Update: Part 2

• Liver Disease
  • Hepatitis
  • Fatty liver (NAFL)
  • Non-alcoholic (NASH)
  • Alcohol-related
  • Wilson’s disease
  • Hemochromatosis

Session Objectives
After the program the participant will be able to:

• Describe nutritional concerns associated with liver disease
• Apply current dietary guidelines to practice
• Identify resources for additional information

Liver - Review

• Largest [inside] organ
  • 3 - 3.5 lb.
• 500+ system tasks
  • Processes food/drink
  • Detox blood
• Maintenance plan
  • Healthy diet
  • Normal body weight
  • Limit alcohol
  • Avoid toxins: smoking, chemical exposure,

Liver: Nutrition-Related Functions

• Carbohydrate metabolism
  • Galactose & Fructose → Glucose
  • Performs glycogenesis, glycolysis, gluconeogenesis
• Protein metabolism
  • Performs transamination and deamination
  • Forms blood-clotting factors, serum protein and lipoproteins
• Fat metabolism
  • Fatty acids → acetyl-co A
  • Produces ketone bodies
  • Synthesizes & hydrolyzes triglycerides, phospholipids, cholesterol, and lipoproteins
Liver: Nutrition-Related Functions

- Vitamin / Mineral
  - Stores
    - Vitamins A, D, E, K, and B₁₂
    - Iron, Copper, Zinc, and Manganese
  - Activates
    - $B₁ \rightarrow \text{thiamine pyrophosphate}$
    - $B₆ \rightarrow \text{pyridoxal phosphate}$
    - Folic acid $\rightarrow \text{tetrahydrofolic acid}$
    - Vitamin D $\rightarrow 25\text{-hydroxycholecalciferol}$
  - Synthesizes
    - Carrier proteins for vitamins A and B₁₂
    - Lipoproteins that transport vitamin E

Other Liver Functions

- Formation and excretion of bile
- Ammonia $\rightarrow$ urea
- Metabolism of steroids
- Detoxification
  - Alcohol
  - Drugs (Rx and illicit)
  - Water / food chemicals
  - Environmental chemicals

Liver Disease: Epidemiology

- Hepatic = ‘of the liver’
- 1 in 10 Americans affected
- #12 cause of death in US (CDC 2010)
- NAFLD most common
  - 75.1% of all chronic liver disease
    - Now > alcoholic liver disease and Hep C
  - >37% of people are obese $\rightarrow$ risk factor for fatty liver

American Liver Foundation, Centers for Disease Control

Progression to Liver Disease

Liver Disease

- 100+ diseases of liver
  - Acute Viral Hepatitis
  - Fatty Liver (NAFLD)
  - Nonalcoholic Steatohepatitis (NASH)
  - Alcohol-Related
  - Wilson’s disease
  - Hemochromatosis

Key Symptoms

- Cirrhosis
  - Bleed or bruise easily
  - Ascites – legs & abdomen
  - Jaundice - skin and eyes may take on a yellow color
  - Itchy skin
  - Blood vessel blockage or hemorrhage
  - Increasing sensitivity to medications and their side effects
  - Development of insulin resistance and type-2 diabetes
  - Toxins may build up in brain, causing problems with concentration, memory, sleeping, or other mental functions.

- Liver Failure
  - Nausea
  - Loss of appetite
  - Fatigue
  - Diarrhea
  - Progressively worsening: Confusion and disorientation
  - Extremely sleepy
  - Coma and death

- Liver transplanted
- Liver Cirrhosis
- Liver Fibrosis
- Persistent inflammation
- Liver failure
- Liver healing and regeneration
- Trauma to liver
Acute Viral Hepatitis

- Hepatitis A & E
  - Infectious forms spread by fecal-oral route
- Hepatitis B, C & D
  - Serum forms spread by blood and body fluids
- Other causes of acute hepatitis:
  - Epstein-Barr, cytomegalovirus, herpes simplex, yellow fever, and rubella

Hepatitis A

- Caused by virus from an infected person
- Highly contagious
- Inflammation (swelling) of liver
- Prevention:
  - Vaccination
  - Hand washing
    - After using toilet or changing diaper
    - Food prep and before eating

Hepatitis B

- Caused by exposure to hepatitis B virus (HBV)
  - Leads to irritation and swelling of liver
  - 1.25 million with HBV
    - ~25% of people with HIV have HBV
- Prevention:
  - Avoid (blood, bodily fluids) contact with infected people
  - Gloves, hand washing
  - Vaccination for high-risk people
  - Vaccination immediately upon exposure

Hepatitis B

- Symptoms
  - Asymptomatic to mild to acute illness
    - Appetite loss
    - Fatigue
    - Low fever
    - Muscle and joint aches
    - Nausea and vomiting
    - Yellow skin and dark urine
  - Confirmed by blood test (HBV panel)

