

## SESSION 9 MANAGEMENT OF DRUG AND FOOD INTERACTIONS IN HIV/AIDS THERAPY

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### Purpose

The purpose of the session is to equip students with knowledge and skills for the nutritional management of drug and food interactions in HIV/AIDS therapy.

### Learning objectives

By the end of the session, students will be able to:

- State why nutritional management of drug and food interactions is important in HIV/AIDS therapy.
- List the common types of drugs taken by people living with HIV/AIDS, different types of food-drug interactions, their nutritional implications, and the appropriate dietary responses.
- Assess and analyze information collected during client assessment and work with the HIV-infected person to select the most appropriate actions or approach.

### Prerequisite knowledge

- Technical background in infant, child, maternal, and adult nutrition and HIV/AIDS-related symptoms
- Basic counseling skills

**Estimated time:** 120 minutes, excluding time for field work

## Outline

Content	Methodology	Timing
<p>1. Rationale for the proper nutritional management of drug and food interactions in HIV/AIDS therapy</p> <ul style="list-style-type: none"> <li>• Increased need for management of HIV/AIDS and treatment of opportunistic infections and other diseases</li> <li>• Effects of food and nutrients on drug efficacy</li> <li>• Medications side effects on food intake, nutrient absorption, and compliance</li> </ul> <p>2. Main types of drugs (common modern and traditional therapies) taken by people living with HIV/AIDS to treat and manage HIV/AIDS</p> <p>3. Food and drug interactions and the nutritional management of the interactions</p> <ul style="list-style-type: none"> <li>• Effects of food and nutrients on drug efficacy</li> <li>• Effects of drugs on nutrient absorption and metabolism</li> <li>• Potential side effects of drugs on food intake, absorption and metabolism</li> <li>• Unhealthy effects of the interaction</li> </ul>	<p>Facilitate an interactive lecture using <b>PowerPoint 9</b> presentation</p> <p>Use the questions and answers in <b>Discussion Points 9</b> to help students master concepts</p> <p>Go through some of the examples in <b>Handout 9.1: Drugs Commonly Taken by People Living with HIV/AIDS, Likely Side Effects, and Recommended Dietary Practices to Increase Drug Efficacy</b></p>	<p>100 minutes</p>
<p>Discussion of recommendations for service providers to address issues related to food-drug interactions (e.g., food-drug timetables and considerations for women and children)</p>	<p>Distribute <b>Handout 9.1: Drugs Commonly Taken by People Living with HIV/AIDS, Likely Side Effects, and Recommended Dietary Practices to Increase Drug Efficacy</b></p>	

Content	Methodology	Timing
4. Assessment and analysis of the client's information and selection of the most appropriate actions or approaches during the counseling session on drug and food interactions	Use <b>Exercise 9</b> to conduct role-plays (a health worker counseling an HIV/AIDS client on potential food-drug interaction with Combivir (AZT/3TC). Use <b>Handout 9.2: Observation Checklist for Assessment during a Counseling Session on the Management of Drug and Food Interactions in HIV/AIDS Therapy</b> to observe the role-play	20 minutes

### Required materials

- LCD or overhead projector
- Flipchart stand and paper or board
- Writing pens or chalk

### Recommended preparation

- Be familiar with **Lecture Notes 9: Management of Drug and Food Interaction in HIV/AIDS Therapy**, **Handouts 9.1: Drugs Commonly Taken by People Living with HIV/AIDS, Likely Side Effects, and Recommended Dietary Practices to Increase Drug Efficacy and Prevent Malnutrition** and **9.2: Observation Checklist for Assessment during a Counseling Session on the Management of Drug and Food Interactions in HIV/AIDS Therapy**, and the **Discussion Points** for interactive discussions.
- Prepare to use **Exercise 9** at the appropriate moment in the session. Divide students for the role-play on counseling HIV-infected people on the management of drug-food interactions. Make sure the foods and drugs used in the role-plays are available in the country.

- Allocate time for each activity considering the time available for the session, the students' backgrounds, the coverage of the activity elsewhere.

## Materials provided

### PowerPoint Presentations

- **PowerPoint 9/overhead presentation:** Management of Drug and Food Interactions in HIV/AIDS Therapy

### Handouts

- **Lecture Notes 9:** Management of Drug and Food Interactions in HIV/AIDS Therapy
- **Handout 9.1:** Drugs Commonly Taken by People Living with HIV/AIDS, Likely Side Effects, and Recommended Dietary Practices to Increase Drug Efficacy
- **Handout 9.2:** Observation Checklist for Assessment during a Counseling Session on the Management of Drug and Food Interactions in HIV/AIDS Therapy

### Exercise

- Exercise 9

## Suggested reading materials

Dobkin, JF. 2002. Tenofovir, the first nucleotide for HIV Infection. *Infect Med* 19 (1): 11, 38.

Food and Nutrition Technical Assistance (FANTA) Project. 2001. HIV/AIDS: A guide for nutrition, care and support. Washington, DC: FANTA Project, Academy For Educational Development.

Health Canada/Santé de Canada: 2002. Canadian Strategy on HIV/AIDS. A comprehensive guide for the care of persons with HIV disease. Ottawa.

Mondy, K, et al. 2002. Longitudinal evolution of bone mineral density (BMD) and bone markets in HIV-infected people. 9<sup>th</sup> Conference of Retroviruses and Opportunistic Infections, Seattle, Washington.

Moyle, G. 2002. The once-a-day era is upon us. *AIDS Read* 12(2): 56-58.

National Institutes of Health. 2002. Garlic supplements can impede HIV medication. *AIDS Read* 12(2): 60.

———. 2002. Structured intermittent therapy may prove feasible. *AIDS Read* 12(2): 60.

Pronsky, Z, SA Meyer, and C Fields-Gardern. 2001. HIV medication-food interactions handbook. Second edition. Birchrunville, PA: Food Medication Interactions.

Schambelan, M, CA Benson, A Carr, JS Currier, et al. 2002. Management of metabolic complications associated with antiretroviral therapy for HIV-1 infection: Recommendations of an International AIDS Society-USA Panel. *J Acquir Immune Defic Syndr* 31: 257-275.

