REVISITING THE NEUTROPENIC DIET

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OBJECTIVES

• To review the purpose of the Neutropenic diet and non-standardized guidelines.

• Discuss the current debate to revise nutritional recommendations and practices for immunosuppressed patients.
PUBLIC HEALTH GRAND ROUNDS
DECEMBER 17, 2009

• Foodborne Diseases: Better Prevention with Better Public Health Information
  • The Division of Foodborne, Bacterial, and Mycotic Diseases
    National Center for Zoonotic, Vector-borne, and Enteric Diseases

• http://intranet.cdc.gov/od/odweb/about/directorGrandRounds.htm
THE ORIGIN OF THE NEUTROPENIC DIET

• Neutropenia makes one more susceptible to infection

• Neutropenic precautions are taken to reduce risk of bacterial, fungal, and viral infections

• It is known that foods, especially fresh fruits and vegetables, contain pathogens.
  • E. coli, Pseudomonas aeruginosa, other gram-negative bacilli, mold and other microbes can lead to serious infections

• Chemotherapy and radiation can further compromise gut integrity in the immunosuppressed
  • Bacterial translocation

• Thus the origin of the Neutropenic diet...
NEUTROPENIC DIET VS. GENERAL HOSPITAL DIET

- 206 patients with AML or high risk MDS to receive induction chemo
- 78 patients randomized to not receive raw fruits or vegetables
- 75 patients randomized to receive fresh fruits and vegetables (were encouraged to have at least 1 serving per day)
- 53 patients opted to not be randomized but follow the hospital’s policy of eating a diet without raw fruits and vegetables

NEUTROPENIC DIET VS. GENERAL HOSPITAL DIET

• Occurrence of major infections:
  • 29% of patients from the cooked foods group
  • 35% of patients allowed raw fruits and vegetables
  • 36% of the nonrandomized group developed a major infection

• Incidence of pneumonia was higher in the cooked foods group

• Incidence of bacteremia was higher in the raw foods group

• Survival in all 3 groups was as expected for newly diagnosed AML or MDS: cooked food group 56%, raw food group 61%, and nonrandomized group 64%

• Concluded little was gained from the use of a Neutropenic diet
  • Rates of major infection and death were similar for both groups.

NEUTROPENIC DIET VS. GENERAL HOSPITAL DIET

- Retrospective study, Northwestern Memorial Hospital, 726 consecutive HSCT (Autologous and Allogeneic) recipients
  - 363 received a Neutropenic diet (ND)
  - 363 received a General Hospital diet (GD)

- ND excluded all fresh fruits/vegetables, black pepper, raw and undercooked meats/cheeses, cold smoked fish, raw dairy products, raw grain, and brewer’s yeast.

- GD followed mandated safe food handling practices, permitted black pepper, washed fresh fruits and vegetables but excluded raw tomatoes, seeds, and grains


Trifilo, S., Helenowski, I., Giel, M., Gobel, B., Pi, J., Greenberg, D., and Mehta, J. (2012). Questioning the role of a Neutropenic diet following hematopoietic stem cell transplantation. Biology of Blood Marrow Transplantation, 18 (9), 1385-1390
NEUTROPENIC DIET VS. GENERAL HOSPITAL DIET

- Of statistical significance, there were fewer microbiologically confirmed infections in the GD group (P<0.0272).
- Diarrhea was more common in the ND group (<0.095).
- Overall hospital length of stay and mortality were similar in both groups.
- ND groups stayed in house longer after engraftment in both Auto-HSCT recipients (5 days vs. 4 days) and Allogeneic HSCT recipients (10 days vs. 9 days).
- Concluded no benefit in maintaining a low microbial diet.