- Treatment
  - Acute: rest, fluids, healthy diet
  - Chronic: antiviral medications
- Nutrition Implications
  - Avoid alcohol
  - Herbal supplements ... check with MD
- Increased risk for liver cancer

National Institutes of Health Medline Plus
Hepatitis C

• Caused by exposure to hepatitis C virus (HCV)
  • Leads to irritation and swelling of the liver

• Prevention:
  • Avoid needle stick or sharps injury
  • Don’t get tattoo, body piercing or acupuncture from an unlicensed source
  • Avoid contact of blood of infected individual

National Institutes of Health Medline Plus

Hepatitis C

• Symptoms
  • No immediate symptoms
  • With chronic infection:
    • Abdominal pain
    • Ascites
    • Clay-color or pale stools
    • Dark urine
    • Fatigue
    • Fever
    • Itching
    • Jaundice
    • Loss of appetite
    • Nausea and vomiting

National Institutes of Health Medline Plus

Hepatitis C

• Screening: any born btw 1945-1965
• Diagnosis
  • Blood tests
    ✓ Antibody
    ✓ Viral load
    ✓ Identify genotype (1 through 6)
  • Further testing for liver damage
    • Albumin, liver function, prothrombin time
    • Liver biopsy

CDC, National Institutes of Health Medline Plus

Hepatitis C

• Treatment
  • Medications

• Nutrition implications
  • Avoid alcohol
  • Eat healthy

• Prognosis

American Liver Foundation

When is Hepatitis Chronic?

• >6 months of biochemical / clinical evidence of liver disease
• Biopsy confirming unresolved inflammation
• Etiology – any, including unknown (cryptogenic cirrhosis)
• Symptoms – optional
  • Can range greatly from non-specific mild to severe advanced

The following section is a review of ASSLD Practice Guideline

The Diagnosis and Management of Non-Alcoholic Fatty Liver Disease: Practice Guideline by the American Association for the Study of Liver Diseases, American College of Gastroenterology, and The American Gastroenterological Association

A fatty liver is NOT normal

Fatty Liver Disease

- Risk Factors
  - Overweight
  - Excessive BMI, Visceral obesity
  - T2 Diabetes
  - ↑ triglycerides and ↓ serum HDL
  - Metabolic syndrome
  - ↑ Age
  - Men
  - In order; Hispanic, Caucasian, African American, and lower...American-Indian, Alaskan-Native
  - Also, hypothyroidism, hypopituitarism, hypogonadism, sleep apnea, PCOS

- Large Waist Size
  - For men: 40 inches or larger
  - For women: 35 inches or larger

- Cholesterol: High
  - Either
    - 150 mg/dL or higher
    - Using a cholesterol medicine

- Cholesterol: Low Good
  - Either
    - For men: Less than 40 mg/dL
    - For women: Less than 50 mg/dL
    - Using a cholesterol medicine

- Triglycerides
  - Either
    - 150 mg/dL or higher
  - Using a cholesterol medicine

- High Blood Pressure
  - Either
    - Having blood pressure of 135/85 mm Hg or greater
    - Using a high blood pressure medicine

- Blood Sugar: High Fasting Glucose Level
  - 100 mg/dL or higher

Fatty Liver Disease

- NAFL
  - 10%-20%
  - Fatty liver with no inflammation
  - No liver damage

- NASH
  - 2%-5%
  - Rule out: medication cause, viral hepatitis, excessive alcohol

Fatty Liver Disease - NASH

- Nonalcoholic steatohepatitis (NASH)
  - “Silent”
  - Accumulation of fat in the hepatocytes; cells are inflamed
  - Constant inflammation → scarring (fibrosis) → cirrhosis

- ?? Cause
  - Middle-age; overweight / obese
    - Can be child and normal weight
  - Elevated lipids
    - Could be normal
  - Pre- and diabetes
    - Or not
  - May be tied to:
    - Insulin resistance
    - ↑ Cytokines
    - Oxidative stress

Fatty Liver Disease - NASH

- Lifestyle Intervention
  - Weight loss (slow, steady) Evidence Grade A
    - Min. 3% - 5%; ideally 10% (or more)
    - Result ~40% ↓ in liver fat (range 20%-81%)
    - Proportional to the intensity of change
    - Greater % loss → better the improvement

  - Exercise Evidence Grade B
    - Liver fat ↓ without significant change in BW
    - 30-60 min. @ 2-3x / week for 6-12 weeks

Fatty Liver Disease

• Treatment
  • Insulin-sensitizing drugs?
    • Metformin & NASH Evidence Grade A
      • ↓ Insulin resistance & aminotransferases but no sig. change in liver histology so not recommended
    • Pioglitazone & NASH Evidence Grade B
      • Improved steatosis and inflammation but not fibrosis
        • Long-term safety is TBD
  • Vitamin E & NASH Evidence Grade B
    • Assoc. with ↓ aminotransferases; improved steatosis and inflammation but not fibrosis
    • 800 IU / day for NASH w/o DM
    • Contraindicated for diabetic NASH, NAFL, and any cirrhosis etiology.