WHO/UNAIDS. 2000. Safe and effective use of antiretroviral treatments in adults with particular references to resources limited settings. Geneva. PDF available

### **Web sites with information about ARV and food and nutrition interactions**

AIDS Nutrition Services Alliance (ANSA)  
[www.aidsnutrition.org](http://www.aidsnutrition.org)

AIDS Info  
[www.aidsinfo.nih.gov](http://www.aidsinfo.nih.gov)

American Medical Association  
[www.ama-assn.org](http://www.ama-assn.org)

Clinical Infectious Diseases  
[www.journals.uchicago.edu/CID/journal/contents/v36nS2.html](http://www.journals.uchicago.edu/CID/journal/contents/v36nS2.html)

Food and Drug Administration  
[www.fda.gov](http://www.fda.gov)

Food Medication Interactions  
[www.foodmedinteractions.com](http://www.foodmedinteractions.com)

Immunodeficiency Clinic University Health Network, Toronto, Canada.  
[www.tthhivclinic.com](http://www.tthhivclinic.com)

Johns Hopkins AIDS Service  
[www.hopkins-aids.edu](http://www.hopkins-aids.edu)

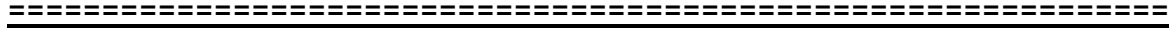
Medline Plus (U.S. National Library of Medicine and National Institutes of Health)  
[www.nlm.nih.gov/medlineplus](http://www.nlm.nih.gov/medlineplus)

Medscape  
[www.medscape.com](http://www.medscape.com)

World Health Organization  
[www.who.org](http://www.who.org)

For information about herbs: [jkinabo@suanet.ac.tz](mailto:jkinabo@suanet.ac.tz)

# LECTURE NOTES 9: MANAGEMENT OF DRUG AND FOOD INTERACTIONS IN HIV/AIDS THERAPY



## Introduction

As described in previous sessions, people living with HIV/AIDS risk malnutrition because of malabsorption, reduced food intake, and increased loss of nutrients as a result of infections and viral replication. People living with HIV/AIDS use medications to treat HIV/AIDS, opportunistic infections caused by HIV/AIDS, and the common diseases encountered in resource-constrained settings, such as waterborne diseases, malaria, tuberculosis, and intestinal parasites.

Effective medical treatment can slow the progress of HIV, reduce opportunistic infections, and ease symptoms, but food can interact with drugs and affect the drugs' efficacy. Drugs can also interact with foods and nutrients and negatively affect nutritional status. The side effects of both traditional and modern medications can affect both food intake and nutrient absorption and thereby the client's adherence to medications. Additionally, drugs and food can interact to cause unhealthy side effects. Ultimately, if not addressed, drug and food interactions can result in poorer health and nutritional status.

## Purpose (slides 2, 3)

The purpose of this session is to equip students with knowledge and skills for the nutritional management of drug and food interactions in HIV/AIDS therapy. The session:

- Explains why nutritional management of drug and food interactions is important in HIV/AIDS therapy
- Lists common types of drugs taken by people living with HIV/AIDS, types of food-drug interactions, nutritional implications, and appropriate dietary responses

- Describes information collected during client assessment and working with the HIV-infected person to select the most appropriate actions or approach

## **Rationale for the proper nutritional management of drug and food interactions in HIV/AIDS therapy (slides 4, 5)**

The food and nutritional implications of modern and traditional therapies need to be properly addressed to prevent weight loss, wasting, and malnutrition. Proper management of drug and food interactions will also ensure the efficacy of the therapies.

Side effects that interfere with food consumption or interactions that limit food intake or reduce nutrient absorption may also lead to poor medication adherence. This may result in clients discontinuing medications before completing the necessary course, which for antiretroviral drugs (ARVs) may last many years. Proper nutritional management of the side effects will help minimize them and improve the client's adherence to the treatment.

## **Types of drugs taken by people living with HIV/AIDS in resource-constrained settings (slide 6)**

People living with HIV/AIDS often use both modern and traditional therapies to treat HIV/AIDS-related symptoms and opportunistic infections.

### **Modern medications**

ARVs significantly reduce the replication of HIV in the body and slow the progression of the disease. The main types of ARVs are listed below. Table 1 lists the main classes of ARVs with examples for each class.

1. Non-nucleoside reverse transcriptase inhibitors (NNRTIs): Efavirenz and Nevirapine
2. Nucleoside reverse transcriptase inhibitors (NRTIs) or nucleoside analogues: Abacavir, Didanosine, Lamivudine, Stavudine, Zalcitabine, and Zidovudine

3. Protease inhibitors (PIs): Amprenavir, Indinavir, Nelfinavir, Ritonavir, and Saquinavir

**Table 1 Major classes of ARVs and examples**

Non-nucleoside reverse transcriptase inhibitors		Nucleoside reverse transcriptase inhibitors or nucleoside analogue		Protease inhibitors	
<i>Generic</i>	<i>Brand name</i>	<i>Generic</i>	<i>Brand name</i>	<i>Generic</i>	<i>Brand name</i>
Nevirapine (NVP)	Viramune	Didanosine (ddl)	Videx	Ritonavir (RVT)	Norvir
Efavirenz (EFV)	Sustiva/Dupont	Zidovudine (AZT, ZDV)	Retrovir	Saquinavir (SQV)	Invirase

Fusion inhibitors are a new type of ARV that prevent HIV from binding to the surface of the T cell and infecting the T cell. HIV-positive people who have become resistant to PIs, NRTIs, and NNRTIs are likely to benefit from the fusion inhibitors because they are a different type of ARV. However, because fusion inhibitors are not included in the list of ARVs published by WHO for resource limited settings, they are not discussed in this session.

Each type of ARV is active at different stages of the virus' replication. Two, three, or more ARVs are generally combined to enhance their efficacy in suppressing this replication. This is referred to as combination therapy or highly active antiretroviral therapy (HAART). During combination therapy, one medication acts in combination with another to treat the HIV infection. For example, the action of the antiretroviral Zidovudine is enhanced if used in combination with Didanosine or Lamivudine. Thus a person living with HIV/AIDS will most likely take a combination of ARVs rather than just one.

Like ARVs, anti-fungal drugs, antibiotics, anti-malaria drugs, antihelminthics, and dietary supplements may interact with food. Appropriate dietary responses will be required during the treatment.

- *Antifungal drugs* such as Nystatin and Nizoral are used to treat thrush.
- *Antibiotics* such as Rifampin and Cotrimoxazole are used to treat bacterial infections.

- *Antimalaria drugs* such as quinine and pyrimethamine are used to treat malaria in endemic regions.
- *Anthelmintics* such as Ivermectin and Provacina are used for the treatment of intestinal parasites and worms
- *Dietary supplements* such as iron and vitamins A, B, and E may be taken to treat nutritional deficiencies.

### **Traditional therapies**

The use of traditional therapies such as herbs, teas, and infusions to treat several symptoms or diseases is a common practice. People living with HIV/AIDS often use traditional therapies to relieve symptoms and increase their sense of hope, empowerment, and control over their health problems. These traditional therapies vary from one place to another. The efficacy of traditional therapies has not been documented.

