding rural practice. Yet, it was not the challenges of rural medicine that will stay with me. Rather, the most indelible impressions came from the joys and opportunities experienced. While still undecided about what specialty to pursue, I am now giving rural medicine more consideration than I ever had. This makes me wonder, if more of my classmates had an opportunity to experience rural medicine, would they also consider it as career choice? Could rural exposure in medical education also ameliorate the ignorance about rural medicine within our profession? Based on personal experience, the answer is a resounding “yes!”

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## Student Internships at the University Hawai'i Cancer Center

**Karin Koga MPH and Gertraud Maskarinec MD, PhD; University of Hawai'i Cancer Center, Epidemiology Program**

### Program Description

One of the roles of the University of Hawai'i (UH) Cancer Center as an academic institution is to train the next generation of students to contribute to cancer research. The internship program provides high school and undergraduate students with experience in different areas of cancer research. The goal of the program is to expand access to cancer research experiences to motivated students from Hawai'i's geographically, culturally, ethnically, and socio-economically diverse communities. In addition to lab-based training in basic sciences, an increasing number of students participate in population-based research such as epidemiology, nutrition, and behavioral sciences. Interns placed with population-based cancer researchers are exposed to projects that aim to understand risk factors for cancers and strategies to modify behavior in individuals and communities. They learn about efforts to lower the risk profiles of different ethnic groups by addressing physical activity patterns, obesity, smoking, and other modifiable risk factors.

Since 2002, the UH Cancer Center internship program has provided 49 high school and 93 undergraduate students with mentored research training experiences. The number of applications has increased in recent years, with a current selection rate of 20%. All students are matched with faculty mentors from different fields. If students state a particular interest and demonstrate more advanced skills, they may express a preference for a particular lab or project. The interns attend an orientation, participate in training sessions and seminars, work on a mentored cancer research project, and present their research progress and findings to the other students and mentors at the end of the summer. Interns and mentors each complete a written evaluation of their research experiences and of the program in general. Adjustments are made to the program based on the feedback received in the evaluations.

### Ethnic Diversity

All interns are residents of Hawai'i who are selected according to outstanding academic achievement with priority given to applicants who are members of groups underrepresented in biomedical cancer research. Given our geographic location, the program focuses on Native Hawaiians and other Pacific Islander populations, but Filipinos, Hispanics, African Americans, Native Americans, Native Alaskans, economically disadvantaged, and first generation college attendees are also considered underrepresented minorities. The UH Cancer Center internship program's commitment to diversity is evidenced by the composition of its interns. Of the 142 interns since 2002,

75% belonged to underrepresented minority groups, primarily Native Hawaiians/Pacific Islanders. The internship program has partnered with teachers at Kamehameha and Waipahu High Schools to recruit highly motivated underrepresented minority students, and applications are received from students attending a wide variety of high schools. In 2011, applicants represented 6 public and 5 private high schools in Hawai'i, as well as colleges in Hawai'i and on the mainland.

Engaging underrepresented minority students, particularly Native Hawaiian/Pacific Islanders, in cancer research internships contributes to the understanding and remediation of health disparities by increasing awareness of cancer risk factors and prevention among underrepresented minority groups, by introducing students to cancer research career opportunities, and by ultimately increasing the number of underrepresented minority cancer researchers. Improving access for ethnically diverse high school students in Hawai'i can be expected to increase the ethnic diversity of the Cancer Center interns, and ultimately, Hawai'i's cancer researchers. As importantly, providing research opportunities to Native Hawaiian/Pacific Islander high school students is an important diversity and equity goal in itself. Access to research opportunities can be expected, in the long run, to address issues of ethnic, cultural, geographical, and socio-economic diversity and equity in Hawai'i's health research professions.

### Funding

Undergraduate interns commit a total of 300 hours for a \$3,000 stipend and high school interns work a total of 200 hours for a \$1,500 stipend. In addition, laboratory-based interns receive a \$500 allowance for supplies. The Cancer Center utilizes various sources of funds to sponsor the research internships including:

- A supplement to the P30 Cancer Center grant under the Continuing Umbrella of Research Experiences (CURE) from the National Cancer Institute supports underrepresented minority high school and undergraduate interns.
- An endowment from the Meiji Yasuda Life Insurance Company to support undergraduates.
- A Diversity and Equity Initiative Award from the University of Hawai'i's Office of Student Equity Excellence and Diversity is offered to Native Hawaiian high school interns.

