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<b>13. SUPPLEMENTARY NOTES</b> Original contains colored plates: ALL DTIC reproductions will be in black and white.						
<b>14. ABSTRACT</b> The purpose of this research is to investigate whether eating brown seaweed ( <i>Undaria pinnatifida</i> ) can influence breast cancer risk. Brown seaweeds are popular in Japan, where the incidence of breast cancer is about 1/6 the rate of that reported for American women. In several animal studies of diet and cancer, adding seaweed to the normal diet resulted in longer healthy lives. In particular, we will examine cell surface binding characteristics and protein expression associated with the consumption of dietary seaweeds by women without breast cancer, women with estrogen receptor negative breast cancer, and women with estrogen receptor positive breast cancer. Final approval by the Human Subjects Research Review Board (HSRRB) on 28 September 2005. Recruitment for our study is ongoing. Of the 15 subjects required, 14 have been enrolled and 4 have complete the study. The final subject has indicated interest, and will begin the protocol in the next week. The first paper on iodine content in commercially available seaweeds has been published, as has a review of the health effects and a manuscript has been submitted on the bioavailability of seaweed iodine in brown seaweeds.						
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## **INTRODUCTION**

Breast cancer is the second leading cause of cancer among American women. Survival rates at 5 years average 87%, decreasing to 77% at 10 years, 63% at 15 years, and 52% at 20 years<sup>1</sup>. Although current use of tamoxifen and letrozole may have a significant impact on long term survival in the future, an estimated 39,800 American women will die of breast cancer in 2003<sup>1</sup>. There is an urgent need for new treatments for metastatic breast cancer and chemoprevention that can be used to prevent breast cancer recurrence.

Epidemiologic studies comparing breast cancer rates among Japanese women in Japan and American women in the US are supportive that dietary factors could be critical to understanding breast cancer rates. *In vitro* work using seaweed extracts have shown high antitumor activity. *In vivo* work using rats and mice have demonstrated that seaweed, both as part of a regular diet, as an extract in drinking water, and as extracts which were injected into tumor bearing rats, have all confirmed that something in seaweed inhibits cancer formation and can cause tumor remission/tumor rejection in tumor bearing animals.

Although little is known about relative breast cancer risk and seaweed intake among humans, a small body of research, both *in vivo* and *in vitro*, suggests seaweed may be useful in breast cancer prevention. Seaweeds are specifically used to treat tumors in Traditional Chinese Medicine and Japanese folk medicine. On a population level, those people for whom seaweed is a regular part of their diet, most notably in Japan, have dramatically lower rates of hormone sensitive cancers, both of the breast and prostate<sup>2-4</sup>. Epidemiologic studies done in Japan in the 1980s, before Westernized diets were common, reported that Japanese women had 1/3 the rate of premenopausal breast cancer and 1/9 the rate of postmenopausal breast cancer<sup>5</sup>. In addition, when a Japanese woman developed breast cancer, she was more likely to survive at least five years than a woman diagnosed with breast cancer in the United States<sup>6</sup>.

No clinical studies of breast cancer and seaweed have yet been done, however, in a large prospective dietary study 21,852 Japanese nurses in Japan, investigators reported after 9 years of follow-up, that high intake of miso (fermented soybean paste) soup was the food most closely associated with the lowest breast cancer risk<sup>7</sup>. This is particularly interesting since an *in vivo* study compared dietary seaweed water extract to powdered seaweed and to injected seaweed extract, and reported that dietary seaweed water extract was the most effective against induced tumors<sup>8</sup>. Since miso soup is made from a concentrated hot water extract of seaweed plus a tablespoon or less of miso (soybean paste) and usually a few vegetables, it is very suggestive that seaweed and seaweed soup consumption may help explain the lower breast cancer rates of women in Japan. Women who had three or more bowls of miso soup each day had about half the rate of breast cancer (RR 0.51; 95% Confidence Interval 0.32 to 0.83). In two other epidemiologic studies of diet and breast cancer in Japan, 15% lower rates of breast cancer were associated with daily miso soup consumption,<sup>9</sup> and 13% lower rates for women who drank miso soup at least five times /week<sup>10</sup>.

Seaweed are also rich sources of iodine<sup>11</sup>. Iodine deficiency may be a risk factor for breast cancer<sup>12-14</sup>. Additionally, some physicians have reported therapeutic success using oral elemental iodine solution for breast fibrocystic disease<sup>15, 16</sup>. Iodine is critical for the health of newborn infants, and during lactation iodine is concentrated in breast milk and is found in rapidly dividing breast cells. When rapidly dividing breast cancer cells are present in the breast, iodine may also play a role, although the exact mechanism is unclear. Breast cancer cells have lower iodine content than nearby healthy breast cells<sup>12</sup>, and the work of Funahashi and colleagues report protection from dimethylbenzanthracene (DMBA)-induced mammary tumors when iodine was given to the rats in their diet. As a possible mechanism, they reported a high correlation between serum iodine and apoptosis of mammary cancer cells<sup>17-19</sup>. These results, along with those we<sup>20</sup> and others<sup>21-23</sup> have reported for dietary seaweed as inhibitory of DMBA-induced mammary tumors are consistent with the idea that seaweed, possibly via iodine, could be involved in breast cancer prevention.

We were interested in providing a similar amount of seaweed to that eaten in Japan. On average, seaweed intake in Japan is estimated between 7 and 10 g/d dry weight<sup>11</sup>. The bioavailability of the seaweed iodine to humans has been reported<sup>24-26</sup>, and we have therefore chosen a low-iodine seaweed for this study. On average, *Undaria pinnatifida* contains 50 $\mu$  iodine/g. 5 grams of *Undaria* will provide an additional 250 $\mu$  iodine/d, well under the 1,000  $\mu$  iodine/d that is considered the maximum tolerated dose of iodine/d.