Because traditional medications may have side effects and interact with certain foods or other drugs, it is important to address their side effects as well as their negative effects on nutrient absorption, metabolism, distribution and excretion. For example, the concurrent use of garlic supplements and Saquinavir is not recommended. This combination has been reported to decrease plasma levels of Saquinavir by 50 percent, which will decrease the effectiveness of Saquinavir as an antiretroviral drug.

Very little information on the interaction between antiretroviral medication and traditional medication and herbs is available. It seems prudent to recommend that patients on HAART should not add traditional medication and herbs if the effects of these are not known. Timely management of traditional therapy and food interactions will help prevent weight lost, wasting, and malnutrition.

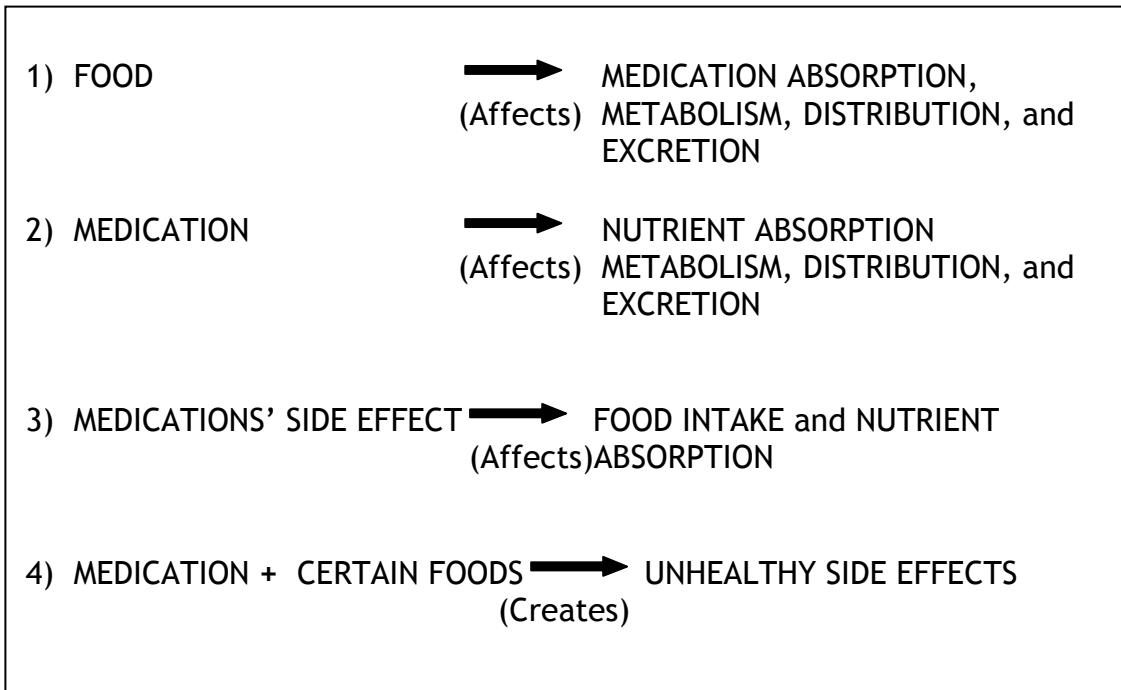
### **Food and drug interactions and their dietary management (slide 7)**

The main food and drug (modern and traditional medications) interactions are listed below and in figure 1.

- Food effects on drug efficacy

- Drug effects on nutrient absorption, metabolism, distribution, and excretion
- Side effects of medications that affect food intake and nutrient absorption
- Drug and food interactions that cause unhealthy side effects

**Figure 1 Types of interactions between medications and food**



Source: Castleman et al forthcoming

The side effects of drugs on food intake and the effects of drugs on nutrient absorption, metabolism, distribution and excretion may have the most negative impact on the nutritional status of people living with HIV/AIDS. The side effects of drugs and the effects of the disease are often difficult to distinguish. For example, headaches, malaise, fever, and gastrointestinal symptoms may be side effects of drugs but can also be associated with HIV and AIDS. Appropriate dietary responses may help address these.

Moreover, the effects of food on drugs' efficacy and the unhealthy side effects caused by the interaction of food and drugs also require appropriate dietary responses to maintain nutritional status and ensure the client's adherence and the effectiveness of the treatment.

## **Food effects on drug efficacy (slides 8, 9)**

Food intake or meals can enhance or inhibit the absorption, metabolism, distribution, and excretion of medications. This type of interaction varies from one drug to another and requires appropriate dietary responses to improve the client's adherence and optimize the medication's efficacy. Dietary management to improve the efficacy of a medication includes taking the medication with food, on an empty stomach, or with or without certain types of foods. Examples of the ways food intake affects drug efficacy are listed below.

- Food reduces the rate of absorption of aspirin (acetylsalicylic acid), commonly used to treat the fever and pain that are common in people living with HIV/AIDS. Aspirin is best taken 2 hours after meals with a full glass of water.
- Food reduces the absorption of Isoniazid, a medication commonly used to treat tuberculosis. Therefore, Isoniazid has to be taken 1 hour before or 2 hours after meals.
- Rifampin is also used to treat tuberculosis. As with Isoniazid, food reduces the absorption of Rifampin. Rifampin should be taken 1 or 2 hours after meals to increase the medication's absorption.
- Food enhances the absorption or metabolism of some ARVs and inhibits the absorption or metabolism of others. For example, a high-fat meal increases the bioavailability of the nucleoside analogue Tenofovir (Pronsky, Meyer, and Fields-Gardner 2001). A high-calorie, high-fat, high-protein meal decreases absorption of the protease inhibitor Indinavir and reduces the absorption of the nucleoside reverse transcriptase inhibitor Zidovudine. It is therefore recommended not to take Zidovudine with high-fat meals (>40g of fat).

As the effect of food on the efficacy of a drug is food and drug specific, the counselor should help the client draw up a food and drug timetable. This timetable should take into account both the food and drug interactions of each drug to be taken and the client's eating habits to ensure the greatest efficacy of the treatment.

## **Drug effects on nutrient absorption, metabolism, distribution, and excretion (slides 10, 11)**

Certain modern medications affect nutrient absorption, metabolism, and excretion. Modern medications that inhibit or enhance nutrient absorption and metabolism may have negative effects on nutritional status. Dietary management may require either increasing food intake, taking a nutrient supplement to compensate for the nutrient affected, or reducing the nutrient intake if the metabolite produced can negatively affect health.

***Drugs that may require increased food or nutrient intake***

The medication Isoniazid, commonly taken to treat tuberculosis, inhibits the metabolism of vitamin B<sub>6</sub>. Supplementation of this vitamin is therefore recommended. The antibiotic and antituberculosis medication Rifampin may increase vitamin D metabolism. Supplementation of this vitamin D may be required.

