# Position of the American Dietetic Association and Dietitians of Canada: Nutrition Intervention in the Care of Persons with Human Immunodeficiency Virus Infection

**ABSTRACT**
Infection with the human immunodeficiency virus (HIV) and the development of acquired immunodeficiency syndrome (AIDS) have had a significant impact on domestic and global health, social, political, and economic outcomes. Prevention and treatment efforts to control HIV infection are more demanding than in previous decades. Achieving food and nutrition security, and managing nutrition-related complications of HIV infection and the multiple aspects of disease initiated by or surrounding HIV infection, referred to as HIV disease, remain challenges for patients and for those involved with HIV/AIDS prevention, care, and treatment efforts. Confounding clinical issues include medication interactions, coinfection with other infections and diseases, wasting, lipodystrophy, and others. Dietetics professionals, other health care professionals, and people infected with HIV will need to understand and address multiple complex aspects of HIV infection and treatment to improve survival, body functions, and overall quality of life. Individualized nutrition care plans will be an essential feature of the medical management of persons with HIV infection and AIDS.
*J Am Diet Assoc. 2004;104: 1425-1441.*

**POSITION STATEMENT**

*It is the position of the American Dietetic Association and Dietitians of Canada that efforts to optimize nutritional status, including medical nutrition therapy, assurance of food and nutrition security, and nutrition education, are essential components of the total health care available to people with human immunodeficiency virus infection throughout the continuum of care.*

According to the 2003 AIDS Update by the Joint United Nations Programme and World Health Organization, an estimated 40 million people are currently living with human immunodeficiency virus (HIV) infection worldwide. This number includes more than 37 million adults and 2.5 million children under the age of 15 years. The estimated number of new infections in 2003 was 5 million, including more than 4.2 million adults (approximately 50% women) and 700,000 children less than 15 years of age. Estimated deaths in 2003 alone were 3 million, including 2.5 million adults (50% women) and 500,000 children (1).

In the United States, the reporting of HIV infections is not required in all states and is, therefore, incomplete. However, the Centers for Disease Control and Prevention (CDC) estimates that there have been approximately 40,000 new cases of HIV infection annually since the early 1990s, and currently there are between 850,000 and 950,000 HIV-infected Americans (2). With the advent of effective combinations of medications and other health care advances in HIV and acquired immunodeficiency syndrome (AIDS) care, the number of reportable AIDS cases decreased sharply in 1996 and leveled off between 1999 and 2002.

The CDC reports that by the end of 2002 there were 859,000 AIDS cases reported in the United States. Death rates to date are 57% of the adults and 58% of the children diagnosed with AIDS. The largest proportion of new HIV cases is among ethnic minorities, women, and youth who tend to come from economically disadvantaged communities and have experienced historical barriers to accessing HIV care (3,4).

A total of 51,470 cumulative cases, including 708 children less than 15 years old, of HIV infection have been reported in Canada since testing began in 1985 (5). Since 1995 there has been a 30% decrease in cases of HIV infection reported annually.

The profile of reported AIDS cases has continued to show an increase in underserved populations in both the United States and Canada, including ethnic minorities, women, adolescents, injection drug users, and immigrants and refugees from endemic regions who have historical barriers to accessing HIV care. These affected groups are usually diagnosed at a later stage of HIV infection when related disease is present, and they often delay care for themselves because they must care for others or have competing subsistence needs for their time and economic resources (6,7). Although health care is universal in Canada, in the United States these groups often lack health insurance, which directly impacts their likelihood of receiving care and successfully adhering to AIDS therapies (8). Reimbursement for nutrition-related services and products will be important to the access and integration of nutritional care and should be part of efforts to improve access to care in the United States. HIV infection has be-

*0002-8223/04/10409-0015$30.00/0*
*doi: 10.1016/j.jada.2004.07.012*

come a political, social, and economic struggle worldwide. These issues present significant challenges to health care systems in both the prevention and the treatment of HIV infection.

## NUTRITION AND HIV DISEASE INTERACTIONS

### Global Issues and Response

Food and nutrition insecurity* have been linked worldwide to the transmission of HIV and poor outcomes related to HIV disease (1,9-11). Food and nutrition insecurity can lead to survival strategies that can expose populations to a greater risk of HIV infection, such as migration to urban slums and involvement in the sex trade, and can increase the vulnerability to the progression of HIV disease to AIDS. At the same time, these events can occur where there is a lack of infrastructure precluding access to health care services that could counter these problems. As children lose educational opportunities to provide more basic care for malnourished and/or infected family members and as adults responsible for childcare become sick and die, the social and economic infrastructures diminish and crumble. The result can be the initiation or exacerbation of malnutrition.