## **BODY**

This research project was begun in 1999, at the University of Massachusetts. However, only the initial work on seaweed toxicity was completed before the PI moved to the University of South Carolina. This coincided with the necessity of obtaining Army IRB approval, and although numerous renditions of the grant have now been made, and tentative Army IRB approval was given in August 2003, the study was not officially approved, and further changes have been made to the study design. The Memorandum for Record has been completed, and we are in the process of subject recruitment. We have enrolled 14 of the 15 required subjects, and have a tentative agreement with the possible 15<sup>th</sup> subject for her participation.

Based on the findings of significant changes in cell surface binding characteristics associated with dietary seaweed, we are conducting flow cytometry to analyse changes. These cell surface binding sites are particularly important in breast cancer metastases, CXCR4 and CCR5<sup>27</sup>, and changes in CD36 binding to CD11+ monocytes are associated with angiogenesis<sup>28</sup>. CXCR4 appears to act as a homing signal for metastatic breast cancer cells, binding exclusively to stromal derived factor-1, a cytokine found most abundantly in the liver, lung, and bone, all preferred sites for breast cancer metastases. The role of CCR5 is less well understood in breast cancer metastasis, but is also considered crucial in breast cancer<sup>29</sup>. We will use standard flow cytometry to identify the relative binding site densities and in-depth proteomics to indicate which proteins are involved in both binding site activation and responses to dietary seaweed. Based on concurrent work on breast cancer and CXCR4 and CCR5 changes on CD4 and CD8 cells associated with dietary seaweed as measured by flow cytometry, we will focus on serum T lymphocytes. CD36 is a marker of monocyte, and alterations in this binding site are associated with decreased angiogenesis<sup>28</sup>.

Profiling of serum proteins using surface enhanced laser desorption/ionization time of flight (SLEDI-TOF) mass spectrometry has become increasingly specific and can now identify with high sensitivity and specificity cancer types, including breast cancer based on the specific signature of proteomic serum biomarkers. Recent studies (reviewed by Laronga<sup>30</sup>) have shown that using SLEDI-TOF can differentiate between BrCa1 carriers and healthy controls (13/15 women with BrCa1 compared to one of the 15 non-carriers), 14/16 patients with breast cancer even 6-9 months following treatment for breast cancer, compared to healthy controls, and sentinel lymph node positive (22/27) patients from sentinel lymph node negative (55/71) patients. SELDI ProteinChip® technology is the primary proteomic platform technology for the NCI Early Detection Research Network (EDRN) study of early detection serum biomarkers of prostate cancer (e.g., review by Grizzle et al.<sup>31</sup>; other prostate diseases (e.g., review by Fung<sup>32</sup>, Semmes<sup>33</sup>), ovarian cancer<sup>34</sup> and. In addition, SELDI ProteinChip® technology has been used to identify changes in serum protein expression with the addition of novel foods, like green tea, to the diet<sup>35</sup>.

The purpose of this research is to investigate whether consuming brown seaweed (*Undaria pinnatifida*) can change lymphocyte populations, surface binding sites on CD4 and CD8 cells, and alter serum protein expressions. Specifically we will study CXCR4 and CCR5 cytokine receptor sites, both known to be important in determining location of

breast cancer metastases. To minimize the variation with menstrual cycle phase, and to concentrate on the age group with the highest risk of breast cancer, we will focus on postmenopausal women. Based on our *in vitro* studies showing that seaweed extract has a dose dependent inhibitory effect on estrogen receptor negative (ER-), but no effect on estrogen receptor positive (ER+) breast cancer cells, we anticipate that estrogen receptor status will be an important variable in our study. Our blinded, crossover study design will serve to address the issues of any carry-over effect of seaweed after cessation of seaweed intake.

In a second study done at the University of Massachusetts on the bioavailability of seaweed iodine has now been submitted to the *Journal of Medicinal Food*. Our conclusions were that although 5 grams/day of seaweed, the average daily consumption in Japan, was associated with a statistically significant increase in thyroid stimulating hormone, the increase was small and not biologically important. All clinical values remained within normal limits. This means that our next intervention will be done with a clinically proven safe level of iodine-containing seaweed. A copy of this manuscript is included in the appendix.

A poster presentation of the first results of dietary seaweed on estrogen metabolism and catabolism was presented at the American Association for Cancer Research in April, 2006. A copy of this presentation is included in the appendix.

## **KEY RESEARCH ACCOMPLISHMENTS**

Final approval by the Human Subjects Research Review Board (HSRRB) on 28 September 2005. Recruitment for our study is ongoing. Of the 15 subjects required, 14 have been enrolled and 4 have completed the study. The final subject has indicated interest, and will begin the protocol in the next week.



## REPORTABLE OUTCOMES:

### Manuscripts:

Jane Teas, Lewis E. Braverman, Mindy S Kurzer, Sam Pino, Thomas G. Hurley, James R. Hebert. Seaweed and Soy: Companion Foods in Asian Cuisine and Their Effects on Thyroid Function in American Women. *Thyroid* 14(10):836-841. 2004

Jane Teas. Dietary Brown Seaweeds and Human Health Effects. In: World Seaweed Resources (CD). Ed: Critchley, Alan T , Masao Ohno and Danilo Largo. Publisher Expert Centre for Taxonomic Identification, Univ. Amsterdam. 2006.

### Poster presentations

Teas J, Kurzer M, Hurley T, Sepkovic D, Longcope C, Hebert J. Seaweed, soy, and estrogen metabolism in healthy postmenopausal American women. **American Association for Cancer Research** Annual Meeting, Washington DC, April 1-4, 2006.

**Jane Teas**, Sam Pino, Thomas G. Hurley, Alan Critchley, Lewis E. Braverman Effect of Seaweed Ingestion on Thyroid Function in Postmenopausal Women (P3-675). **Endocrinology Society** Annual Meeting, Philadelphia, PN June 2003.

### Funding applied for and awarded

Dietary Algae as a Modulator of Breast Cancer Metastases: An exploratory Grant to Document Proof of Principle (**Principal Investigator: Jane Teas**). Cancer Prevention and Cancer Control (Department of Defense Award to encourage collaboration between the Medical University of South Carolina and the University of South Carolina). Awarded December 2003.