***Drugs that may require reduced food or nutrient intake***

Studies have reported lipid abnormalities, including increased level of triglycerides, cholesterol, and fat maldistribution, in people who have taken protease inhibitors or non-nucleoside reverse transcriptase inhibitors. The protease inhibitors Saquinavir and Ritonavir may cause an elevation in cholesterol and triglycerides levels, which may increase the risk of cardiovascular diseases (Pronsky, Meyer, and Fields-Gardner 2001). Most of the protease inhibitors may cause changes in lipid levels that require both dietary and medical responses.

Lipid abnormalities include hypertriglyceridemia, hypercholesterolemia, and lipodystrophy syndrome. For hypertriglyceridemia, it is important to maintain a healthy weight, eat a variety of foods, reduce the intake of refined sugar and excessive carbohydrates, increase intake of fiber, avoid alcoholic beverages, exercise daily, and take medication to lower triglycerides. For hypercholesterolemia, it is important to maintain a healthy weight, eat a diet low in fat and limited saturated fat, increase intake of fruits and vegetables, avoid food rich in cholesterol, avoid alcohol and smoking, exercise daily, and take medication to lower the cholesterol (Pronsky, Meyer, and Fields-Gardner 2001).

The effective management of fat maldistribution or lipodystrophy syndrome has not yet been established. Diet and exercise, use of medications, and change in the ARV regimen can help.

Some antiretroviral drugs may affect glucose metabolism and cause insulin resistance. Insulin resistance is associated with increased risk of diabetes (Gelato 2003). For diabetes, specific carbohydrate controlled diet, reduced intake of refined sugar and saturated fat, exercise, and antidiabetic medications are recommended.

Progressive lactic acidosis is a complication of NRTI therapy (Carr 2003). The signs of severe lactic acidemia include fatigue, weight loss, abdominal pain, dyspnea, liver dysfunction, and cardiac dysrhythmias. In case of any of these symptoms, stopping the NRTI may help.

Table 2 lists the purposes, recommended consumption, and potential side effects some of the better-known and more widely taken medications in resource-limited settings. This list is not comprehensive, and health workers and programs are encouraged to add or update the list as medications become available or their use is discontinued.

**Table 2 Modern medications and recommended food intakes and side effects**

Medication	Purpose	Recommended To be taken	Potential side effects
Abacavir (ABC)	Antiretroviral	Can be taken without regard to food.	Nausea, vomiting, fever, allergic reaction, anorexia, abdominal pain, diarrhea, anemia, rash, hypotension, pancreatitis, dyspnea, weakness and insomnia, cough, and headache
Chloroquine	Treatment of malaria	With food	Stomach pain, loss of appetite, nausea, vomiting Not recommended for women breastfeeding
Didanosine (ddl)	Antiretroviral	With water only, 1 hour before or 2 hours after eating. Avoid alcohol. Do not take with juice. Do not take with antacid containing aluminum or magnesium	Anorexia, diarrhea, nausea, vomiting, pain, headache, weakness, insomnia, rash, dry mouth, lost of taste, constipation, stomatitis, anemia, fever, dizziness, and pancreatitis.

Medication	Purpose	Recommended To be taken	Potential side effects
Efavirenz	Antiretroviral	Can be taken without regard to food. Avoid alcohol.	Elevated blood cholesterol levels, elevated triglycerides levels, rash, dizziness, anorexia, nausea, vomiting, diarrhea, dyspepsia, abdominal pain, flatulence
Fluconazole	Treatment of candida (thrush)	With food	Nausea, vomiting, diarrhea. Can be used during breastfeeding.
Indinavir (IDV)	Antiretroviral	1 hour before or 2 hours after meal. Drink at least 1,500ml of fluid daily. Do not drink grapefruit juice as it may lower the level of medicine in the blood. Avoid St. John's wort.	Nausea, abdominal pain, headache, kidney stones, taste changes, vomiting, regurgitation, diarrhea, insomnia, ascites, weakness, and dizziness. May increase the risk of lipodystrophy.
Isoniazid	Treatment of tuberculosis	1 hour before or 2 hours after meals. May cause possible reactions with foods such as bananas, beer, avocados, liver, smoked pickled fish, yeast and yogurt. May interfere with vitamin B <sub>6</sub> metabolism and require vitamin B <sub>6</sub> supplementation. Avoid alcohol.	Anorexia and diarrhea.
Lamivudine (3TC)	Antiretroviral	Can be taken without regard to food. Avoid alcohol.	Nausea, vomiting, headache, dizziness, diarrhea, abdominal pain, nasal symptoms, cough, fatigue, pancreatitis, anemia, insomnia, muscle pain, and rash.
Lopinavir	Antiretroviral	Can be taken without regard to	Abdominal pain, diarrhea, headaches, headache,

Medication	Purpose	Recommended To be taken	Potential side effects
		food. Avoid St John's wort.	weakness, nausea. May increase the risk of lipodystrophy and or diabetes.
Nelfinavir	Antiretroviral	With meal or light snack. Avoid St John's wort.	Diarrhea, flatulence, nausea, abdominal pain, and rash. May increase the risk of lipodystrophy.
Nevirapine (NVP)	Antiretroviral	Can be taken without regard to food. Avoid St John's wort.	Nausea, vomiting rash, fever, headache, skin reactions, fatigue, stomatitis, abdominal pain, drowsiness, paresthesia. High hepatotoxicity.
Nystatin	Treatment of thrush	With food	Infrequent occurrence of diarrhea, vomiting, nausea
Quinine	Treatment of malaria	With food	Abdominal or stomach pain, diarrhea, nausea, vomiting, lower blood sugar
Rifampin	Treatment of tuberculosis	On an empty stomach 1hour before or 2 hours after meals. Avoid alcohol.	Nausea, vomiting, diarrhea and loss of appetite.
Ritonavir	Antiretroviral	With meal if possible. Avoid St John's wort.	Nausea, vomiting, diarrhea, hepatitis, jaundice, weakness, anorexia, abdominal pain, fever, diabetes, headache, dizziness. May increase the risk of lipodystrophy.
Saquinavir	Antiretroviral	With meal or light snack within 2 hours of a high-fat meal and high-calcium meal. Avoid garlic supplements and St John's wort.	Mouth ulceration, taste changes, nausea, vomiting, abdominal pain, diarrhea, constipation, flatulence, weakness rash, and headache. May increase the risk of lipodystrophy.
Stavudine (d4T)	Antiretroviral	Can be taken without regard to food	Nausea, vomiting, diarrhea, peripheral neuropathy, chills and fever, anorexia, stomatitis, diarrhea, anemia, headaches, rash, bone marrow, and pancreatitis. May increase the risk

