HCV Nutrition
Charlie Smigelski, RD was on the community speakers bureau for EMD Merk-Serono, which produces Serostim.

- HRSA Education Committee Disclosures
  HRSA Education Committee staff have no financial interest or relationships to disclose.

- CME Staff Disclosures
  Professional Education Services Group staff have no financial interest or relationships to disclose.
Nutrition Support For People with HIV/HCV, before, during & after IFN/RBV tx.

Charlie Smigelski RD
charlie@charlienuanutrition.com
Case Study

Gene HIV HCV co-infection age 51 ...

• 2000 IFN 6 mo. .... no eradication
• 2002 LFT’s in 250 re-treat:
  16 weeks ..... IFN/RBV
  quit ... too depressed, too sick
• 2004 LFT’s 500 re-treat: IFN/RBV

What would you do to improve his chances?
Today’s Nutrition Talk

Nutritional help for immune cells.

The best diet you could be eating?

Supplements to get through IFN.
Chronic HCV

Hep C exposure

20% clear it  80% chronic dz.

20-30% cirrhosis

Rx. IFN Ribavirin

Hepatocellular Carcinoma

where nutrition has an impact
CD8 Cytotoxic T Lymphocytes

H^+  HO^-  H_2O

Peroxide H_2O_2

H_2O_2  --

O^-

O^-

H_2O_2

CTL
IMMUNOLOGY

TH1: IL1  IL2  TNFa  IFN
TH2: IL4  IL5  IL6  IL8

TH0

Lower GSH  Selenium  Zinc: TH1 > TH2
Zinc intake in America

RDA 12/15 mg  Mean  Median
age 20-39      12.4  10.9
age 40-59      11.9  10.5

Zinc foods: ???  (Zycam)
Hepatitis C virus encodes a selenium-dependent glutathione peroxidase gene. Implications for oxidative stress as a risk factor in progression to HCC.

Vit D is related to severe fibrosis and low responsiveness to interferon-based therapy

- older age
- necroinflammation
- higher ferritin
- lower cholesterol

All liked to fibrosis

Hepatology 2010; 51(4) 1158 – 1167.
Iron, Innocent Bystander?

N=34  IFN/RVN failures  6 yrs
(8-OHdG)* Low Fe    Reg Fe
HCC    0    (16-23%)

Total, Special K, Vitamins, Ensure, etc.

Kato, Cancer Res 2001 61(24) 8697-702

*(8-oxo-7, 8-dihydro-2’ doxoguanosine)
Chronic HCV

Hep C exposure

15% clear it

85% chronic dz.

Zinc Selenium Vit D

20-30% cirrhosis

Rx. IFN Ribavirin

(Fe) Se

Hetocellular Carcinoma
THE SECRET KILLER

- The surprising link between INFLAMMATION and HEART ATTACKS, CANCER, ALZHEIMER'S and other diseases
- What you can do to fight it
Oxidative Stress In Symptom-free HCV carriers: relation with ALT Flare-up

N=30; median 49 yrs, (27-60), chronic HCV 1b, -6 .... 0 ... +18 mo. Nml ALT at enrollment
Serum markers for Oxidative stress q 2 mo.
Liver biopsy for GSH and MDA & histology
Sulphhydryl proteins (P-SH)

Oxidative Stress: ALT Flare-up

GSH (reduced) glutathione
GSSG (oxidized) glutathione
MDA (using thiobarbituric acid)

Oxidative Stress: ALT Flare-up

... detect disease evolution based on redox capacity ...

<table>
<thead>
<tr>
<th>Group A (16)</th>
<th>Group B (14)</th>
</tr>
</thead>
<tbody>
<tr>
<td>~ nml redox</td>
<td>altered redox</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>GSH</th>
<th>MDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥3 mmol/g</td>
<td>&lt; 3 mmol/g</td>
</tr>
<tr>
<td>&lt; 3 mmol/g</td>
<td>&gt; 75 pmol/g</td>
</tr>
</tbody>
</table>

ALT values comparable for first 12 months

Oxidative Stress: ALT Flare-up

Group A (16)    Group B (14)

ALT flare    2 (13.5%)    9 (64%)

New sort No flare 19    ALT flare 11

Oxidative Stress: ALT Flare-up

$T_0 - T_{18}$

<table>
<thead>
<tr>
<th></th>
<th>High ALT (11)</th>
<th>NML ALT (19)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GSH</td>
<td>8.1 &gt; 6.7</td>
<td>9.3 &gt; 9.1</td>
</tr>
<tr>
<td>MDA</td>
<td>0.5 &gt; 0.67</td>
<td>0.35 &gt; 0.35</td>
</tr>
<tr>
<td>Ferritin</td>
<td>164 &gt; 180</td>
<td>93 &gt; 84</td>
</tr>
</tbody>
</table>

High serum ALT in HCV and more rapid development of HCC in pt’s with cirrhosis.