Dietary Algae and Breast Cancer. University of South Carolina preliminary grant to be used in application for NIH funding of a Cancer Complementary and Alternative Medicine Center. (**Principal Investigator: Jane Teas**). Awarded May 2004.

### Funding applied for:

Changes associated with dietary algae in poor-prognosis breast cancer patients. Project within the University of South Carolina SPORE submission. **P.I.: Jane Teas, Ph.D.**

Cinical intervention for metabolic syndrome. Project within the University of South Carolina EX02 submission. **PI: Jane Teas**

## **CONCLUSIONS**

**Beyond the great variability of iodine in brown seaweed and its bioavailability to humans, we can not make any conclusions until we have data. However, the women in our ongoing study report improved wellbeing, and we anxiously await the results of the clinical data at the conclusion of our study.**

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## **APPENDICES**

1. Teas J, Kurzer M, Hurley T, Sepkovic D, Longcope C, Hebert J. Seaweed, soy and estrogen metabolism in healthy postmenopausal American women. American Association of Cancer Research, Washington DC. April 1-4, 2006.
2. CV of Jane Teas.

# Seaweed, soy, and estrogen metabolism in healthy postmenopausal American women

Teas J<sup>1</sup>, Kurzer M<sup>2</sup>, Hurley T<sup>1</sup>, Sepkovic D<sup>3</sup>, Longcope C<sup>4</sup>, Hebert J<sup>1</sup>

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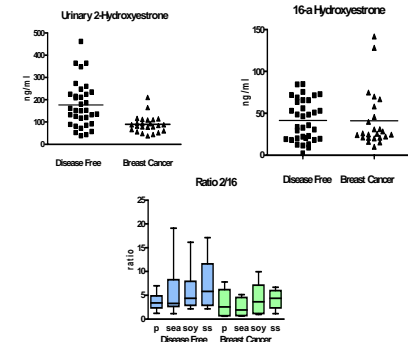
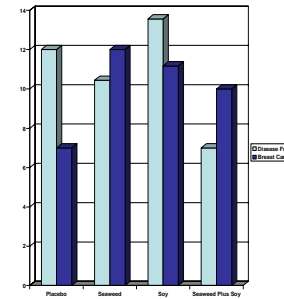
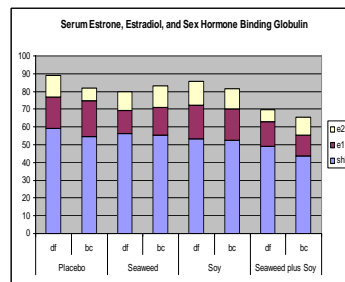
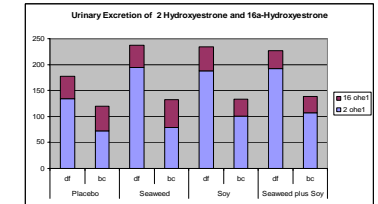
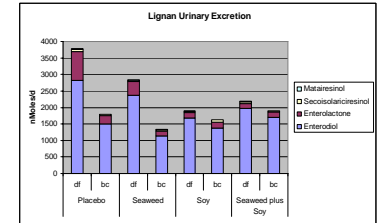
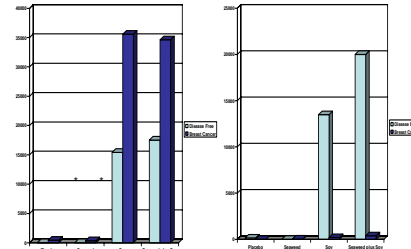
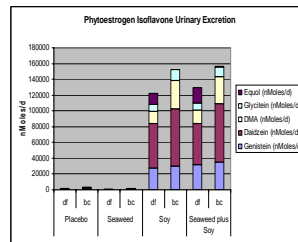
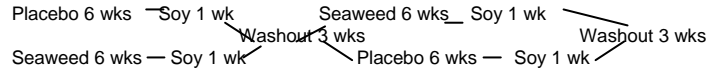
**Introduction:** Seaweed and soy foods are common in Japan and Korea where the incidence and mortality of breast cancer are significantly lower than in the US. Most attention has focused on soy foods and their phytoestrogen content. Seaweeds are known to have an antibiotic effect in vitro and in vivo studies support the idea that dietary seaweed modifies gastrointestinal bacteria populations. We investigated the possibility that dietary seaweed could act as a probiotic when consumed with soy, and enhance the gastrointestinal metabolism of phytoestrogens, especially the increasing the production of equol. Equol production is associated with decreased breast cancer risk.

**Study Design:** Women were randomized to either seaweed or placebo for six weeks, followed by a week when soy supplementation (2 mg isoflavones/kg body weight) was added. A 3-week washout period separated the two arms of the study, after which women were crossed over to the alternate intervention arm. Blood samples for estradiol, estrone, and sex hormone binding globulin were obtained at each clinic visit, and 48-hour urine specimens were provided at each of the time points for phytoestrogen and estrogen metabolite determination.

**Methods:** In a double-blinded placebo-controlled clinical trial, 15 healthy postmenopausal women (average age = 58 years) were recruited to our 17 week study. Six of the women had been treated for early breast cancer but were disease free at the time of the study. None of the women had taken antibiotics in the preceding 3 months or during the study. All were non-smokers and drank alcohol once or fewer times per week.

**Results:** Serum levels of estradiol were lower for women who had never had breast cancer (p=0.04). SHBG levels significantly decreased for both groups of women during the seaweed plus soy supplementation period. No urinary phytoestrogen excretion was reported during the placebo or seaweed interventions, but urinary phytoestrogens were detected during both the soy and seaweed plus soy intervention periods. O-DMA and equol production was significantly different among women who had had breast cancer (p=0.03; p=0.02). Equol production was only seen in women who had never been treated for breast cancer. Urinary lignan excretion was higher among disease free women (p=0.06);

## Randomized Blinded Crossover



	Breast Cancer n=6	Disease free n=9
Age (yr ± SD)	58.8 ± 7.9	59.6 ± 10.1
BMI (± SD)	28.8 ± 3.1	25.1 ± 3.2

## Conclusions:

The presence of seaweed in the Asian diet may act as a probiotic, enhancing intestinal conversion of equol and O-DMA. Since seaweed and soy are often eaten together, some of the benefits of soy may accrue from the combination.