The role of food and nutrition security in maintaining the family unit, preserving livelihood strategies, and prolonging life is an important component in developing countries, in which the very survival of family members and community infrastructure is dependent on passing indigenous survival-related knowledge to future generations (12). In developing, transitional, and developed countries, poor nutritional status can be related to psychosocial and economic issues. Lack of education, food access, economic support, and access to health care services may increase the risk of malnutrition.

*Food security is defined here as the "access by all people, at all times to sufficient food for an active and healthy life. . .[and] includes at a minimum: a ready availability of nutritionally adequate and safe foods, and an assured ability to acquire acceptable foods in socially acceptable ways." Nutrition security may be defined as, "the provision of an environment that encourages and motivates society to make food choices consistent with short- and long-term good health" (15,16).*

### Food and Nutrition Security Issues

Achieving optimal nutritional status is a challenge for anyone living with HIV. The Committee on World Food Security's 2001 paper, "The Impact of HIV/AIDS on Food Security," states: "All dimensions of food security—availability, stability, access and use of food—are affected where the prevalence of HIV/AIDS is high" (13). As such, the nutritional issues facing HIV-affected populations challenges the development and implementation of resolutions to the problem of world hunger and malnutrition. Many people with AIDS face hunger and multiple barriers to food and nutrition security. Coupled with their HIV status and the disease's complications, some people are facing economic insecurity, social isolation and stigmatization, incarceration or other institutionalization, inadequate cooking skills and facilities, limited food availability and dietary diversity, substance use, and coinfections and other illnesses, including mental illness and disabilities. Food represents more than a vehicle to deliver nutrients, and having food security includes being able to access food with dignity.

Safe access to appropriate food in an acceptable environment is an important part of improving and maintaining physical and emotional health (14). Discussing and resolving barriers to food security is an essential step in improving health status (15,16). The American Dietetic Association's (ADA) papers on domestic and global food and nutrition security exhort dietetics professionals to build food and nutrition security through competent and collaborative practice as a part of the health care team as well as client advocacy (15,16). In an effort to reduce the incidence of hunger 50% by 2015, both the United States and Canada signed a final declaration of the World Food Summit to work collaboratively with 182 other countries.

Opportunities exist between domestic and international HIV/AIDS service organizations to collaborate and transfer expertise and skills, known as twinning. The Interagency Coalition on AIDS and Development is a Canadian group that mobilizes human and financial resources in Canada to respond to HIV/AIDS in resource-limited communities and countries. This coalition has developed a guide to twinning for HIV/AIDS service organizations to assist organizations interested in cross-border learning and action from their counterparts related to HIV/AIDS (13,17). An example of such a partnership that focuses on nutrition and food security programming exists between Open Arms of Minnesota and the Zwane Community Center in the Guguletu district of South Africa (18).

### Nutrition-Related Clinical Issues

Malnutrition, independent of HIV infection, can lead to immune function decline predisposing the body to infections, including infection with HIV, and other conditions associated with loss of immune function (19-22). Nutrition-related deficiencies affecting immune function may range from anemias and antioxidant depletion to protein-energy malnutrition. Adequate calorie, protein, and micronutrient intake is essential to the maintenance and restoration of malnutrition-related immune dysfunction (23). Protein seems to be especially essential to the maintenance of body cell mass and normal body functions, including immunity (24). In addition to ensuring adequate substrate for general body maintenance, cytokine production and immune functions can be modulated by pharmaceutical uses of nutrients. An example may be emphasizing particular types of fat, such as n-3 fatty acids to alter inflammatory response, which has led to mixed results (25,26). Although important roles for specific micronutrients in immune function maintenance have been identified, more recent information suggests that generalized malnutrition may explain much of the immune dysfunction (27,28).