Tarao et al. Cancer, 1999; 86(4):589-95
High ALT > cirrhosis > HCC.

69 HCV cirrhosis (Child’s A)
  A/28  B/13 C/28
ALT: < 80  Variable  >  80
HCC  7.1%  5 yr  53.6%
HCC  25%  10 yr  71.4%

Tarao et al. Cancer, 1999; 86(4):589-95
HCV HIV Care

Vitamins to support immune system
... CTL’s = Pacman cells

Take antioxidants to clean up debris and reduce inflammation
Chronic HCV

- Hep C exposure
  - 15% clear it
  - 85% chronic dz.
  - 20-30% cirrhosis
  - Rx. IFN Ribavirin
  - Zinc Selenium Vit D
  - (Fe) Se
  - Hetocellular Carcinoma
...thinking about food and diet
Mitochondrial Injury, Oxidative Stress, and Antioxidant Gene Expression Are Induced By Hepatitis C Virus Core Protein

Okuda et al. Gastroent 2002;122(2):366-75
Making Energy: ATP

Starch

FFA’
TNF

HCV

ATP

K
R
E
B
S
HCV Insulin Resistance

Age >40: 3x the diabetes rate in HCV+ people

Normal GTT, but higher fasting Insulin levels

Feeding High Fat diet led to overt diabetes

Higher TNFa

HCV Insulin Resistance

– HCV confers insulin resistance in liver

– Other elements generate overt diabetes:

  Obesity    Aging    Inflammation

The Fats Of Life

<table>
<thead>
<tr>
<th>η - 6</th>
<th>η - 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>LA - corn oil</td>
<td>D-6* ALA - flax, walnuts - soy</td>
</tr>
<tr>
<td>GLA – primrose</td>
<td>D-5* EPA</td>
</tr>
<tr>
<td>(Hihomo GLA)</td>
<td></td>
</tr>
<tr>
<td>AA arachidonic</td>
<td>D-4* DHA - fish oils</td>
</tr>
</tbody>
</table>

(Cyclo-ox PGE₂) (PGE₃)

*Delta 6, 5, 4 desaturase/elongase enzymes
EPA/DHA Action on Cells

GLUT-4

DHA

EPA

GLUCOSE

Hexokinase II

Glucose-6-P

Glycogen Synthase

Glycogen

Energy!!!

dperoxisomes
HCV inhibits TG’s and VLDL secretion:

- Interfering with hepatic assembly and secretion of triglyceride-rich VLDL.
- Reduction in microsomal transfer protein (MTP)

Perlemuter et al. FASEB J. 2002; 16(2): 185
Grease, Sugar, Leaks & TNFα

FFA' 

TNF 

K 

R 

E 

B 

S 

ATP 

Starch
HCV Pathophysiology

Repair Issues:
• Oxidative stress
• Damaged mitochondria
• Improve fat metabolism
• Preserve glucose tolerance
• Reduce IFN Tx : wasting
Vit E improves ALT status

N=23  2 x 400iu/d 12 wks alpha-tocopherol

0  12 16  28  (weeks)

Vit E 400 iu bid

11/23 were responders: 48%

ALT down: 17%, 23%, 24% (4, 8, 12 wks)

11 responders: > 35% drop

ALT resp: 31%, 40%, 46% (4, 8, 12 wks)

Vit E improves ALT status

N=23  2 x 400iu/d 12 wks alpha-tocopherol

Vit E improves ALT status

Washout: ALT rises again,

... retreat: ALT drop 42%

serum vit E rose equally in all treated.

\[\sim 25 >> 52 \ \mu\text{mol/l}\]
Glutathione enzyme

- What does glutathione do?
- What groceries support better levels?
- What supplements help liver make more?
Improve Glutathione Levels?

GSH-sparing:
Vitamin C, Vitamin E:

GSH-boosting:
Higher Protein Diet, N-acetylcysteine, L-glutamine, alpha lipoic acid:
L-Carnitine for repair

Spackling compound for mitochondrial outer walls

1-2 grams/day esp. during IFN Tx.
Carnitine reduces steatosis

Group A:
IFN alpha 3 MIU 3X/w & 1,000 mg ribavirin per day for 12 months

Group B:
IFN & RBV & 2 g carnitine /d.