Medication	Purpose	Recommended To be taken	Potential side effects
			lipodystrophy. Limit the consumption of alcohol.
Sulfadoxine and Pyrimethamine (Fansidar <sup>®</sup> )	Treatment of malaria	With food and continuous drinking of clean boiled water	Nausea, vomiting, taste loss, and diarrhea. Not recommended if folate deficient. Not recommended for women breastfeeding.
Sulfonamides: Sulfamethoxazole, Cotrimoxazole (Bactrim <sup>®</sup> , Septra <sup>®</sup> )	Antibiotic for treatment of pneumonia and toxoplasmosis	With food	Nausea, vomiting, and abdominal pain
Tenofovir (TDF)	Antiretroviral	With food	Abdominal pain, headache, fatigue, and dizziness
Zidovudine/lamivudine/Abacavir (AZT/3TC/ABC)	Antiretroviral combination	On empty stomach if possible; if not, with low-fat meals	Nausea, vomiting, abdominal pain, diarrhea, anorexia, fever, bone marrow suppression, anemia, and hyperlactacemia
Zidovudine (AZT)	Antiretroviral	With low fat meal food. Avoid alcohol.	Anorexia, anemia, nausea, vomiting, bone marrow suppression, headache, fatigue, constipation, fever dizziness, dyspnea, insomnia, muscle pain, and rash

Source: Adapted from FANTA 2001

## Effects of drug side effects on food intake and nutrient absorption (slide 12)

Modern and traditional medications may cause side effects that affect food intake and nutrient absorption. Side effects may include changes in taste, loss of appetite (anorexia), nausea, bloating and heartburn, constipation, vomiting and diarrhea that affect food intake and nutrient absorption. Changes in taste, loss of appetite, nausea, bloating and heartburn, and constipation may lead to reduced food intake, whereas vomiting and diarrhea can cause poor nutrient absorption. Reduced food

intake and poor nutrient absorption can lead to the weight loss and wasting associated with faster progression of HIV to AIDS.

### **Appropriate dietary responses (slides 13, 14)**

Appropriate dietary responses may help maintain food intake and compensate for nutrient losses. Diet-related side effects need to be managed immediately to help continue proper eating habits and to maintain weight.

Examples of appropriate dietary responses is the addition of flavor enhancers such as salt, sugar, spices, vinegar, or lemon to help stimulate the taste buds, increase taste acuity, and mask unpleasant flavors as a result of taste changes from medication.

Eating energy- and nutrient-dense foods such as maize, groundnuts, and carrots and drinking plenty of fluids may help replace nutrient losses and prevent dehydration during fever or diarrhea.

Because drug side effects such as changes in taste, loss of appetite, nausea, bloating and heartburn, constipation, vomiting, and diarrhea are similar to HIV/AIDS-related symptoms, the dietary management is the same. Refer to Lecture Notes 5 on the dietary management of HIV/AIDS-related symptoms.

Some ARVs have been associated with increased risk of bone disorders such as osteoporosis, osteopenia, and osteomalacia (Tebas et al 2000) and may require medical and dietary responses. A balanced diet with high calcium foods such as milk yogurt, cheese, or calcium and vitamin D supplements may be required, along with a medical response. This is especially important for populations already at risk of calcium deficiencies and for pregnant and lactating women whose calcium need is increased.

Proper nutritional management of the side effects of medications will help improve the client's adherence to the treatment. If not properly managed, diet-related side effects of medications often lead to interruption of treatment or poor adherence to treatment. The health worker or counselor should provide the client with the most appropriate dietary guidance in his/her specific context.

### **Unhealthy side effects of some food and drug combinations (slide 15)**

Combinations of specific medications and food can cause unhealthy side effects. Such food should not be taken at the same time as these medications. The consumption of alcohol can cause inflammation of the pancreas while taking the ARV Didanosine and should be avoided. Alcohol should also be avoided while taking the antituberculosis medication Isoniazid, as this combination may increase the risk of inflammation of the liver.

Table 3 lists some of the known contraindications for some of the better-known medications consumed by people living with HIV/AIDS. The list is not comprehensive, and health workers and programs are encouraged to add or update the list as medications become available or their use is discontinued.

**Table 3 Foods contraindicated with modern medications**

Medication	Purpose	Contraindications
Indinavir (IDV)	Antiretroviral	Do not drink grapefruit, which may lower the level of medicine in the blood
Isoniazid	Treatment of tuberculosis	May cause possible reactions with foods such as bananas, beer, avocados, liver, smoked pickled fish, yeast and yogurt Avoid alcohol
Rifampin	Treatment of tuberculosis	Avoid alcohol
Zidovudine (AZT)	Antiretroviral	Avoid alcohol
Zidovudine/lamivudine (AZT/3TC)	Antiretroviral combination	Avoid alcohol

### **Drug–drug interactions (slide 16)**

People living with HIV/AIDS often take several modern and traditional therapies simultaneously. This combination may affect the drugs' efficacy and nutritional status. Such interactions need to be managed appropriately to ensure that side effects do not affect food intake, nutrient absorption, and metabolism and to facilitate the optimal efficacy of all medications.

Anti-acid medications containing magnesium and aluminum interacts and leads to increased side effects. Didanosine should therefore not be taken at the same time with an antacid containing magnesium and aluminum.

Studies have shown that the blood concentration of the protease inhibitor Saquinavir decreases by 50 percent if taken together with a garlic supplement. Garlic usually is taken as a traditional therapy to strengthen the immune system. Saquinavir should therefore not be taken with a garlic supplement (Piscitelli et al 2002). The antifungal agents Fluconazole (Diflucan®) and Ketoconazole (Nizoral®) may inhibit the metabolism of protease inhibitors and contribute to increase the toxicity of these drugs.

### **Recommendations for the proper management of food and drug interactions (slides 17, 18)**

Antiretroviral therapy is becoming simpler, with fewer doses and fewer pills. Given the rapid evolution in antiretroviral therapy and the effects of food and drug interactions on drug efficacy and nutritional status, health providers and counselors should know about and keep up to date on possible interactions and their management.

The following recommendations to guide the health worker or counselor in addressing food and drug interactions for the people living with HIV/AIDS should be supplemented by national guidelines if available.

- Because different drugs have different food interactions, recommendations should be drug specific. Understand the specific interactions of each drug used and counsel accordingly.
- If several drugs are taken, refer to the food and drug interactions of each.
- Pay close attention to the client's diet and drug regimen and manage interactions that will affect nutritional status. The nutrition implications of some drug combinations differ from the implications of an individual drug. For example, food reduces the absorption of the protease inhibitor Indinavir, but when Indinavir is taken in combination with Ritonavir or Delavirdine, studies

have shown that food has no effect on its absorption, and it can be taken with or without food.