The effects of HIV and its complications on nutritional status and the effect of nutritional status on HIV disease progression have been explored (29-31). A well-nourished HIV-positive person with a controlled viral load is more likely to be able to with-

stand the effects of HIV infection. However, macronutrient and micronutrient needs may increase significantly with one or a combination of these interrelated factors: a high viral load associated with a decline in immune function, ineffective treatment regimens, viral resistance, and/or active secondary infections. Men, women, and children have specific nutrition considerations that must be addressed with the patient's sex and age in mind. Men, women, and children with HIV/AIDS are at risk for compromised nutritional status, although the type and severity of malnutrition may vary from macronutrient and micronutrient deficits to altered nutrient metabolism (32-34).

Nutritional status, specifically the maintenance of weight and crucial body-protein stores (body cell mass), affects a person's ability to survive HIV disease (35-37). With a loss of body cell mass to a level of 54% of the expected value based on height, death is likely to occur in HIV-infected patients regardless of the presence or absence of infectious complications (38). Because metabolism of nutrients and medications occurs primarily in the body cell mass compartment (composed mostly of organ and muscle tissues), knowledge and preservation of these body tissues may support the efficacy of medication therapies (39-41). It is likely that there are a combination of mechanisms for weight and protein losses, including a loss of appetite and increased use associated with inflammatory responses (42,43). Negative nitrogen balance and weight losses are correlated. It is expected that 80% to 90% of weight loss during acute events is accounted for by protein losses, whereas less protein is lost during the starvation process (44). During critical events, both nutrition and other medical therapy strategies are required to achieve disease management goals, including the preservation of crucial body cell mass stores (29,45,46). Diets high in both calories and protein may be required to improve the body's response to the challenge of symptomatic HIV infection (47,48).

Starvation or metabolic changes can lead to detrimental nutritional alterations (49,50). Starvation refers to the lack of nutrient substrates because of decreased intake, malabsorption, or increased losses (51-54). Nutrition insecurity and lower levels of nutrient intake are more likely to occur in advanced HIV disease or in populations at risk for deficient intake, such as the economically disadvantaged, elderly, children, injection drug users, the transitionally housed or homeless, and people with compromised mental health.

Starvation-style malnutrition can result from malabsorption of nutrients. Malabsorption—particularly fat malabsorption—seems to occur throughout the disease process and is not always accompanied by diarrhea or other typical symptoms (44,46,47). Villous atrophy, intestinal cell maturation defects, increased gut permeability, autonomic neuropathy, and gastrointestinal pathogens have all been documented with malabsorption throughout the disease (44,46,47,55-57). It has also been suggested that activation of gut immunity and the inflammation that results can contribute to malabsorption (58).

Infectious disease can lead to a cascade of events such as anorexia, diarrhea, and an inflammatory response causing a preferential loss of nitrogen stores, even early in the disease process and during asymptomatic phases (59). The cascade of events that occurs as part of the inflammatory and immune response to infection is dependent on the severity of the infection and may include the preferential and rapid loss of lean body mass (60). Seminal research examining cortisol levels and immune function suggests that psychological stress, as an inducer of the physiologic stress response, may contribute to metabolic alterations and subsequently to lean tissue losses. Although of interest, empirical evidence has not yet accrued to support this hypothesis (61). The loss of lean tissue central to body metabolism may be present throughout the disease process, regardless of weight maintenance, suggesting that weight is not a good early indicator of declining nutritional status (59). Differences in sex seen in HIV infection have suggested that a large proportion of the weight loss in female patients may come from the fat compartments (62). Fat tissue losses can also alter metabolic stability.

It has been well established that deficiencies and sometimes excesses of nutrients adversely affect immune and other normal body processes. Altered levels of plasma proteins, micronutrients, and other nutrition-related markers have been documented early in the disease process and are associated with an increased risk of mortality in HIV infection (34,63-65). Although nutritional repletion of micronutrients has been recommended, it is not yet clear that the cause is true deficiency or altered metabolism associated with HIV infection and the inflammatory response (66).

In addition to nutrition and disease interaction, the health care professional must consider the nutritional interactions with treatment regimens. It is apparent that the efficacy of antiretroviral and other medications is important to nutritional status maintenance (67,68). There are currently four classes of antiretroviral medications: nucleoside reverse transcriptase inhibitors, nonnucleoside reverse transcriptase inhibitors, protease inhibitors, and fusion inhibitors. Lifelong pharmacotherapy with combinations of these medications may be required for continuous disease management and presents challenges to nutrition status maintenance by introducing potential interactions with food, body metabolism, and side effects. Potential side effects may be reduced in incidence or severity with nutrition status maintenance and strategies aimed at symptom management. Nutrients and nutritional status can affect medication absorption, use, elimination, and tolerance (69-71). Developing meal plans to support medication regimens may include meal timing, macronutrient and micronutrient modulation, and symptom management strategies (72-74). Nonnutrient therapies may be required to manage nutrition-related adverse effects of treatment, including exercise and medications (75,76).