The differences between women who have never had breast cancer and those who have had breast cancer suggest that there may be persistent baseline differences due to disease status.



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**Lecturer** 1990-1991

University of Massachusetts, Department of Anthropology. Boston, MA

Taught two-semester undergraduate course in primate behavior.

**Research Associate** 1984-1985

Harvard University, Department of Anthropology, Cambridge, MA

Infant Care Project. Analyzed data collected on breastfeeding and non-breastfeeding mothers living in the Boston area, co-authored papers, and supervised two research assistants.

**Grants Awarded:**

**University of South Carolina Education Foundation and personal E-Funds at the Department of Health Promotion, Education and Behavior** 2/03-open  
**Algae and AIDS**

**Purpose:** To explore the possibility that dietary algae could prolong symptom-free survival and reduce HIV viral load for HIV positive patients.

**Role:** PI

**Direct Costs** \$2,700

**University of South Carolina Office of Research** 7/04-7/06  
**Part of the Center for Cancer Complementary and Alternative Medicine (CCCAM) at the University of South Carolina**

**Dietary algae in poor prognosis breast cancer**

**Purpose:** To explore the consequences of dietary algae on cell-cell adhesion.

**Role:** PI

**Direct Costs** \$40,000

**Department of Defense / Phase VI Medical University of South Carolina and University of South Carolina** 2/04 – 1/06

**Dietary Algae as a Modulator of Breast Cancer Metastases.**

**Purpose:** To explore validate methods for detecting metastatic breast cancer cells in peripheral blood and to evaluate whether dietary seaweed has an effect on breast cancer cell numbers and CXCR4/SDF-1 binding

**Role: PI**

**Direct Costs** **\$81,084**

**Department of Defense BC996167/DAMD-17-00-1-0659** **10/17/05**

**Do the Effects of Exercise on Breast Cancer Prevention Vary with Environment?**

**Purpose:** To investigate whether the effects of exercise vary with the specific environment (indoors versus outdoors).

**Role: PI**

**Direct Costs** **\$50,000**

**Centers for Disease Control SIP6 U48/CCU409664** **2000-2004**

**Complementary and Alternative Medicine with Curative Intent**

**Purpose:** To investigate the use and efficacy of faith healing and macrobiotics as complementary and alternative medicine as it is currently being used in the Columbia, South Carolina area.

**Role: PI**

**Direct Costs** **\$383,841**

**Department of Defense DAMD17-98-1-8207** **3/31/98 - 5/31/2006**

**Dietary Seaweed and Soy and Early Breast Cancer: A Randomized Trial**

**Purpose:** The major goal of this study is to compare the effects of dietary seaweed and soy to placebo. We are collecting data on biomarkers of breast cancer risk.

**Role: PI**

**Direct Costs** **\$250,000**

**The South Carolina Cancer Center** **July 1, 2000 - June 30, 2001**

**Ratio of Two Urinary Estrogen Metabolites and Risk of Prostate Cancer**

**Purpose:** To determine if estrogen metabolism is correlated with PSA levels and prostate cancer in men.

**Role: PI**

**Direct Costs** **\$14,858**

**Palmetto Health Foundation** **October 2000 - September 2003**

**Pilot Study of HBO Treatment to Reduce Breast Cancer Treatment Related Lymphedema**

**Purpose:** To evaluate the effectiveness of hyperbaric oxygen therapy on breast cancer treatment related lymphedema.

**Role: PI**

**Direct Costs** **\$10,000**

**Susan G. Komen Foundation** 1998-2000

**Brown Seaweed as a Breast Cancer Preventive**

**Purpose:** Evaluate the health effects of chronic seaweed ingestion in healthy postmenopausal women.

**Role: PI**

**Direct Costs** \$250,000

**Earthwatch** 1984

**Rhesus Maternal Care and Demography. Kathmandu, Nepal**

**Purpose:** Collect primate behavioral data.

**Role: PI**

**Transportation and Cost of Living Support**

**Wallace Genetic Foundation** 1982

**Seaweed and Breast Cancer**

**Purpose:** Pilot study to explore the effects of dietary seaweed in a rat Dimethylbenzanthracene (DMBA) mammary carcinogen model

**Role: PI**

**Direct Costs** \$10,000

**Earthwatch** 1978

**Male Behavior of Rhesus Kathmandu, Nepal**

**Purpose:** Collect primate behavioral data on non-troop males and their social behavior.

**Role: PI**

**Earthwatch** 1977

**Rhesus Troop Home Range Behavior**

**Purpose:** Collect information on the home range behavior of two troops of monkeys living in temples in Kathmandu, Nepal.

**Role: PI**

**Transportation and Cost of Living Support**

**National Geographic Society** 1974-1978

Temple Monkeys of Kathmandu Nepal

**Purpose:** Collect information on monkeys living in two temples in Kathmandu Nepal

**Role: Project Leader**

**Peer Reviewed Publications**

**Teas J.**, Fitton J.H., Irhimeh M., Ghumare S., Hand G., Phillips K., Randolph L.J., Belay A., Dudgeon W., Daniels D., Postic B. Enhancement of CD4 cell counts in people with HIV taking dietary algae supplements. Abstract number CDB0875. CD-ROM and Conference website. XVI International AIDS Conference and Toronto, Canada, 13-18 August 2006.

**Teas J.**, Cunningham JE, Fowke JH, Nitcheva D, Kanwat CP, Boulware RJ, Sepkovic DW, Hurley TG, Hebert JR. Urinary estrogen metabolites, prostate specific antigen, and

body mass index among African-American men in South Carolina. **Cancer Detection and Prevention**. 2005 29: 494-500.

**Teas J**, Holland M, Ghumare S, Nitcheva D, Dudgeon WD, Ogoussan K, Hand G. (2005) Do the effects of exercise vary with environment? **Cancer Epidemiology Biomarkers & Prevention** 14 (11): 2755S-2756S Part 2 Suppl. S.