**Table 2. Results**

<table>
<thead>
<tr>
<th></th>
<th>ND</th>
<th>GD</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total microbiologically confirmed infections, n</td>
<td>135</td>
<td>106</td>
<td>.03</td>
</tr>
<tr>
<td>During neutropenia, n</td>
<td>100</td>
<td>85</td>
<td>.22</td>
</tr>
<tr>
<td>After resolution of neutropenia, n</td>
<td>35</td>
<td>16</td>
<td>.01</td>
</tr>
<tr>
<td>Diarrhea, n</td>
<td>294</td>
<td>276</td>
<td>.10</td>
</tr>
<tr>
<td>Grade II-IV acute GI GVHD, n</td>
<td>19</td>
<td>10</td>
<td>.13</td>
</tr>
<tr>
<td>Hospital length of stay, days (range)</td>
<td>18</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Autologous (overall LOS)</td>
<td>16 (10-73)</td>
<td>16 (8-71)</td>
<td>.13</td>
</tr>
<tr>
<td>Autologous (day of engraftment to day of discharge)</td>
<td>5</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Allogeneic (over LOS)</td>
<td>26 (12-92)</td>
<td>26 (14-160)</td>
<td>.13</td>
</tr>
<tr>
<td>Allogeneic (day of engraftment to day of discharge)</td>
<td>10</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Overall mortality, n</td>
<td>17</td>
<td>18</td>
<td>.58</td>
</tr>
</tbody>
</table>
ONGOING RESEARCH

• The Effectiveness of the Neutropenic Diet in Pediatric Oncology Patients (NCT00726934)
  - Estimated Enrollment: 400 Study
    • Start Date: September 2007
    • Estimated Study Completion Date: December 2013
    • Estimated Primary Completion Date: December 2013 (Final data collection date for primary outcome measure)

• Outpatient Neutropenic Diet Study (NCT00947648)
  - Enrollment: 30 Study
    • Start Date: July 2009 Primary Completion Date: March 2013 (Final data collection date for primary outcome measure)
REVISING THE NEUTROPENIC DIET

• The concept of the Neutropenic diet isn’t supported using evidenced-based practice.

• There’s no standard guidelines for the Neutropenic diet.

• Transition to Standard Safe Food Handling guidelines for prevention of foodborne illness.

ROLE OF PUBLIC HEALTH

- Foodborne disease surveillance and outbreak investigations have been the primary driver to prompting foodborne disease prevention by the industry by:
  - Identifying new foodborne pathogens
    - Example: E. coli O157 and hamburgers, 1982, 2 outbreaks, 43 cases
  - Identifying new risky practices
    - Example: Chopped garlic-in-oil and botulism, 3 cases in NY, unrefrigerated
      - research determined need to acidify
  - Identifying foods not previously recognized as high risk
    - Examples: peanut butter, peanut paste, dried dog food, bagged fresh cut spinach, bagged fresh-cut lettuce, cookie dough flour, imported pepper, and Chinese dried vegetable flavoring
FOODBORNE ILLNESS

- Norovirus and Food
  - Norovirus is a leading cause of disease from contaminated foods in the United States.
  - Foods that are most commonly involved in foodborne Norovirus outbreaks include: leafy greens (such as lettuce), fresh fruits, and shellfish (such as oysters).

- Food may also be contaminated if it is grown in or irrigated with water contaminated with Norovirus, as has been shown with oysters, lettuce, and raspberries.

http://www.cdc.gov/foodborneburden/questions-and-answers.html
CHALLENGE: A BROAD RANGE OF FOODS CAN BE CONTAMINATED

- Prevention often focuses on specific foods
- 2003-2007: Illnesses in 1,355 outbreaks caused by single food

![Pie chart showing the distribution of food types associated with foodborne illnesses.](chart.png)
TRENDS IN FOODBORNE ILLNESS

Changes in incidence of laboratory-confirmed bacterial infections, U.S., 2010*

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Decrease</th>
<th>Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yersinia</td>
<td>52%↓</td>
<td></td>
</tr>
<tr>
<td>Vibrio</td>
<td></td>
<td>115%↑</td>
</tr>
<tr>
<td>STEC§ O157</td>
<td>44%↓</td>
<td></td>
</tr>
<tr>
<td>Shigella</td>
<td>57%↓</td>
<td></td>
</tr>
<tr>
<td>Salmonella</td>
<td></td>
<td>3%↑</td>
</tr>
<tr>
<td>Listeria</td>
<td>38%↓</td>
<td></td>
</tr>
<tr>
<td>Campylobacter</td>
<td>27%↓</td>
<td></td>
</tr>
</tbody>
</table>

% change compared with 1996–1998

*Data are preliminary
§Shiga toxin-producing Escherichia coli

THE FOODNET 2010 DATA SHOWED A LACK OF PROGRESS IN REDUCING INFECTIONS CAUSED BY SALMONELLA AND VIBRIO

- Salmonella was the most common infection (1.2 million U.S. illnesses annually) and the most common cause of hospitalization and death tracked by FoodNet.

- Infections have actually increased since 2006—2008.
  - In 2010, the incidence of Salmonella was nearly three times the 2010 national health objective target.