- UH Cancer Center research and program grant funds.

### Research Projects

The following are highlights of research projects during recent summers:

#### Population-based Projects —

- Surveying residents to determine barriers to performing physical activity and eating fruits and vegetables for the Healthy Hawai‘i Initiative
- Prepare data for the publication “Hawai‘i Cancer Facts & Figures”
- Colorectal cancer genetic variants and gene expression
- Effects of a Vitamin D intervention trial on obesity-related markers
- Differences in breast cancer survival by ethnic group
- Human papilloma virus infection in American Samoa
- Hawai‘i’s youth and the tobacco industry
- Testing alternative stage models of smoking cessation

#### Lab-based Projects —

- Studying the chemotherapeutic effects of syringolin A on human neuroblastoma
- CIP85 interaction and involvement in the degradation of connexin 43
- Effects of bamboo extract on breast cancer
- Determination of clonal pattern in mesothelioma
- A specific SphK1 inhibitor, SKI-II, inhibits human colon cancer growth
- The effects of PEA15 in glioma cells
- Synthesis of oxaadamantane cannabinoids functionalized at C3’

#### Publications

During recent years, interns have first-authored and co-authored several peer-reviewed publications, such as the following:

- Coleman CS, Rocetes JP, Park DJ, Wallick CJ, Warn-Cramer BJ, Michel K, Dudler R, Bachmann AS. Syringolin A, a new plant elicitor from the phytopathogenic bacterium *Pseudomonas syringae* pv. *syringae*, inhibits the proliferation of neuroblastoma and ovarian cancer cells and induces apoptosis. *Cell Prolif.* 2006 Dec;39:599-609.



A group of the 2011 summer interns.

Front row: Kendrick Go, Loreto Coloma, Michelle Tagorda, Hannah Claire Beltran, Awapuhi Lee, Aleena Arakaki. Back row: Karin Koga (Internship Coordinator), Pomai Chandler, Mia-Danica Balignasay, Chastity Nakamura, Maile Hollinger, Karen Herndon, Dr. Gertraud Maskarinec (Internship Director), Cherrisse Sen.

- Cochrane K, Berestecky JM, Kitamura C, Lau AF. Monoclonal antibodies against the connexin43-interacting protein CIP85. *Hybridoma* (Larchmt). 2009 Oct;28:355-61.
- Maetani M, Maskarinec G, Franke AA, Cooney RV. Association of leptin, 25-OH vitamin D, and parathyroid hormone in women. *Nutrition and Cancer* 2009;61:225-31.
- Erber E, Maskarinec G, Hopping BN, Grandinetti G, Park S-Y, Kolonel LN. Dietary Patterns and Risk for Diabetes: The Multiethnic Cohort. *Diabetes Care* 2010; 33:532-8.
- Maskarinec G, Sen C, Koga K, Conroy SM. Ethnic Differences in Breast Cancer Survival: Status and Determinants. *Womens Health* (Lond Engl). 2011 Nov;7:677-87.
- Schembre SM, Yuen J. Project TwEATs. A feasibility study testing the use of automated text messaging to monitor appetite ratings in a free-living population. *Appetite*. 2011 Apr;56:465-8. Epub 2011 Jan 18.

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# THE WEATHERVANE

RUSSELL T. STODD MD  
CONTRIBUTING EDITOR

## FAIR MARKET PRICE IS \$50. WHY NOT MARKET IT FOR \$2,000?

Genentech, a division of Roche Holding AG, markets two drugs which are used for wet macular degeneration (AMD). According to a clinical study released by the National Institutes of Health (NIH) the two drugs are equally effective in slowing wet AMD. Lucentis, approved by the Food and Drug Administration (FDA) costs \$2,000 per injection. In general, patients must cover 20% of the cost. Avastin, a drug used for cancer treatment, is used "off label" by many eye surgeons, and costs \$50 per treatment. Genentech is claiming Avastin may not be as safe as Lucentis because pharmacists turn larger vials of Avastin into single-dose syringes for eye injection. Medicare data show that Avastin accounts for more than 60% of the injections for AMD. Bottom line is that Medicare could have saved more than \$1 billion and Medicare patients \$275 million over the past two years. A Genentech spokesman said, "the price of Lucentis allows us to continue discovering medicines for people with serious eye diseases." Right! This is one more example of the pharmaceutical industry displaying a complete lack of conscience.