Adams, SA, Modayil, MV, Daguise, VG, Berger, SH, Horner, MJD, **Teas, J**, Brandt, HM, Mitas, M, Mosley, CM, Johnson, MG, Cunningham, JE, Butler WM, Hebert JR. Breast cancer disparities in South Carolina: Early detection, special programs, and descriptive epidemiology. **The eJournal of the South Carolina Medical Association**. 2005:E188-194.

**Teas J**, Patterson K, Royer J. Could Dietary Algae protect against HIV Progression? **HIV Nutrition Update** February 15, 2005

**Teas J**, Pino S, Critchley A, Braverman LE. Variability of iodine content in common commercially available edible seaweeds. **Thyroid** 2004;14(10) 836-841.

**Teas J**, Cunningham JE, Cone L, Jansen K, Raghavan SK, Nitcheva DK, Xie D, Butler WM. Can hyperbaric oxygen therapy reduce breast cancer treatment-related lymphedema? A pilot study. **Journal of Women's Health** 2004;13(9):1008-1018.

**Teas J**, Hebert JR, Fitton HJ, Zimba PV. Algae – a poor man's HAART? **Medical Hypotheses** 2004;62, 507-510.

**Teas J**, Cunningham J, Rice G S Rice, P Verma, CP Kanwat, J Whetstone, J Hebert, A Kushi, T Leatherman, A Cousins, LH Kushi  
Macrobiotics and cancer: Interviews with practitioners and their impressions of efficacy of macrobiotics for healing from cancer. **Cancer Epidemiology Biomarkers & Prevention** 11(10):D136 Part 2 Oct 2002

Kushi LH, Cunningham, Hebert JR, Lerman RH, Bandera EV, **Teas J**. The Macrobiotic Diet in Cancer. **Journal of Nutrition**. 2001; 131: 3056S-3064S.

Cunningham JE, Cousins A, **Teas J**, Kushi L. Macrobiotics for Health, Healing and Cancer Prevention: Progress Report. **Journal of Nutrition** 131(11S): 3152S-3153S. 2001.

Dai Q, Shu X-O, Jin F, Potter JD, Kushi LH, **Teas J**, Gao Y-T, Zheng W. Population-based case-control study of soyfood intake and breast cancer risk in Shanghai. **British Journal of Cancer** 2001; 85(3), 372-378.

Hebert JR, Gupta PC, Bhonsle RB, Mehta H, Zheng W, Sanderson M, Teas J. Nutrient exposures and oral precancerous lesions in Srikakulam District, Andhra Pradesh, India. **Public Health Nutrition** 2001; 5(2), 303-312.

Hebert, JR, Hurley TG, Olendzki BC, **Teas J**, Ma Y. Re: Nutritional and socioeconomic factors in relation to prostate cancer mortality: a cross-national study. **Journal of the National Cancer Institute** 1999;91(8):725-726. Letter.

Hebert JR, Hurley TG, **Teas J**, Olendzki B, Ma Y, Hampl JS. Nutritional and socioeconomic factors in relation to prostate cancer mortality: a cross-national study. **Journal of the National Cancer Institute** 1998;90:1637-1647.

Massion AO, **Teas J**, Hebert JR, Wertheimer MD, Kabat-Zinn J. Meditation, melatonin, and breast/prostate cancer. **Medical Hypotheses**, 1995; 44:39-46.

Hebert JR, Miller DR, Toporoff ED, **Teas J**, Barone J. Black-white differences in U.S. cancer rates: A discussion of possible dietary factors to explain large and growing divergences. **Cancer Prevention** 1991; 1:141-156.

Elias M, **Teas J**, Johnson J, Bora C. Nursing Practices and Lactation Amenorrhoea. **Journal of Biosocial Science** 1986; 18: 1-10.

Beldekas J, **Teas J**, Hebert JR. African Swine Fever Virus and AIDS. **Lancet** .March 8, 1986; 546-565.

**Teas J**, Harbison ML, Gelman RS. Dietary seaweed (Laminaria) and mammary carcinogenesis in rats. **Cancer Research** 1984; 44: 2758-2761.

**Teas J**. Can AIDS agent be a new variant of African Swine Fever V **Lancet** April 23, 1983; 923.

**Teas, J**. The dietary intake of Laminaria, a brown seaweed, and breast cancer prevention. **Nutrition and Cancer** 1983; 4(3):217-222.

**Teas J**, Feldman IT, Richie TL, Taylor HG, Southwick CH. Sex Differences in aggressive behavior of free-ranging rhesus monkeys in Kathmandu, Nepal. **Aggressive Behavior** 1982; 8:63-77.

**Teas, J**. The consumption of seaweed as a protective factor in the etiology of breast cancer. **Medical Hypotheses** 1981; 7(5):601-613.

**Teas J**, Shrestha R, Richie TL, Taylor HG, Turner GK, Southwick CH. Parturition in rhesus monkeys (Macaca mulatta) **Primates** 1981; 22(4):580-586.

**Teas J**, Richie TL, Taylor HG, Southwick CH. Natural population regulation of rhesus monkeys in Kathmandu, Nepal. **Folia Primatologica**. 1981; 35:117-123

Bishop N, Blaffer Hrdy S, **Teas J**, Moore J. Qualitative and quantitative definitions of human influence in habitats of South Asian monkeys. **International Journal of Primatology** 1981; 2(2): 153-167

Richie TL, Shrestha R, **Teas J**, Taylor HG, Southwick CH. Rhesus monkeys at high altitudes in northwestern NEPAL. **Journal of Mammalogy** 59(2): 443-444.

Taylor HG, **Teas J**, Richie TL, Southwick CH. Social interaction between adult male and infant rhesus monkeys in Nepal. **Primates** 1978; 19(2): 343-351.

### **Publications in Press**

### **Book Chapters**

J. Helen Fitton, **Jane Teas**. Marine algae and polysaccharides with therapeutic applications. In **Marine Nutraceuticals**, Ed Colin Barrow. CRC Press. In Press.

**Teas J**. Dietary Brown Seaweeds and Human Health Effects  
**Seaweed Resources** 2006. Ed: Critchley, Alan T, Masao Ohno and Danilo Largo  
Expert Centre for Taxonomic Identification, Univ. Amsterdam.