Metabolic abnormalities, including changes in organ or other tissue function, leading to altered utilization, storage, and excretion of nutrients, may occur as a result of immune dysfunction, medication side effects, infection, or alterations in the hormonal milieu, or through the effects of HIV itself in adults and children (77-81). Since the introduction of highly active antiretroviral therapy (HAART), altered patterns of body composition (eg, peripheral loss of fat [lipoatrophy] and central fat deposition [lipo-

hypertrophy]), metabolic abnormalities of elevated blood lipids, altered insulin sensitivity or glucose dysregulation, mitochondrial toxicity, and lactic acidosis have been reported (82-86). Some of these problems may have occurred independently and before the use of these therapies (87,88). An increase in longevity suggests that both clients and health care professionals will have to address these chronic metabolic and physical alterations as a part of routine health care provision (89).

Support to reduce or eliminate malnutrition shows the potential to significantly slow progression of disease, decrease its severity, and improve longevity (90). Individualized care that integrates medical and social services and is delivered by health care professionals with HIV experience, training, and expertise is necessary for optimally managing HIV disease (91,92). Dietetics professionals and other health care professionals involved in evaluation and intervention will need to be well versed in issues specific to HIV infection and its treatment as well as sensitive to privacy and disclosure of an HIV diagnosis. The HIV care provider should be comfortable in providing services to people with HIV infection without judgment.

## NUTRITION EVALUATION

Nutrition plays an essential role in supporting the health and quality of life of people with HIV disease. Nutritional alterations can occur early in HIV infection, thus, nutrition intervention should begin soon after diagnosis. The negative effects of malnutrition are often preventable and are usually not easily reversed.

A complete baseline nutrition assessment should be performed as part of the multidisciplinary care plan development, with regular follow-up as indicated. For optimal care, a dietetics professional should perform nutrition evaluation and follow-up. There are many formats for nutrition evaluation, including the "ABCD" nutrition evaluation of anthropometric, biochemical, clinical, and dietary parameters (93). The dietetics professional or other qualified clinician may use these assessment parameters in partnership with clients to form the basis for the nutrition care plan.

### Measuring Nutritional Compromise

Clinical assessment includes obtaining a medical history and performing a physical examination. The medical history will provide insight into comorbidities that have nutritional implications, including renal disease, hepatitis, pulmonary diseases and tuberculosis, diabetes, cardiovascular disease, neurological diseases, cancers, and osteoporosis. Other key areas in the clinical assessment include a physical examination, presence of opportunistic infections that may affect metabolism, occurrence of gastrointestinal complications, potential food and drug interactions, use of complementary and alternative therapies, and nutrition-related side effects of prescription and nonprescription drugs.

The AIDS-related wasting syndrome is defined by the CDC as a 10% weight loss from baseline in a 6-month period accompanied by diarrhea or fever for more than 30 days without a known cause (94). Although the rate of opportunistic infections has decreased in the last few years, the incidence of AIDS-related wasting syndrome according to this AIDS-defining diagnosis seems to have held steady (95-97). Malnutrition is not an AIDS-defining diagnosis at this time. Recommendations for a revision to the current CDC definition include time frames for weight loss and body composition alterations, with specific attention to the body cell mass compartment, to identify detrimental wasting of lean tissues that may occur even without weight loss (45,98). Anthropometrics are measures of body weight, dimension, and subcutaneous fat stores. Tracking anthropometrics is a noninvasive way to characterize changes in body composition or growth-related nutritional status (99). Monitoring weight and calculating body mass index is an important part of identifying wasting, and even small amounts of weight loss have long been associated with poor outcomes in HIV (100-102).