## NO BARNACLES, NO ALGAE, NO FUNGUS, NO CORAL – NO DISEASE!

In 2002, Dr. Anthony Brennan, University of Florida science and engineering professor, was visiting the naval base at Pearl Harbor. He was doing research sponsored by the U.S. Navy to find new strategies to reduce use of toxic anti-fouling paint associated with dry dock and drag. As he watched an algae-coated nuclear submarine lumbering into the harbor, he asked which slow moving marine animals don't foul? The answer is only one, the shark. Dr. Brennan took an impression of shark skin which he studied with electron microscopy. He found that the skin is arranged in a distinctive diamond pattern which discourages microorganisms from settling. Further product research yielded a synthetic bacteria-inhibiting protective film that Brennan named sharklet. It is non-toxic, long lasting and reduces the survival and transfer of bacteria. It can be applied to high touch surfaces such as hospital walls, doors, counters and tables without contributing to bacterial resistance or "superbugs." It proved successful in limiting staph aureus, pseudomonas, E coli, MRSA and other potentially lethal bacteria. It is presently being marketed for use in hospitals, public restrooms, laboratories and other areas where bacteria like to flourish. How about my socks and underwear?

## LET'S TRY SOME NEW FILM IN THE CAMERA.

Pfizer and its partners in the United Kingdom, University College London's Institute of Ophthalmology, are gearing up to conduct a human study on a revolutionary treatment for macular degeneration. Human embryonic stem cells have been heavily researched in labs and vigorously debated in Congress and other corridors of power. These stem cells can be transformed into any cell type, making them a potentially useful mechanism for regenerating damaged or diseased tissue and organs. Because the cells are derived from days-old embryos, some religious groups oppose their use in medicine on ethical grounds. The embryos are created at fertility clinics through in vitro fertilization, but not used for fertility procedures. They can be donated for research. The team aims to cover the damaged areas with a patch of retinal cells that have been generated from human embryonic stem cells. The patch can be inserted through a slit in the intact globe and planted in the macular area. The eye is particularly good for implanting stem cell tissue because it is relatively isolated, meaning that any problems are less likely to spread elsewhere.

## BE CAREFUL IF YOU ARE ROTTEN TO THE CORPS. SEMPER FI, PAL.

Store manager Orville Smith, at Best Buy in Atlanta, Georgia, observed a male customer, later identified as Tyrone Jackson, putting a laptop computer under his jacket. When Smith confronted the man, he became irate, drew a knife and ran for the door. Immediately outside the door, four Marines were collecting toys for the "Toys For Us" program. When the Marines stopped Jackson, he stabbed one of them in the back. The

wound did not appear to be severe. After the police and ambulance arrived, the Marine was transported to the hospital for evaluation and care. The thief was also taken to the hospital with two broken arms, a broken ankle, a broken leg, several missing teeth, possible broken ribs, a broken nose, broken jaw and multiple lacerations and contusions. The police report stated that he sustained the injuries when he fell off the curb after he stabbed the Marine.

## THEY WORK OUT WHEN THEY HAVE TO, LIKE JOGGING AFTER THE ICE CREAM TRUCK.

Data Recorded by Trust for America's Health and the Robert Wood Johnson Foundation, found that Mississippi is still the fattest state with 34.4% rate of obesity. They have a seven year most-fat streak going. Colorado recorded the leanest (read, less obese) with 19.8% straining the scales. Hawaii was fifth best at 23.1%. No state was better in 2010 than the previous year, and sixteen were worse. The biggest collection of porkers is in the south where nine of ten states top out. Somewhat alarming in the numbers is that Colorado at 19.8% would have been the fattest in 1995. The most important, even crucial, part of these figures is what it means for heart disease, diabetes, and high blood pressure. America's future is figuratively turning into lard in front of TV sets and computers.