Massion AO, **Teas J**, Hebert JR. Meditation, melatonin, & cancer. **Melatonin in Psychiatric & Neoplastic Disorders**. Shafii M & Shafii S, Eds., American Psychiatric Press, Inc., 1997, Washington DC.

**Teas J**. Considerations in searching for the cause of AIDS. Acquired Immune Deficiency Syndrome 1984. Ed by Selikoff IJ, Teirstein AS and Hirschman SZ. **Annals of the New York Academy of Sciences**, Vol. 437:270-272.

**Teas J**. Rhesus monkey aggression and grooming social dynamics. In **Female Primates: Studies by Women Primatologists**. Edited by Small MF. Alan R. Liss, Inc: New York. Monographs in Primatology. 1984; Vol. 4:237-247.

**Teas, J**. Ecological considerations important in the interpretation of census data on free-ranging monkeys in Nepal. 1983. In **Perspectives in Primate Biology**. Edited by Seth, PK. Today and Tomorrow's Printers: New Delhi.

**Teas J**, Richie TL, Taylor HG, Southwick CIT. Population patterns and behavioral ecology of rhesus monkeys (*Macaca mulatta*). 1980. In **The Macaques; Studies in Ecology, behavior and Evolution**. Edited by Lindburg DG. Van Nostrand Reinhold Co: New York. pp 247-262.

Southwick GH, Richie TL, Taylor HG, **Teas J**, Siddiqi MF. Rhesus monkey populations in India and Nepal: Patterns of growth, decline, and natural regulation. In: **Biosocial Mechanisms of Population Regulation**. 1980. Edited by Cohen MN, Malpass RS, and Kelin HG. Yale University Press: New Haven. Pp 151-170.

**Teas J**, Richie TL, Taylor HG, Southwick CIT. Seasonal influences on aggression in Macaca mulatta. In: **Recent Advances in Primatology** 1977. Edited by Chivers, D. Academic Press: London.

**Book Submitted:**

**Jane Teas**, Mindy Holland. **Faith that Heals**. Submitted to First Edition Press.

**Papers Submitted:**

**Teas J**, Braverman LE, Kurzer MS, Pino S, Hurley TG, Hebert JR. Seaweed and Soy: Companion Foods in Asian Cuisine and Their Effects on Thyroid Function in American Women

Heiney SP, McWayne J, **Teas J**. Being Real on Holy Ground: The Lived Experience of Hospital Chaplains

**Non-peer reviewed publications**

**Teas J**. Series #2: Lawn Care Regulation. **Pesticides and Drinking Water Bulletin** 1987: 1-6.

**NESCAUM Health Evaluation Document for Tetrachloroethylene (J Teas, ed)** NESCAUM, 1986.

**Teas J**. Update on Perchloroethylene. **National Air Toxics Information Clearing House Newsletter** 1986; 3.

**Teas, J**. Regional Air Toxics Strategy. **National Air Toxics Information Clearing House Newsletter** 1985; 2(5): 6-7.

Hebert JR, **Teas J**. Urban third world children: exposure to toxic substances among the nutritionally compromised. **Science for the People** 1985; 17(6) 18-22.

**Teas J**. Temple Monkeys in Nepal. **National Geographic** April 1980; pp 575-584.

**Teas J**, Taylor HG, Richie TL, Southwick CH. Behavioral ecology of rhesus monkeys in Kathmandu, Nepal. **Nepal Nature Conservation Society Annual Report** 1978.

**Teas J**, Taylor HG, Richie TL, Southwick CH. Ecology and behavior of rhesus monkeys in Nepal. **Final Report to the National Geographic Society** April 15, 1977. 103 pp.

**Teas, J**. Some epidemiological considerations of children under fifteen treated by the staff of the Kunde Hospital, Nepal, 1966-1972. **Department of Local Development/UNICEF Research cum Action Project** Paper No. 1. Kathmandu,



Nepal. 1973.

### **Papers Presented**

**Teas, J.** Whispers of the Heart. **National Women's History Keynote Presentation. SC Corrections.** March 17, 2006.

**Teas J,** M Holland M.Div., D Nitcheva, Ph.D., G Hand, Ph.D., S Ghumare, W Dudgeon, K Ogoossan, MPH. Are the Effects of Walking Different Outdoors and Indoors? **American Society of Preventive Oncology,** Washington DC, February 28, 2006.

**Teas J.** Complementary and Alternative Medicine. Health Promotion Class Nov. 30, 2005.

**Teas, J.** Translating alternative medicine. Epidemiology Lunchtime Seminar, School of Public Health, University of South Carolina. February 25, 2005.

**Teas J** Dietary Seaweeds and Breast Cancer. **British Phycology Society** Lancaster, England January 2004.

**Teas J.** HIV and Edible Algae: Preliminary Findings. **XVIII International Seaweed Symposium.** Bergen, Norway June 2004.

**Teas J.** Macrobiotics and Peace. **American Anthropology Association.** Chicago IL. November 21, 2003.

**Teas J.** Macrobiotics for Cancer: Theory and Practice. **Society of Applied Anthropology.** Portland Oregon. March 19-23, 2003.

**Teas J.** The Cultural Construction of Seaweed: From Slime to the Macrobiotic Sublime. **Society for Applied Anthropology.** Atlanta GA. March 6-10, 2002.

**Teas J.** "Healing among the faithful" **University of South Carolina Medical Humanities Lunch Seminar,** October 30, 2002.

**Teas J,** Heiney SP, Cousins A, and Khushf G, with P. Verma, C.P. Kanwat, G. Jackson and V. Moore. "Concepts of Healing Among Doctors and Patients." **The Carolinas Medical Humanities Group.** College of Charleston. Saturday, September 21, 2002.

**Teas J.** Health Effects of Seaweed. **International Macrobiotic Summer Conference.** Allardsoog-Holland. July 14-20, 2001.

**Teas J.** Faith and Healing: Overview of a new study at USC. **Alpha Xi Chapter of the Sigma Theta Tau International Honor Society of Nursing.** Columbia, SC Feb 23, 2001.