The manifestation of wasting has changed in the HAART era. Clients may experience body composition changes such as lean tissue wasting or lipodystrophy, which are not reflected as weight change and may not be identified in a weight record (103). Body composition changes characterized as lipodystrophy syndrome may involve fat accumulation in the abdomen, dorsocervical, and breast areas, and subcutaneous fat loss in the limbs and face. Screening and monitoring of wasting, lipodystrophy, and other body changes can be accomplished using measures of body composition, including anthropometrics, bioelectric impedance analysis, computed tomography scans, magnetic resonance imaging, and dual energy x-ray absorptiometry scans (104-109). The choice of diagnostic techniques should be appropriate for the problems experienced by the client. Although anthropometrics can provide important insight into nutritional status and alterations in body dimensions and composition, the clinician (includes dietetics professional, physician, nurse or nurse practitioner, physician assistant, and others) should be sensitive to the client's body image and self-esteem. The health care provider and the client should make informed decisions together about the use of anthropometrics to determine problems and monitor treatment (108,109).

The clinician should also determine the client's usual physical activity level, which may have an impact on the ability to prevent and treat wasting, alterations in body fat deposition, and other long-term complications of HIV disease and treatment. Limitations in physical activity should be noted, including barriers such as peripheral neuropathy and fatigue. These barriers should be further explored to determine the potential role for nutrition-related problems of anemias, vitamin B-12 alterations, and vitamin B-6 deficiency and toxicity (110).

Biochemical assessment provides laboratory measurements of serum protein, lipids, and micronutrients. Indicators of disease complications and prognosis include nutrition-related laboratory values such as albumin, transthyretin, hemoglobin, hematocrit, creatinine, urea nitrogen, transferrin, glucose, vitamin B-12, C-reactive protein, and others (111,112). For instance, alterations in nutrition-related laboratory values may reflect inflammatory responses rather than purely nutritional compromise. Alterations in micronutrient and macronutrient metabolism such as zinc, iron, selenium, vitamin B-12,

carbohydrate, and fat have been reported during asymptomatic and symptomatic disease states (113-115). Zinc and albumin may decrease rapidly during the physical stress of infection and quickly increase when an infection is resolved. Iron may be shunted to a storage form during inflammation. Various types of anemias occur with chronic HIV infection and may sometimes include anemias associated with nutrient deficiencies, but more often may reflect anemias of chronic disease and related to medication interactions (116,117). Although shifts in nutrient levels may not represent deficiency, other body tissues, such as blood, may be at risk for depletion of shunted nutrients (118,119).

Low levels of micronutrients are common because of malabsorption, alterations in metabolism, and accelerated turnover. Regular measures of albumin, transthyretin, hemoglobin, serum iron, total iron-binding capacity, magnesium, vitamin levels, trace elements, cholesterol, C-reactive protein, triglycerides, fasting glucose, CD4 and CD8 immune cells, HIV viral load, renal function, and liver enzyme levels may be useful in assessing nutritional status, depending on the patient's clinical status and disease stage (61,120).

Medication therapies, including the types, duration of use, and history of use, should be considered in nutritional status assessments. Some of the potential adverse effects that are related to medications include dyslipidemia, insulin resistance and glucose intolerance, and anemias (121-126). Evaluation of potential adverse effects of medications along with risk factors may help in the early identification of disease complications. For instance, a diagnosis of diabetes may alert the clinician to the possibility of an increased risk of neuropathies that can affect physical activity necessary for the maintenance of body composition.

Male and female patients may experience problems associated with medication interactions differently, which may be related to varying hormone and enzyme levels and body composition (127). For instance, female patients may experience higher increases in blood lipids, whereas the expected differences in ratios between low-density lipoprotein cholesterol and high-density lipoprotein cholesterol disappear between the sexes with antiretroviral therapy. A higher percentage of female patients experience fat accumulation, whereas male patients tend to experience subcutaneous fat losses. In the use of ritonavir- and nelfinavir-containing regimens, male patients may experience more diarrhea, whereas female patients may experience nausea, vomiting, and abdominal pain more frequently than male patients.

Dietary intake assessment examines eating patterns and current diet, and evaluates the factors influencing the client's ability to achieve an adequate diet. Important components of the diet history include evaluation of usual intake, current intake and any perceived changes, ethnic and cultural food preferences and practices, food preparation limitations, food intolerances, and use of macronutrient and/or micronutrient supplements. In addition, potential antiretroviral medication interactions with food, nutrient supplements, other medications, and herbal treatments should be considered in nutritional evaluations. Specific nutrients of interest include, but are not limited to, vitamins A, B-6, B-12, and D; folate; carotenoids; selenium; and zinc (128).