## FOR LAPAROSCOPY USE THREE CLIPS – ONE FOR THE PATIENT, ONE FOR THE SURGEON, AND ONE FOR THE LAWYER.

Pelvic mesh has been used for hernia repair and is well tolerated, so it appeared to be a good solution for pelvic prolapse. When organs such as the bladder, uterus, bowel, and rectum lose support they will fall out of place. Post-menopausal women, especially those with multiple vaginal deliveries, may suffer pain during sexual activity, leakage from the rectum, constipation, and urinary incontinence. In recent years, medical device companies have made and distributed polypropylene mesh kits to gynecologists and urologists for treatment of the problem. The trans-vaginal approach allowed for minimally invasive surgical repair with polypropylene mesh like a sling or hammock to support tissue. The Food and Drug Administration (FDA) gave hasty approval. Perhaps too hasty. In 2008 the FDA advised physicians of serious side-effects associated with the procedure. Reported complications are infection, inflammation, erosion of vaginal tissue, mesh disintegration, perforation of the bowel, bladder, and blood vessels, plus severe pain. In 2011 a study reported in the Journal of Obstetrics and Gynecology Canada (JOGC) stated, "Until adequate effectiveness and safety evidence is available, the use of these devices should be considered experimental." Public Citizen, a consumer advocacy group, petitioned the FDA to recall the mesh slings and reclassify them as a class III medical devices which will require more research and testing. Plaintiffs' attorneys are circling the damaged carcass.

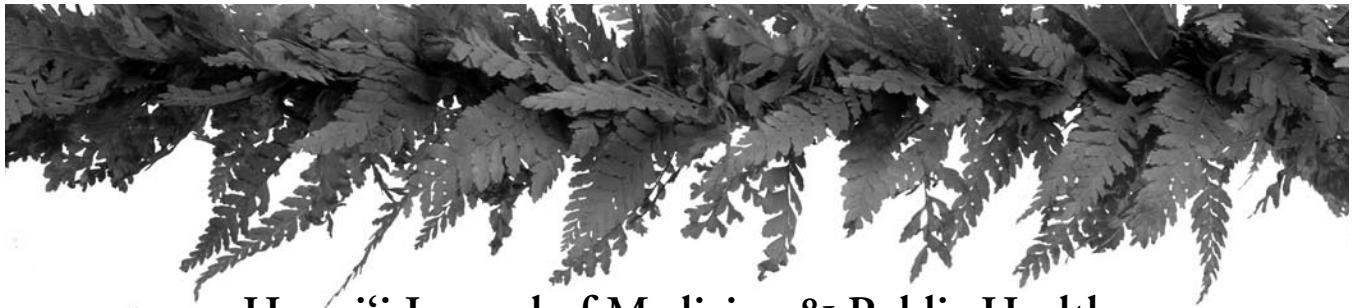
## PROGRESS IS AN ILLUSION.

Patients and physicians alike were very happy with the study which showed that chronic fatigue syndrome (CFS) was caused by a virus. Sad to report that a meticulous study has failed to confirm the previous research. Nine laboratories, including the two that previously identified a viral connection, could not reliably detect the virus or any of its relatives in blood cells from patients. In a further killing blow, one of the labs that contributed the original study retracted its key result. Samples were found to be contaminated. Maybe the virus was there, but just too tired to show up.

## ADDENDA

- The Department of Motor Vehicles in Roseville, California, was closed for one week after a student driver crashed into the building making a five foot hole in the wall. Okay, but did he get a license?
- The difference between Las Vegas and Washington, D.C. Is that in Las Vegas the drunks gamble with their own money.
- Why do women wear perfume that smells like flowers? They would get more attention with an aroma like a new car interior.
- Be careful in there! America's hospitals treat 120 toilet-seat related injuries every day.

**ALOHA AND KEEP THE FAITH** rts  
(Editorial comment is strictly that of the writer.)



# Hawai'i Journal of Medicine & Public Health

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Issue	Space Reservations	Materials
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March 12	February 3	February 10
April 12	March 2	March 9
May 12	April 6	April 13
June 12	May 1	May 8
July 12	June 3	June 10
August 12	July 6	July 13
September 12	August 3	August 10
October 12	September 7	September 14
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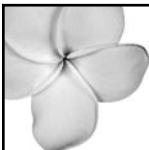
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# UPCOMING CME EVENTS

Interested in having your upcoming CME Conference listed? Please contact Brenda Wong at (808) 536-7702 x103 for information.