Fatty Liver Disease

• Treatment (cont.)
  • Statins Evidence Grade B
    • Treat dyslipidemia
    • Proven safe in patients with liver disease
  • Ursodeoxycholic acid (aka ursodiol)
    • ↓ rate of intestinal absorption of cholesterol
    • Poor evidence for benefit in NAFL / NASH


Fatty Liver Disease

• Treatment (cont.)
  • Omega-3’s
    • Currently approved to tx ↑ triglycerides
    • Some data support use in NAFLD; currently large trial on-going with NASH
    • Not reco’d
      • Okay if TG are elevated


Fatty Liver Disease

• Treatment (cont.)
  • Bariatric Surgery?
    • 90% of patients have a fatty liver
    • With NAFL improved or resolved: steatosis, steatohepatitis, fibrosis
    • With NASH: lacking data
    • Bariatric surgery not contraindicated if no cirrhosis


Alcohol

With liver damage, alcohol is like throwing gas on a fire.....

Association for the Study of Liver Diseases (ASSLD) Practice Guideline

Alcoholic Liver Disease

Alcohol

• Heavy alcohol = risk for liver disease
  • Liver breaks down alcohol which generates toxins

• Heavy drinking =
  • > 4 /day or 14 /week (men)
  • > 3 /day or 7 /week (women)

• ~2 million w/liver disease caused by alcohol
• Alcoholic hepatitis → fibrosis → cirrhosis

Alcohol Liver Disease (ALD)

• In 2003, 44% of all liver disease deaths
• Fatty liver develops in 90% drinking >60g /day alcohol
  • Uncomplicated fatty liver resolves with abstinence
  • Still, progression to fibrosis / cirrhosis in 5%-15%
• Progression ALD or cirrhosis not completely dose-dependent
  • Amount ingested is risk, but not linear
  • Beer and spirits > association than wine
  • Risk 2.7 fold with drinking outside of meals
  • Binge drinking ↑ all cause mortality
  • Women 2x as sensitive to alcohol
  • Ethnicity influence
  • Genetic factors

Alcohol Liver Disease (ALD)

• Mortality ↑ in direct proportion to malnutrition.
• Increasing risk:
  • Obesity, overweight
  • Vitamin A depletion
  • Depressed vitamin E levels
  • Diets rich in polyunsaturated fats vs, saturated fats (animals)

Alcohol Liver Disease (ALD)

• Treatment
  • #1 - stop the alcohol consumption!
• Medications
  • Designed to reduce cravings and/or withdrawal symptoms
  • Side effects
  • Help, but effects on survival not known
• Nutrition therapy
  • 100% are malnourished

ALD – Nutrition Therapy

• All with alcoholic hepatitis or advanced ALD should be assess for nutritional deficiencies and treated aggressively.
  Evidence Grade B
  • Benign Risk:Benefit

  • Alcohol cirrhosis → frequent interval feedings, with emphasis on morning and nighttime, to improve nitrogen balance
  Evidence Grade A
  • 1.2-1.5 g/kg BW protein and 35-40 kcal/kg

National Institute of Alcohol Abuse and Alcoholism (NIAAA)

STANDARD DRINK EQUVALENTS

APPROXIMATE NUMBER OF STANDARD DRINKS IN:

BEER or COOLER
12 oz.
~5% alcohol
• 12 oz. = 1
• 16 oz. = 1.3
• 22 oz. = 2
• 40 oz. = 3.3

MALT LIQUOR
8-9 oz.
~7% alcohol
• 12 oz. = 1.5
• 16 oz. = 2
• 22 oz. = 2.5
• 40 oz. = 4.5

TABLE WINE
5 oz.
~12% alcohol
• a 750 mL (25 oz.) bottle = 5

SPIRITS (hard liquor)
1.5 oz.
~40% alcohol
• a mixed drink = 1 or more
• a pint (16 oz.) = 1
• a fifth (25 oz.) = 1.3
• 1.75 L (59 oz.) = 3.8

National Institutes of Health

ml of beverage x % alcohol = ml or grams of alcohol in the drink
(1 mL alcohol ~ 1 g alcohol)