- Involve the client in finding solutions for side effects and food-drug interactions.
- Give special consideration to traditional medicines. While some side effects of traditional medicines may be known, many of their food and drug interactions are not known. Help the client who is taking traditional medicines alone or with other drugs to identify the side effects and food and drug interactions and use the foods available to mitigate their impact on nutritional status.
- Be attentive to the side effects and nutritional implications of ARVs for malnourished communities in resource-limited settings. These effects have been studied primarily on well-nourished populations and are not well documented among malnourished people. Act promptly to alleviate their negative impact on the health and nutrition status.
- Food insecurity may constrain people living with HIV/AIDS from meeting optimal food and nutrition responses. Seek alternative responses that are feasible given the circumstances.

### **Special considerations for pregnant and lactating women (slide 19)**

Some pregnant women living with HIV/AIDS are treated with ARVs such as Nevirapine or Zidovudine or both during pregnancy or at the onset of labor to reduce mother-to-child transmission of HIV. ARVs can interact with other drugs and foods and have adverse effects on women's health and nutritional status.

When an ARV is taken just one time at the onset of labor, the food and drug interaction and possible impact on nutritional status are limited. However, the counselor has to counsel the mother on the appropriate timing for taking the drug to ensure the best efficacy of the treatment.

Some pregnant women take Zidovudine from 36 weeks of pregnancy to prevent mother-to-child transmission of the virus, and others take ARVs to treat HIV/AIDS after delivery. For medium- and long-term treatment with ARVs and other drugs, ARVs can interact with other drugs and with food and have negative effects on the

women's nutritional status. It is critical to ensure that food and drug interactions during pregnancy do not result in reduced food intake and limited weight gain for the pregnant mother. These may further weaken the mother and also contribute to low birth weight for the baby. The health worker or counselor should be aware of the possible negative effects of the drugs and drug interactions on the fetus and counsel accordingly.

Because pregnant and lactating women living with HIV/AIDS have increased nutritional needs, food and drug interactions should be managed in a timely manner to alleviate the side effects of the drugs, optimize the absorption and metabolism of nutrients, and optimize the drug efficacy. The nutritional management of drug side effects and drug and food interactions are similar to those for other people living with HIV/AIDS.

The goal of nutritional management of food and drug interactions during pregnancy and lactation aims to ensure good health and nutrition for the mother by maintaining or improving food intake through the consumption of a variety of foods. This will help ensure adequate weight gain. Indicators of good nutrition include type of foods consumed, frequency of meals and quantity of food, weight gain, and the absence of micronutrient deficiencies.

For more information refer to Session 6 on nutritional care and support of pregnant and lactating women and adolescent girls infected with HIV/AIDS and Session 7 on infant feeding and PMTCT.

### **Special considerations for infants and children (slide 19)**

Children living with HIV are at a greater risk of malnutrition. The causes of malnutrition include:

- Inadequate nutrient intake as a result of anorexia, nausea, oral or esophageal lesions, or generalized malaise and weakness
- Increased nutrient and energy requirements during hypermetabolic or hypermetabolic periods induced by fever and secondary infections
- Increased energy cost of breathing related to respiratory infections

- Protein, calorie, fluid, and micronutrient losses with vomiting, diarrhea, and malabsorption

Given the high risk of malnutrition for infants, children, and young people living with HIV/AIDS, those taking ARVs and other drugs need to be monitored closely to manage the side effects of the drugs and the food and drug interactions. Side effects of medications and food and drug interactions are similar to those experienced by adults living with HIV/AIDS. The health worker or counselor should work closely with parents or caregivers to ensure that children do not reduce their food intake and that they eat a variety of foods, gain weight, and continue to grow.

For more information, refer to Session 7 on infant feeding and PMTCT and Session 8 on nutritional care for children born of women infected with HIV/AIDS.

### **Programmatic implications for the management of drug and food interactions in HIV therapy**

Because of the possible negative impacts of poorly managed drug and food interactions on the overall health and nutritional status of people living with HIV/AIDS, program managers and policymakers should provide the enabling environment and strengthen the capacity of health providers to properly manage drug and food interactions in HIV/AIDS therapy.

#### ***Enabling environment***

Program managers should integrate the management of drug and food interactions in all services where the provider may come in contact with people living with HIV/AIDS. They should also make guidelines available with information on the ARVs and other modern and traditional therapies used in the area, the drug and food interactions, and the proper management of these interactions using foods available. The guidelines should be available in all health services.

The management of drug and food interactions should be included in the support supervision checklist. The information compiled from the support supervision report will highlight the areas where greater support for health providers is needed, such as information gap and lack of skills. Program managers should give health providers appropriate space to provide every client with confidential counseling on the management of drug and food interactions.

### ***Health provider capacity***

Health providers should be trained to manage drug and food interactions in their contexts and have access to updated information on the management of drug and food interactions. Supervisors of health providers should provide health providers with support supervision in the management of drug and food interactions and help them address gaps in knowledge or skills. Adequate knowledge and appropriate skills to carry out good nutritional assessment are critical for the successful management of food and interactions.

### **Nutritional assessment during counseling on the nutritional management of drug and food interactions (slide 20)**

The nutritional assessment at the beginning of the counseling session will help the health worker or counselor understand the client's feeding practices, medication, ability to access different foods, and constraints. This information will help the client address his/her food and drug interactions. For more information on counseling, refer to Session 6.

#### **Questions to include in the assessment**

- What are the client's feeding practices?
- What foods are frequently eaten?
- How many meals are eaten per day?
- What is the period of food shortages?
- What foods are affected?
- How does the client cope during food shortages?
- What foods are the most available and affordable for the client?
- What drugs will the client be taking?

- What are the client-specific food and drug interactions (for each drug and for all the drugs combined)?
- What are the side effects of each drug?
- What are the side effects of the combined drugs?
- What diets are recommended to alleviate the side effects?
- What are the constraints in addressing the side effects?
- What are the alternative solutions to address the constraints?
- What is the recommended timing for each drug?
- What are the constraints to following the medication timetable?
- What are the alternative options to the medication time table?

It is very important for the health worker or counselor to analyze this information properly to identify different solutions to help the client use available foods to manage the side effects of the drugs and the food and drug interactions. The following questions will help identify possible solutions for the client.

***Questions to help identify foods to manage drug side effects***

- Which foods are available and affordable to manage the side effects of the drugs the client will be taking?
- In case of shortage of foods that can be used to manage side effects, what alternatives (purchased or donated foods) can the client use, and what can the client do to address food constraints.

***Questions to help identify foods that enhance or inhibit drug efficacy***

- Which of the foods that the client often eats may inhibit or enhance the efficacy of drugs taken? Which ones are contraindicated for each drug?

- What foods should not be taken with each drug or all of the drugs?

***Questions to help identify the best time to take drugs and foods to ensure drug efficacy***

- What drugs should the client be taking with foods?
- What drugs should be taken while fasting?
- What drugs should be taken after meals?
- If the client is not eating the number of meals recommended as per the drugs' requirements, what are the alternative solutions?
- How can the client adjust or increase the number of meals to fulfill the medication requirements?
- Which specific foods should not be eaten while taking the drugs?
- What are the alternatives if the specific food not to be eaten is the staple food?