Carnitine reduces steatosis

<table>
<thead>
<tr>
<th>Test</th>
<th>Group A</th>
<th>Group B</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALT</td>
<td>-68</td>
<td>-95 IU/ml *</td>
</tr>
<tr>
<td>Chol</td>
<td>0.08</td>
<td>0.91 mmol//d.*</td>
</tr>
<tr>
<td>TG</td>
<td>+0.25</td>
<td>-20 mmol/l *</td>
</tr>
</tbody>
</table>

*(P < 0.05)

Carnitine reduces steatosis

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<tr>
<th>Test</th>
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<tr>
<td>Response</td>
<td>48%</td>
<td>56%</td>
</tr>
<tr>
<td>Sustained response</td>
<td>39%</td>
<td>46%</td>
</tr>
</tbody>
</table>
Co-enzyme Q10 for repair

Velvet lining for mitochondrial inner walls

100 milligrams/day
Mitochondria: ATP/Energy!
... what is the best diet ...
Caveperson Breakfast

Salmon  Walnuts  Berries

Cottage Cheese  Pecans  Peaches

Designer Whey  Flax Seeds  Banana
(smoothie)
breakfast
for the
modern
person
Caveman Lunch

Salmon  White beans  Large salad  Vinegar

Ham and Lorraine Swiss on Rye, & a large carrot and 2 tomatoes

Cottage Cheese  Humus  Raw Vegetables
Caveman Snacks

Nuts and seeds, berries and fruits

red grapes and cashews
dried apricots and Brazil nuts
apple and sunflower seeds
pumpkin seeds and mango
Caveman Supper

Salmon  Green Peas  Carrots  Pignolias
Chicken Sw. Potato  Gr. beans  Almonds
Pork loin  Black beans  Spinach  Walnuts
Nuestro Plato

ESPINACA

SALMON

FRIJOLES

arroz
Caveperson Supper

H. Choice  Froz. Corn  Carrots  Smart Balance
Turkey Kielbasa  Tub Margarine

Chicken
(pizza slice)
Turkey Meatballs  a box of green beans
Insulin:
1. move sugar,
2. build fat
3. retain sodium
4. make hungry

Blood sugar curve

beans-spinach-fish-nuts
Cocoa Puffs, Bagels, Pasta Subs, Rice, Beans, Tortillas

spike & crash your blood sugar

beans-spinach-fish-nuts

rice bagel pasta
Cocoa Puffs, Bagels, Pasta Subs, Rice, Beans, Tortillas

spike & crash your blood sugar

beans-spinach-fish-nuts

rice bagel pasta

FAT
Grease, Sugar, TNF>> Insulin resistance
Conditions to manage

- Intracellular fat and insulin issues
- Antioxidant capacity
- Glutathione support
- Dietary elements: fats, carbs, antioxidants
- Weight status
- Alcohol intake
- Iron intake
Chronic HCV

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where nutrition has an impact
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What would you do now?
  - Fatigue
  - LFT’s

see handout ... steps 1, 2, 3)
Case Study

Gene HIV HCV co-infection age 51 ...

• 2000 IFN 6 mo. .... no eradication
• 2002 16 weeks ..... IFN/RBV
• 2004 LFT’s 500 re-treat: IFN/RBV

What would you do now?
– Immune cells
– Glutathione .... LFT’s
– Fatigue ...ATP ...Mitochondria

see handout ... steps 1, 2, 3)
Tripple Antioxidant Approach

HCV Esoph varices, portal HTN

Mitochondria: B-complex, Co Q10
2 gm vit C, 800 iu vit E

Cell support: 900 mg Milk Thistle
400 mcg selenium
600 mg alpha lipoic acid

Case Study

Gene HIV HCV co-infection age 51 ...

• 2000 IFN X 6 mo. ... no eradication

• 2002 LFT’s 250 treat: 16 weeks ... IFN/RBV quit ... too depressed, too sick

• 2004 LFT’s 500 re-treat: IFN/RBV (see handout ... steps 1, 2, 3)

36 weeks: LFT’s in the 80’s now
Vitamin D is related to severe fibrosis and low responsiveness to interferon-based therapy

Older age, necroinflammation, higher ferritin:
167 pts on IFN/RBV tx.
70 (41%) SVR ....

Steatosis, low vitamin D, low cholesterol assoc with poor response.
Vitamin D 25.07 +/- 9.92 microg/L vs 43.06 +/- 10.19 cntrls

Hepatology 2010; 51(4) 1158 – 1167.
Peg Interferon-Ribavirin

TH1  IL1  IL2  TNFα  IFN γ

TH0  CD8

TH2  IL4  IL5  IL6  IL8

Lower GSH  Selenium  Zinc  ... vit D
What to support:

- Carnitine, CoQ10
- Vites B, C, E
- Fish oils
- FFA's
- Lactic a.
- Peroxisome
- Protein: FISH, Glutamine, N-acetylcysteine
Thanks for your attention

Charlie Smigelski, RD

www.eatupbooks.com
tong ren therapy

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