Genetic Disorders

Nutrients that can Harm the Liver

- **Copper (Wilson’s Disease)**
  - Rare, genetic disorder
  - Fatal if untreated (copper poisoning)
  - Excess copper accumulated vs. excreted
  - Copper RDI: 2000 mcg (or DRI 900 mcg)
    - Toxic intake >40,000 mcg
  - Lifelong treatment: medication
    - Bind/remove copper via increased urinary excretion
    - Zinc containing block absorption of copper
  - Diet: Low Copper
    - Avoid high copper foods
    - Check water
    - Beware V/M supplements

Foods to Avoid: High in Copper

- >0.2 mg/portion*
  - Lamb, pork, organ meats
  - Pheasant, quail, duck, goose
  - Squid, salmon, shellfish
  - Soy protein meat subs
  - Tofu
  - Nuts and seeds
  - Avocado
  - Chocolate, cocoa
  - Dried beans, peas, lentils
  - Millet, barley, wheat germ, bran breads, soy flour
  - Sweet potato, mushrooms, veggie juice
  - Nectarines, dried fruits
  - Brewer’s yeast
  - Food fortified with copper (cereals)
- *not all-inclusive list

Nutrients that can Harm the Liver

- **Iron (hemochromatosis)**
  - Genetic disorder
  - Absorb 4x the iron vs. normal
  - Increased iron stored
    - 16 million have elevated iron
  - Over time → affects major organs, can be fatal
  - Treatment: blood donation
  - Diet: limit red meat and blue fin tuna; other high iron foods

Nutritional Issues in Advanced Liver Disease

- Progression of disease → more pronounced the malnutrition
- Inadequate oral intake:
  - Anorexia
  - Nausea/vomiting
  - Bloating/distention
  - Abdominal discomfort
  - Ascites
  - Delayed gastric emptying
  - Alcohol vs. food

- Metabolic disturbances
  - Altered energy consumption
  - Alterations in macronutrient metabolism
    - Significant protein depletion
    - Decreased bone density
  - Micronutrient deficiencies:
    - Fat soluble (A, D, E, K)
      - >90% deficient in D
    - Water soluble → may be cause of psychotic disturbances, neuropathies and neurologic issues

Table 1. Protein-Energy Requirements in End Stage Liver Disease

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<thead>
<tr>
<th>Protein &amp; Energy</th>
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- **Energy**
  - Stable; 25-35 kcal/kg/d
  - Malnourished; 30-40 kcal/kg/d

- **Protein**
  - Cirrhosis; 1.0 – 1.5 g/kg/d
    - Prevent muscle breakdown and promote gluconeogenesis
    - With acute encephalopathy 0.6 – 0.8 g/kg until resolved

Amino Acids and Liver Disease

- Amino acid metabolism is altered in hepatic failure resulting in:
  - ↑ phenylalanine, tyrosine, tryptophan (AAAs)
  - ↓ isoleucine, leucine, valine (BCAAs)

- Thought AAAs contributed to hepatic encephalopathy (HE)

- Modification of BCAAs to AAAs might help HE and improve protein status?

  - However, does not improve HE...

- Benefit of BCAAs
  - Improves overall nutrition status
  - Decreased hospitalization frequency

Carbohydrate, Fat, Fluid, & Sodium

- If diabetic, manage carbohydrate load
  - Excess energy can contribute to fat synthesis and accumulation

- Low fat diet (25% - 30% of calories)
  - Impaired fat metabolism
  - Long-chain triglycerides problematic
    - MCT may be useful

- Fluids
  - Balance intake with output

- Sodium
  - Restricted with fluid retention

Summary

- Oral Diet
  - Small/frequent meals; avoid skipping
  - Bedtime snack
  - High protein
    - <2000 mg/day sodium with ascites/edema

- Enteral Tube Feeds
  - With poor PO
  - Standard, energy dense formula
  - Nasoenteral tube
  - PEG contraindicated with ascites or gastric varices
  - Aspiration precautions

- Parental
  - If PO and EN not plausible
  - Watch glucose levels; address hyperglycemia
  - With cholestasis limit manganese and copper
  - Cyclic regimen recommended
  - Concentrate to prevent fluid overload

Table 2. Protein-Energy Requirements in End Stage Liver Disease


Thank you for participating in today's session!

This presentation is intended to provide general information about select diseases but is not intended to provide medical advice.

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Post Test

1. Hand washing, especially after toileting, is critical in preventing the spread of hepatitis B.
   - True
   - False
2. The liver has the ability to heal itself from injury.
   - True
   - False

Post Test

3. The tasks of the liver include:
   a. Processing food/drink
   b. Removing toxins from the blood
   c. Metabolizing steroids
   d. Forming and excreting bile
   e. All of the above and more

Post Test

4. Common liver diseases include:
   a. NAFL
   b. NASH
   c. Alcohol-related
   d. All of the above and more
5. Avoiding alcohol is recommended with any liver disease.
   - True
   - False