***Questions to address the effects of drugs on nutrient absorption and metabolism***

- What nutrients are affected by each drug taken by the client?
- What are the possible solutions (diet supplement or micronutrient supplements) to address the problem in the client's context?

**Counseling and implementation**

The counselor will work with the client to help identify options to address drug and food interactions and enable effective use of drugs with minimal nutritional side effects. This process should involve awareness of food security or other constraints, feasible food-drug options within the constraints, and options to address or reduce the constraints. The option selected will depend on the drugs used, their specific food and nutrition implications, and the client's circumstances. The counselor

should give clients detailed information on the chosen options and alert them to pay close attention to any dietary changes resulting from side effects.

The counselor should meet the client regularly to follow up on implementation of the chosen option. The follow-up sessions will not assess the impact of nutritional management but rather the client's success in implementing the choice and determining the main constraints to help identify other feasible options. If clients are having trouble accessing the required food, the counselor may refer them to other available services to improve food access.

## Conclusion

Careful consideration and management of drug and food interactions is required in HIV/AIDS therapy to ensure drug efficacy and client adherence and avoid negative effects on nutritional status. The dietary management of drug and food interactions in HIV/AIDS therapy will help minimize the side effects of medications and maintain food intake, minimize the effect of medications on nutrient absorption and metabolism, ensure efficacious treatment, and improve client adherence.

Successful management of the client's drug and food interactions requires that the counselor understand the specific context of food access and eating habits. The counselor should motivate the client to use available foods to address side effects and interactions of the medications.

## References

Carr, A. 2003. Lactic acidemia in infection with human immunodeficiency virus. *Clinical Infect Dis* 36(suppl. 2): S96-100.

Castleman, T, E Seumo-Fasso, and B Cogill. 2003. Food and nutrition implications of antiretroviral therapy in resource-limited settings. Washington, DC FANTA Project, Academy for Educational Development. Forthcoming

Food and Nutrition Technical Assistance (FANTA). 2001. HIV/AIDS: A guide for nutrition, care and support. Washington: FANTA, Academy for Educational Development.

Gelato, M. 2003. Insulin and carbohydrate dysregulation. *Clinical Infect Dis* 36: S91-5.

Piscitelli SC, AH Burstein, N Welden, KD Gallicano, and J Falloon. 2002. The effect of garlic supplements on the pharmacokinetics of Saquinavir. *Clin Infect Dis* 34: 234-8.

Pronsky Z, SA Meyer, and C Fields-Gardner. 2001. HIV medications-food interactions handbook. Second edition. Birchrunville, PA.

Tebas P, WG Powderly, S Claxton, D Marin, W Tantisriwat, SL Teitelbaum, et al. 2000. Accelerated bone mineral loss in HIV-infected patients receiving potent antiretroviral therapy. *AIDS* 14: F63-7.

## EXERCISE 9

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Use the Lecture Notes to discuss the PowerPoint slides. After the PowerPoint presentation, depending on the time available, do any of the following tasks to help students begin to master the nutritional management of food and drug interactions in HIV/AIDS therapy.

**TASK 1:** Facilitate a question and answer session on the nutritional implications of Isoniazid or another drug to help students to master the nutritional implications of drug and food interactions in HIV/AIDS therapy. Read the following complaint: “John, who is HIV infected and has been taking Isoniazid for 3 months, complained of nausea and fatigue. His doctor referred him to nutritional counseling.” Ask students to discuss the nutritional implications of Isoniazid for this patient and the appropriate dietary management.

Encourages students to use the reference materials provided in this module while counseling by asking, “Which materials or references are you going to check in this case?” Refer students to **Handout 9.1: Drugs Commonly Taken by People Living with HIV/AIDS, Likely Side Effects, and Recommended Dietary Practices to Increase Drug Efficacy**. Ask students to identify the appropriate dietary management from references by asking, “What dietary management would you consider providing?” Ask a student to read the answer.

Isoniazid in the example may be replaced with other drugs, such as Indinavir or Nystatin.

**TASK 3:** Ask students to role-play an assessment of drug and food interactions in HIV/AIDS therapy during a counseling session using the case study below.

**Case study:** John is 38 and HIV infected. His health condition has declined seriously in the past months. After measuring John's CD4 and viral load, the doctor informed him that he was eligible to enroll in the antiretroviral therapy program. He explained the program in detail, and John agreed to enroll. After prescribing Trizivir (combination of Abacavir/Zidovudine/Lamivudine (ABC/AZT/3TC), the doctor explained how many tablets John should take per day and how often. The doctor

referred him to the counselor for the counseling session on how to manage Trizivir and food interactions.

Ask students to stage a counseling session with John, who has just been prescribed Trizivir. Carry out the assessment bearing in mind potential food and Trizivir interactions and dietary management to alleviate the side effects of the drug. This session will help John maintain food intake and adhere to treatment as well as ensure drug efficacy.

Ask for two volunteers for the role-play. The first volunteer will be the client who has just been prescribed Trizivir (ABC/AZT/3TC). The second volunteer, the counselor, will focus on the assessment during the counseling. The role-play should focus on the assessment. After the assessment, the counselor should explain how the information collected will be used. Distribute **Handout 9.2: Observation Checklist during a Counseling Session on the Management of Drug and Food Interactions in HIV/AIDS Therapy** to the students to use for observation and feedback. Ask the students to write their comments in the “comments” column.

After the role-play, ask the counselor to explain what he or she found easy or difficult during the assessment. Ask the other students to provide feedback using the checklist and following the order of the checklist. Recommend that the students start with what the counselor did well and then add what needs to be improved and suggest how to improve.

Summarize the session, highlighting the importance of taking into account food security issues for the dietary management of food and drugs interactions. Again remind the students to use the reference materials they have been given.

## HANDOUT 9.1 Drugs Commonly Taken by People Living with HIV/AIDS, Likely Side Effects, and Recommended Dietary Practices to Increase Drug Efficacy

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Medication	Purpose	Recommended To be taken	Potential side effects
Abacavir (ABC)	Antiretroviral	Can be taken without regard to food.	Nausea, vomiting, fever, allergic reaction, anorexia, abdominal pain, diarrhea, anemia, rash, hypotension, pancreatitis, dyspnea, weakness and insomnia, cough, and headache
Chloroquine	Treatment of malaria	With food	Stomach pain, loss of appetite, nausea, vomiting Not recommended for women breastfeeding
Didanosine (ddl)	Antiretroviral	With water only, 1 hour before or 2 hours after eating. Avoid alcohol. Do not take with juice. Do not take with antacid containing aluminum or magnesium	Anorexia, diarrhea, nausea, vomiting, pain, headache, weakness, insomnia, rash, dry mouth, lost of taste, constipation, stomatitis, anemia, fever, dizziness, and pancreatitis.
Efavirenz	Antiretroviral	Can be taken without regard to food. Avoid alcohol.	Elevated blood cholesterol levels, elevated triglycerides levels, rash, dizziness, anorexia, nausea, vomiting, diarrhea, dyspepsia, abdominal pain, flatulence
Fluconazole	Treatment of candida (thrush)	With food	Nausea, vomiting, diarrhea. Can be used during breastfeeding.