- Incidence was higher for Vibrio infection (115% increase).

- Vibrio infections are rare, but often serious, and are caused by eating contaminated seafood or exposing an open wound to seawater.
  - Continued Vibrio illnesses highlight the lack of implementation of available control measures.

ADOPTING GUIDELINES FOR A REVISED LOW BACTERIA/MICROBIAL DIET

• Many transplant facilities are using the MMWR to determine diet

• Recommendations and Reports October 20, 2000 / 49(RR10);1-128 Guidelines for Preventing Opportunistic Infections Among Hematopoietic Stem Cell Transplant Recipients

  • Recommendations of CDC, the Infectious Disease Society of America, and the American Society of Blood and Marrow Transplantation

  • Basic food safety measures with the exclusion of some high risk foods and practices

TABLE 3. Foods that pose a high risk for hematopoietic stem cell transplant (H SCT) recipients and safer substitutions

<table>
<thead>
<tr>
<th>Foods That Pose a High Risk</th>
<th>Safer Substitutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw and undercooked eggs* and foods containing them (e.g., french toast, omelettes, salad dressings, egg nog, and pastries)</td>
<td>Pasteurized or hard boiled eggs</td>
</tr>
<tr>
<td>Unpasteurized dairy products (e.g., milk, cheese, cream, butter and yogurt)</td>
<td>Pasteurized dairy products</td>
</tr>
<tr>
<td>Fresh-squeezed, unpasteurized fruit and vegetable juices</td>
<td>Pasteurized juices</td>
</tr>
<tr>
<td>Unpasteurized dishes or dishes containing molds</td>
<td>Pasteurized dishes</td>
</tr>
<tr>
<td>Undercooked or raw pork, meats, fish, and seafood cooked fish, and seafood</td>
<td>Cooked pork, liver, donairs, meats, and fish</td>
</tr>
<tr>
<td>Vegetable sprouts (e.g., alfalfa, bean, and other fresh sprouts)**</td>
<td>Should be avoided</td>
</tr>
<tr>
<td>Raw fruits with a rough texture (e.g., raspberries)</td>
<td>Should be avoided</td>
</tr>
<tr>
<td>Smooth fruits</td>
<td>Should be washed under running water, peeled, or cooked</td>
</tr>
<tr>
<td>Unwashed raw vegetables*</td>
<td>Should be washed under running water, peeled, or cooked</td>
</tr>
<tr>
<td>Undercooked or raw tofu</td>
<td>Cooked tofu (e.g., cut into 1-inch cubes and boiled for 5 minutes in water or broth before eating or using in recipes)</td>
</tr>
<tr>
<td>Raw or uncooked grain products</td>
<td>Should be avoided</td>
</tr>
<tr>
<td>Malted beer*</td>
<td>Should be avoided; H SCT recipients should avoid any contact with raw yeast (e.g., they should not make bread products themselves)</td>
</tr>
<tr>
<td>All milk and outdated food products</td>
<td>Should be avoided; H SCT recipients should avoid any contact with raw yeast (e.g., they should not make bread products themselves)</td>
</tr>
<tr>
<td>Unpasteurized dairy (e.g., homemade and certain microwave beer)</td>
<td>Pasteurized beer (e.g., retail bottled or canned, or draft beer that has been pasteurized after fermentation)</td>
</tr>
<tr>
<td>Raw, uncooked brewer's yeast</td>
<td>Shown to be avoided</td>
</tr>
<tr>
<td>Unroasted raw nuts</td>
<td>Should be avoided; H SCT recipients should avoid any contact with raw yeast (e.g., they should not make bread products themselves)</td>
</tr>
<tr>
<td>Roasted nuts in the shell</td>
<td>Canned or bottled roasted nuts or further baked products</td>
</tr>
</tbody>
</table>


http://www.cdc.gov/mmwr/preview/mmwrhtml/rr4910a1.htm#tab3
FOOD SAFETY

• Focus on Food Safety

• Counsel patients and their caregivers about safe food practices during admission and at home

• Resources:
  - Food Recall list provided by the CDC and FDA: [http://www.recalls.gov/food.html](http://www.recalls.gov/food.html)
  - FoodSafety.gov
  - Partnership for Food Safety Education (Fight BAC !) [www.fightbac.org](http://www.fightbac.org)
  - Water Health Series: Bottled Water Basics. [www.epa.gov](http://www.epa.gov)