Date	Specialty	Sponsor	Location	Meeting Topic	Contact
<b>January 2012</b>					
1/8-1/13	R	University of California San Francisco School of Medicine	Fairmont Orchid, Kona, Hawai'i	A Practical Approach to Breast Imaging	Web: <a href="http://www.cme.ucsf.edu/cme">www.cme.ucsf.edu/cme</a>
1/13-1/14	OBS, PAN, PD, EFM	The Queen's Medical Center	Halekulani, O'ahu	Advanced Fetal Monitoring: A Multidisciplinary Approach	Email: <a href="mailto:cme@queens.org">cme@queens.org</a>
1/16-1/20	CD	Mayo Clinic	Mauna Lani Hotel, Hawai'i	Hawai'i Heart 2012: Case-Based Clinical Decision Making Using Echocardiography & Multimodality Imaging	Web: <a href="http://www.mayo.edu/cme">www.mayo.edu/cme</a>
1/15-1/20	R	University of California San Francisco School of Medicine	Fairmont Orchid, Kona, Hawai'i	Body Imaging: Hot Topics in the Tropics	Web: <a href="http://www.cme.ucsf.edu/cme">www.cme.ucsf.edu/cme</a>
1/23-1/27	IM	Mayo Clinic	Ritz Carlton Kapalua, Maui	24th Annual Selected Topics in Internal Medicine	Web: <a href="http://www.mayo.edu/cme">www.mayo.edu/cme</a>
1/23-1/27	AN	California Society of Anesthesiologists	Hyatt Regency Maui, Ka'anapali Beach, Maui	2012 CSA Winter Hawaiian Seminar	Web: <a href="http://www.csahq.org">www.csahq.org</a>
1/30-2/3	CD	Mayo Clinic	Grand Hyatt Kaua'i, Kaua'i	19th Annual Arrhythmias & the Heart: A Cardiovascular Update	Web: <a href="http://www.mayo.edu/cme">www.mayo.edu/cme</a>
<b>February 2012</b>					
2/3-2/5	GE, HEP, NTR	University of Hawai'i John A. Burns School of Medicine	Hawai'i Prince Hotel, O'ahu	Clinical Updates in Gastroenterology, Hepatology & Nutrition - Hawai'i 2012	Web: <a href="http://www.uhmed.org/index.php/gi-conference">www.uhmed.org/index.php/gi-conference</a>
2/5-2/10	GS	Mayo Clinic	Grand Hyatt Kaua'i, Kaua'i	Mayo Clinic Interactive Surgery Symposium 2012	Web: <a href="http://www.mayo.edu/cme">www.mayo.edu/cme</a>
2/13-2/18	IM	University of California San Francisco School of Medicine	Grand Hyatt Kaua'i, Kaua'i	Infectious Diseases in Clinical Practice: Update on Inpatient and Outpatient Infectious Diseases	Web: <a href="http://www.cme.ucsf.edu/cme">www.cme.ucsf.edu/cme</a>
2/18-2/21	OTO, FPS, OMF	University of California San Francisco School of Medicine	Moana Surfrider Hotel, O'ahu	Pacific Rim Otolaryngology Head and Neck Surgery Update Conference	Web: <a href="http://www.cme.ucsf.edu/cme">www.cme.ucsf.edu/cme</a>
<b>March 2012</b>					
3/25-3/28	GS	University of California San Francisco School of Medicine	JW Marriott Ihilani, O'ahu	The Postgraduate Course in General Surgery	Web: <a href="http://www.cme.ucsf.edu/cme">www.cme.ucsf.edu/cme</a>
<b>April 2012</b>					
4/20	GYN, ON, GO	University of Hawai'i John A. Burns School of Medicine	Ala Moana Hotel, O'ahu	Gynecologic Oncology Conference 2012	Email: <a href="mailto:jlouis@ucera.org">jlouis@ucera.org</a>
4/2-4/7	IM	University of California San Francisco School of Medicine	Wailea Beach Marriott, Maui	Primary Care Medicine: Update 2012	Web: <a href="http://www.cme.ucsf.edu/cme">www.cme.ucsf.edu/cme</a>
<b>June 2012</b>					
6/13-6/16	OPH	UC Davis Health System	Hilton Waikoloa Village, Kohala, Hawai'i	35th Annual Ophthalmology Symposium	Web: <a href="http://www.ucdmc.ucdavis.edu/cme">www.ucdmc.ucdavis.edu/cme</a>
<b>July 2012</b>					
7/29-8/2	ORS, OSM, OTR	Kaiser Permanente	Grand Hyatt Kaua'i, Kaua'i	29th Annual Update in Orthopaedic Surgery Conference	Email: <a href="mailto:kpos@sbcglobal.net">kpos@sbcglobal.net</a>



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