Medication	Purpose	Recommended To be taken	Potential side effects
Indinavir (IDV)	Antiretroviral	1 hour before or 2 hours after meal. Drink at least 1,500ml of fluid daily. Do not drink grapefruit juice as it may lower the level of medicine in the blood. Avoid St. John's wort.	Nausea, abdominal pain, headache, kidney stones, taste changes, vomiting, regurgitation, diarrhea, insomnia, ascites, weakness, and dizziness. May increase the risk of lipodystrophy.
Isoniazid	Treatment of tuberculosis	1 hour before or 2 hours after meals. May cause possible reactions with foods such as bananas, beer, avocados, liver, smoked pickled fish, yeast and yogurt. May interfere with vitamin B <sub>6</sub> metabolism and require vitamin B <sub>6</sub> supplementation. Avoid alcohol.	Anorexia and diarrhea.
Lamivudine (3TC)	Antiretroviral	Can be taken without regard to food. Avoid alcohol.	Nausea, vomiting, headache, dizziness, diarrhea, abdominal pain, nasal symptoms, cough, fatigue, pancreatitis, anemia, insomnia, muscle pain, and rash.
Lopinavir	Antiretroviral	Can be taken without regard to food. Avoid St John's wort.	Abdominal pain, diarrhea, headaches, headache, weakness, nausea. May increase the risk of lipodystrophy and or diabetes.
Nelfinavir	Antiretroviral	With meal or light snack. Avoid St John's wort.	Diarrhea, flatulence, nausea, abdominal pain, and rash. May increase the risk of lipodystrophy.

Medication	Purpose	Recommended To be taken	Potential side effects
Nevirapine (NVP)	Antiretroviral	Can be taken without regard to food. Avoid St John's wort.	Nausea, vomiting rash, fever, headache, skin reactions, fatigue, stomatitis, abdominal pain, drowsiness, paresthesia. High hepatotoxicity.
Nystatin	Treatment of thrush	With food	Infrequent occurrence of diarrhea, vomiting, nausea
Quinine	Treatment of malaria	With food	Abdominal or stomach pain, diarrhea, nausea, vomiting, lower blood sugar
Rifampin	Treatment of tuberculosis	On an empty stomach 1hour before or 2 hours after meals. Avoid alcohol.	Nausea, vomiting, diarrhea and loss of appetite.
Ritonavir	Antiretroviral	With meal if possible. Avoid St John's wort.	Nausea, vomiting, diarrhea, hepatitis, jaundice, weakness, anorexia, abdominal pain, fever, diabetes, headache, dizziness. May increase the risk of lipodystrophy.
Saquinavir	Antiretroviral	With meal or light snack within 2 hours of a high-fat meal and high-calcium meal. Avoid garlic supplements and St John's wort.	Mouth ulceration, taste changes, nausea, vomiting, abdominal pain, diarrhea, constipation, flatulence, weakness rash, and headache. May increase the risk of lipodystrophy.
Stavudine (d4T)	Antiretroviral	Can be taken without regard to food	Nausea, vomiting, diarrhea, peripheral neuropathy, chills and fever, anorexia, stomatitis, diarrhea, anemia, headaches, rash, bone marrow, and pancreatitis. May increase the risk lipodystrophy. Limit the consumption of alcohol.

Medication	Purpose	Recommended To be taken	Potential side effects
Sulfadoxine and Pyrimethamine (Fansidar <sup>®</sup> )	Treatment of malaria	With food and continuous drinking of clean boiled water	Nausea, vomiting, taste loss, and diarrhea. Not recommended if folate deficient. Not recommended for women breastfeeding.
Sulfonamides: Sulfamethoxazole, Cotrimoxazole (Bactrim <sup>®</sup> , Septra <sup>®</sup> )	Antibiotic for treatment of pneumonia and toxoplasmosis	With food	Nausea, vomiting, and abdominal pain
Tenofovir (TDF)	Antiretroviral	With food	Abdominal pain, headache, fatigue, and dizziness
Zidovudine/lamivudine/Abacavir (AZT/3TC/ABC)	Antiretroviral combination	On empty stomach if possible; if not, with low-fat meals	Nausea, vomiting, abdominal pain, diarrhea, anorexia, fever, bone marrow suppression, anemia, and hyperlactacemia
Zidovudine (AZT)	Antiretroviral	With low fat meal food. Avoid alcohol.	Anorexia, anemia, nausea, vomiting, bone marrow suppression, headache, fatigue, constipation, fever, dizziness, dyspnea, insomnia, muscle pain, and rash

Source: Adapted from FANTA 2001.

Note: The list is not comprehensive and health workers and programs are encouraged to add to or update it as medications become available or their use is discontinued.

## HANDOUT 9.2: Observation Checklist during a Counseling Session on the Management of Drug and Food Interactions in HIV/AIDS Therapy

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**Problem:** The client is experiencing side effects from the drugs and food and drug interactions.

**Purpose:** The purpose of the assessment is to improve the counselor’s understanding of the client’s feeding practices and access to different foods. This will enable the counselor to help the client choose the most suitable food response to address the drugs’ side effects and the food and drug interactions. Without a good assessment, the counselor cannot know and appreciate the client’s context and motivation to address the problem. The client will implement a solution only if it is acceptable, affordable, and feasible.

	Yes	No	Comments
<b>1-Did the counselor ask the client about:</b>			
<i>Feeding practices</i>			
Foods frequently eaten?			
Number of meals per day?			
Period of food shortage?			
Foods affected by food shortage?			
Client’s coping strategy during food shortage?			
Most available and affordable foods?			
<i>Drugs</i>			
Drugs the client will be taking?			
Types and frequency of problem experienced with these drugs?			
<b>2- Did the counselor find out from his or her own knowledge and the information collected about:</b>			

Side effects of each drug?			
Side effects of the drugs if combined?			
Foods to alleviate the side effects and the alternatives?			
Constraints to addressing the side effects?			
Alternative options?			
Client's food and drug interactions (for each drug and for all the drugs combined)?			
Recommended timing for each drug?			
Constraints of the drug-taking timetable?			
Ways to adjust feeding practice to follow the drug-taking timetable?			