**Teas J.** A Review of Iodine and Arsenic in Dietary Seaweeds. **Kushi Institute Summer Conference** 2000.

Kushi LH, Akbar CR, Hebert JR, Lerman RH, Lerner A, Pollack S, Potter JD, **Teas J**, Gallagher M, Kushi M. Study of the Macrobiotic approach to cancer: A best case series. **American Public Health Association**. 124<sup>th</sup> Annual Meeting, New York, NY. Nov 17-21, 1996.

### **Posters Presented**

**Teas J**, Kurzer M, Hurley T, Longcope C, Sepkovic D, Hebert J. Seaweed, soy, and estrogen metabolism in healthy postmenopausal American women. AACR Annual Meeting Washington DC April 1-5, 2006

**Teas J**. Dietary Algae and Breast Cancer. Hollings Cancer Center MUSC 5th Annual Research Retreat Citadel's Holliday Alumni Center, November 18, 2005

**Teas J**, Holland M, Ghumare S, Nitcheva D, Ogoussan K, Dudgeon W, Hand G. Do the Effects of Exercise Vary with Environment? Fourth Annual **AACR International Conference on Frontiers in Cancer Prevention Research** Baltimore Convention Center, October 30-November 2, 2005.

**Teas J**, Ph.D., Fitton HJ, Ph.D., Irhimeh M, M.S., Ghumare S, BOMB<sup>3</sup>, Talwani R, M.D.<sup>4</sup>, Phillips KD, Ph.D.<sup>5</sup>, Hand G, Ph.D.<sup>3</sup>, Dudgeon W, M.S.<sup>3</sup>, Daniels D, M.D., Randolph LJ, M.D., Belay A, Ph.D. Dietary Algae as Modulator of CD4 Cell Counts in People with HIV. **3rd Annual SC Nutrition Research Summit** on Friday, November 4, 2005 Columbia Conference Center, Columbia SC.

**Teas, J**, , Holland, M., Ghumare, S Do the Effects of Exercise on Breast Cancer Prevention Vary with Environment? **South Carolina Public Health Association** May 25, 2005 Myrtle Beach , SC.

**Ghumare, S., Teas, J.** AIDS Epidemic in India - Exploring New Alternatives **SCPHA** May 25, 2005 Myrtle Beach , SC.

**J Teas**, Ghumare S, Talwani R, Fitton JH, Belay A, Irhimeh M Eat Algae to Slow down HIV? A Pilot Study and Economic Feasibility Case Study in India. **2nd Annual SC Nutrition Research Summit**. October 29, 2004 Columbia, SC.

**Teas J**, Pino S, Hurley TG, Critchley A, Braverman LE. Effect of Seaweed Ingestion on Thyroid Function in Postmenopausal Women P3-675 **Endocrinology Society** Annual Meeting, Philadelphia, PN June 2003.

Vitoc C, Cunningham J, Heiney SP, **Teas J**, Jansen K, Gregory L. A survey of lymphedema among breast cancer survivors: Preliminary results. **Hollings Cancer Center** MUSC 3rd Annual Research Retreat, Isle of Palms, SC Dec 5, 2003

**Teas J**, Cousins A, Heiney SP, Verma P, Kanwat CP, Jackson TG, Moore V. Healing Imagery Among Charismatic Christians in South Carolina. **International Center for the**

**Integration of Health and Spirituality (ICHS)** Integrating Research on Spirituality and Health and Well-Being Into Service Delivery: A Research Conference April 1-3, 2003, National Institutes of Health Campus, Bethesda, Maryland

Heiney SP, McWayne J, **Teas J**. Holy Ground: A phenomenological study of hospital chaplains. **International Center for the Integration of Health and Spirituality (ICHS)** Integrating Research on Spirituality and Health and Well-Being Into Service Delivery: A Research Conference April 1-3, 2003, National Institutes of Health Campus Bethesda, Maryland

**Teas J**, Raghavan S, Nitcheva D, Lamb L, Meeh P, Bopp C, Thompson R, Zhang Q, Reisman D, Zimba P, Carraway R, Davis JM, Muga S, Kanwat CP, Durstine JL. Can Eating Seaweed Make a High Fat Fast Food Breakfast Healthier? **First Annual SC Nutrition Research Consortium**, October 17, 2003. Irmo, SC

Harmon B, MS, RD; **Teas J**, PhD; Hebert JR, ScD; Hurley T, Ehlers M. A Comparison of typical Macrobiotic Diets to the Dietary Reference Intakes - Preliminary Results. **First Annual SC Nutrition Research Consortium**, October 17, 2003. Irmo, SC

Raghavan R, **Teas J**, Cunningham J, Cone L, Jansen K, Nitcheva D, Xie D, Deng, Z, Butler W. Can Hyperbaric Oxygen Therapy Reduce Breast Cancer Treatment-Related Lymphedema? **Hollings Cancer Center MUSC 3rd Annual Research Retreat**, Isle of Palms, SC Dec 5, 2003.

**J Teas**, JE Cunningham, G Rice, S Rice, P Verma, CP Kanwat, J Whetstone, J Hebert, A Kushi, T Leatherman, A Cousins, LH Kushi. Macrobiotics and Cancer: Interviews with Macrobiotic Practitioners. **American Association of Cancer Research International Conference on Frontiers in Cancer Prevention Research**. Boston MA. October 14-18, 2002.

AL Cousins, G Jackson, S Heiney, P Verma, CP Kanwat, JE Cunningham, G Khushf, **J Teas**. Faith and Healing among Christians in South Carolina. Spirituality & Healing in Medicine. **Harvard Medical School and The Mind/Body Medical Institute**. Boston MA. Dec 15-17, 2001.

AL Cousins, S Heiney, P Verma, JE Cunningham, G Khushf, **J Teas**. Data in search of analysis: How can we understand patient narratives that attribute healing to faith? **Alpha Xi Chapter of the Sigma Theta Tau International Honor Society of Nursing**. Columbia, SC February 2001.