Psychosocial issues related to nutrition should also be evaluated. It is important to determine how the client is accessing food, including the use of food assistance programs, who is shopping for and preparing meals, how and where meals are prepared; whether there is a history of eating disorders or body image concerns; socioeconomic issues; and housing status. A discussion of the client's lifestyle, living arrangements, cultural practices, and weight- and food-related goals may help the clinician and the client work together to develop an appropriate nutrition care plan. In addition, factors that affect the ability of the individual to seek health care should be evaluated and addressed with the health care team to overcome barriers to achieving and maintaining nutritional status.

Risk factors for disease that affects or is affected by diet and nutritional status should be included in a complete nutrition evaluation. For instance, clients with a family history of renal dialysis, diabetes, and/or heart disease should be evaluated for these disease states on a routine basis. Risk factors such as smoking, alcohol or other drug abuse, age, sex, obesity or underweight, and medication profiles can help to determine the need to monitor for bone mineral density losses, lactic acidosis, and other common complications of chronic HIV disease.

### Pediatric Issues

Children living with HIV experience the same nutrition issues as adults who have the disease, but because of the added demands of growth and development, the effects are often more devastating. Inability to achieve a normal weight for height, growth stunting, failure to thrive, malnutrition, impaired cognitive development, and wasting are potential adverse nutrition-related outcomes in pediatric HIV (129). HIV-positive children are at high nutritional risk and should be referred for ongoing nutrition assessment and counseling. Children are hard-hit by HIV/AIDS worldwide, and the growing numbers of orphans tend to be malnourished and uneducated and to live in poverty (130). Some children and their families, friends, and school personnel may not know their HIV status, which presents challenges for counseling and intervention for medication interactions and other nutrition-related problems.

Nutrition assessment includes regular growth monitoring of height, weight, and head circumference with comparison to growth standards for age and sex. Additional anthropometry that may be helpful for serial measure comparisons includes thigh circumference and mid-upper arm circumference (131). Other aspects of nutrition assessment include dietary intake, psychosocial and environmental variables, physical activity, dental health, oral-motor feeding skills, and medical data (eg, clinical symptoms, comorbidities, nutrition-related laboratory values, viral load, and histories of medication and infections) (132). In addition to the standard assessment, the clinician should address the following issues with nutritional implications in the pediatric population:

- Perinatal factors in infants, including nutritional status of the

| Category | Examples |
|---|---|
| Pregnancy, lactation, infancy, and childhood | • Transmission risk in breastfeeding and replacement feeding alternatives<br>• Growth failure and developmental delay in children<br>• Support for normal growth trends in children |
| Lifestyle | • Basic nutrition concepts and habits<br>• Physical activity levels<br>• Body image and altered body weight and shape<br>• Nutrition and food-related cultural behaviors and ethnic beliefs (142,143) |
| Nutrition interactions | • Prevention, restoration, and maintenance of optimal body composition with an emphasis on lean tissues<br>• Medication-nutrition interactions<br>• Management of barriers to maintenance and restoration of nutritional status, such as nutrition-related side effects and symptoms<br>• Review of nutrient supplements<br>• Review of potential interactions with nonprescription medications and herbal supplements<br>• Evaluation of interactions with alcohol and recreational drugs |
| Life skills and socioeconomic issues | • Food and water safety (144)<br>• Food and nutrition security issues (15)<br>• Food-preparation skills (145,146) |

**Figure 1.** Nutrition-related counseling issues working with HIV/AIDS clients.

mother, exposure to drugs or alcohol, and birth weight (133,134).
- The caregiver's choice of feeding method: HIV-positive mothers should be made aware of the risks and benefits of different infant feeding options, including the risk of transmission of HIV through breastfeeding. Mothers who can provide replacement feeding that is acceptable, feasible, affordable, sustainable, and safe are advised to do so (135). When these criteria cannot be met through family or community resources, particularly in resource-limited settings, women are advised to exclusively breastfeed (135).
- Inadequate nutritional intake because of limited food selectivity, poor appetite, nausea, vomiting, diarrhea, or malabsorption.
- Developmental and oral motor feeding skills delays or regression because of HIV encephalopathy or other reasons.
- Increased nutrient needs to achieve catch-up growth.
- Disordered eating patterns.
- Caregiver health and support system.
- Any distortions in the feeding relationship between caregiver and child (136).
- The food and economic security of the caregiver and child.