**Teas J**, Pino S, Cunningham J, Hurley T, Critchley A, Braverman L. Iodine in Dietary Seaweeds: Range of Values and Possible Concerns. **XVIIth International Seaweed Symposium**. Cape Town South Africa. Jan 28-Feb 2, 2001.

Cunningham J, Cousins A, **Teas J** & Kushi. L. Macrobiotics for Health, Healing and Cancer Prevention: Progress Report. **American Institute for Cancer Research**. Washington DC. July 16-17, 2001.

Cunningham J, **Teas J**, Jack A, Cousins A, and Kushi L. Macrobiotics and Cancer. **Royal Society of Chemistry** Biologically Active Phytochemicals in Foods. Norwich, UK. Sept.26-28, 2001.

**Teas, J.**, Cunningham, J.E. and Braverman, .Dietary Seaweed and Soy and Early Breast Cancer: A Randomized Trial. Era of Hope **Department of Defense** Conference Proceedings, June 8-11, 2000

### **Peer Reviewer for:**

Bio-Medical Central: Complementary and Alternative Medicine  
Nutrition Research  
Journal of Nutrition  
International Immunopharmacology  
Journal of Pharmacy and Pharmacology.  
Molecular and Cellular Biochemistry (2 manuscripts)  
Clinical and Experimental Pharmacology and Physiology  
Chemico-Biological Interactions (4)  
International Journal for Vitamin and Nutrition Research

### **Doctoral Committee(2005-2006)**

Mr. A. Gnanapragasam  
Department of Biochemistry,  
University of Madras, Guindy campus, Chennai  
India

### **Review Committees**

1996-1999 University of Massachusetts IRB  
1998 University of Massachusetts Internal Grant Review  
2004 University of South Carolina Research Centers of Economic Excellence Review

### **Conferences Organized**

Epidemics: Past, Present, and Future. The Carolinas Medical Humanities Group. Spring Meeting (Local arrangements in Columbia): The University of South Carolina, Columbia. Saturday March 29, 2003.

### **Other Activities**

Expert testimony given to FTC in support of SeaVegg  
South Carolina Science Fair Judge 2000-present

Breast cancer telephone support group invited guest speaker  
Winterim supervisor for Heathwood Hall sophomore (March 6-10, 2006)

### **Government Testimony**

Expert testimony to the United States Food and Drug Administration on behalf of SeaVegg. May, 2005.

Comments to the United States Food and Drug Administration on merits of Fucus weight loss patches. December, 2004.

Comments in support of the Macrobiotics Best Case Series made to the Cancer Advisory Panel for Complementary Medicine (CAPCAM) February 25, 2002. Democracy Plaza, Bethesda, Maryland.

<http://nccam.nih.gov/about/advisory/capcam/minutes/2002feb.htm#6>

### **Patent Application**

University of South Carolina Patent Office  
USCRF No. 380.01b-PPA (**Teas**)  
Algae and AIDS (PPA)  
Provisional Patent Application  
May 4, 2005

### **Work Experience**

Invited lectures  
Claflin College/USC noon lunch series  
HIV and Algae

HPEB Class  
Complementary and Alternative Medicine  
November 30, 2005

### **Complementary and Alternative Medicine Studies**

Copy-edited 2,780 pages of transcripts that were then given to the Smithsonian Museum of American History permanent research collection December 28, 2004

### **Earthwatch and National Geographic**

Designed and directed various primate research projects, trained 60 volunteers in behavioral methodologies, coordinated the on-site data collection and analysis in Kathmandu, Nepal, worked with primatology colleagues, analyzed data, interpreted data, wrote papers

**President**

Tobin Hill, Inc

1987-1991

Co-created a company to produce and sell seaweed-based moisturizer. Co-designed product, identified chemist and seaweed ingredients, co-designed label, wrote bylaws, filed incorporation paperwork, co-wrote advertising, co-designed business plan, co-designed packaging, identified packaging company, did order fulfillment, oversaw mail order advertising, kept accounts, and filed taxes and filed un-incorporation paperwork.

**President** Human Ecology Associates 1986-1987  
Dorchester, MA

Organized and moderated one-day workshops for New England Interstate Water Pollution control commission on Pesticides and Drinking Water. Edited newsletter on “Potatoes, Pesticides, and Problems” workshop, wrote newsletter on “Lawncare”; Organized and provided logistical support for two day workshop on Contaminated fish and Shellfish; wrote final summary of workshop for EPA Region I.

Organized and conducted field research on possible animal vectors of AIDS. Identified hogs living in the Belle Glade, Florida AIDS epicenter, coordinated collection of hog blood and delivery of the blood to Pirbright Labs in England. Collected ticks from houses and nearby areas to the Belle Glade epicenter. Arranged for the ticks to be tested for AIDS transmission.

**Consultant** UNICEF 1987  
Kampala, Uganda

Designed and wrote a grant to the World Health Organization for \$20,000,000 for the UNICEF AIDS public health program in Uganda.

**Toxics Coordinator** New England Interstate 1985-1986  
Water Pollution Control  
Commission  
And  
Northeast States for Coordinated  
Air Use Management  
Boston, MA

Coordinated interstate workgroups on aquatic toxicity, pesticides, drinking water, and health, and air toxics for the six New England states, New York, and New Jersey. Edited regional air toxics risk assessments for tetrachloroethylene and trichloroethylene.

**Medical Writer** “New York Native” 1984-1991

Summarized information on AIDS for a general audience. The “New York Native” was a gay newspaper in New York City. My particular focus was on African Swine Fever Virus and AIDS.

**Consultant**

John Snow Inc  
210 Lincoln St.  
Boston, MA 02111

1981, 1982  
and 1983

Provided an annotated bibliography of available research relating to traditional medical practices and health attitudes of people in Nepal, and the status of women in Nepal; designed two goiter intervention programs for a health project in Nepal.

**Collaborator**

Legal Medicine  
Harvard School of Public Health  
665 Huntington Ave  
Boston, MA 02115

1982

Interviewed doctors, nurses, data managers, and hospital administrators about perceived problems with informed consent procedures for cancer patients.