### Nutrition Assessment Research

Research on HIV and nutrition-related assessment criteria and interventions is ongoing and should be expanded to further explore such topics as validity of assessment methods, nutrient needs, management of the adverse effects of disease and medications, the role of nutrition in supporting medication adherence, and interactions between food, nutrition, and medications (137).

## INTERVENTIONS

### Nutrition Education and Counseling

The relationship between clinician and client is important in working together to identify nutrition goals and to develop a nutrition care plan that supports those goals. The nutrition care plan is an important part of the health care plan, and the dietetics professional should work cooperatively with the client and other members of the multidisciplinary care team to ensure that nutrition goals are congruent with other elements of the health care plan (137). The nutrition care plan should work in harmony with the client's complete physical, mental, spiritual, and emotional health goals. AIDS is a complex disease, and its treatment requires specialized knowledge in many areas, including nutrition. Examples of nutrition-related issues that may require counseling are shown in Figure 1.

Nutrition counseling can improve health outcomes and is an integral part of HIV care at any stage of the disease, from helping newly infected people to stay healthy to assisting people taking antiretroviral drugs to manage their therapy, to allowing people with end-stage AIDS to die with dignity (138-140). However, there are many potential barriers to the effectiveness of nutrition education and counseling interventions. Care providers need to work with their clients to develop creative ways to overcome barriers caused by cultural identity, linguistic preference, distrust, cognitive dysfunction, or limited literary skills. Dietetics professionals and other clinicians may find that they need to be prepared for clients from different and overlapping backgrounds, including refugees and immigrants, gay and transgender people, intravenous drug users, and heterosexual couples and their children. Clinicians should consider these elements when providing counseling and developing materials. Clients facing special challenges should be given opportunities for frequent nutrition counseling follow-up, linked to the multidisciplinary team.

Partnering with and supporting clients to develop goals and improve their health and nutrition requires

care providers to develop education and counseling skills. There are many theories and methods available, and the care provider must use counseling styles that they are comfortable with but that are appropriate for their client's individual needs. Regardless of the methods used, all education and counseling should be free from value judgments and conducted in an atmosphere of trust and respect, with an emphasis on building rapport and partnership. These elements are essential to successful nutrition education and counseling in all practice areas, but are especially important when working with people living with HIV/AIDS who may be experiencing stigma and discrimination. Personal counseling should always be kept confidential, and care providers should become good listeners and allow the clients to direct the outcomes of the sessions. Some of the methods that may be incorporated into nutrition counseling include motivational interviewing, problem solving, cognitive behavior theory, and personal coaching.

An example of a method often used as a framework for nutrition counseling is the stages-of-change model, which identifies six stages that individuals go through when changing behavior: precontemplation, contemplation, preparation, action, maintenance, and termination. When using this model, care providers should recognize that change is a process for clients and that the process is repetitive, not linear. A client may enter the counseling process at any point in the stages of change model, and then may move to any other stage, and can be at different stages of change for different goals and behaviors. Care providers should be prepared to support self-efficacy for change when the client is in precontemplation and contemplation phases; to support behavior change when the client is in preparation, action, and maintenance phases; and to respond with flexible counseling skills and a dynamic care plan (141).

#### Nutrient Supplementation

Both nutrient and nonnutrient supplementation have been popular in the treatment of HIV infection for a variety of purposes. Supplements may emphasize calories, protein, fats, and micronutrients. Calorie-containing supplements may be required for patients with volume intolerances, extraordinary macronutrient needs, or other barriers to adequate intake to restore and maintain nutritional status. Calories are required to maintain weight, and additional dietary protein may be required to improve body cell mass (24). Dietetics professionals and other clinicians should keep in mind the potential for toxicities and interactions with prescribed medications when evaluating the potential benefit of nutrient and other supplementation. In general, the goals for nutrient intake should address the provision of food first and recognize that additional intake in pill or other refined forms should be viewed as supplementation beyond dietary intake. Nutrient and nonnutrient substances in foods act synergistically to improve utilization in many cases (147-149). Supplementation based on levels described in the Dietary Reference Intakes, while staying below the known upper limits of safety, seems prudent in the absence of sufficient evidence (150). Specific nutrient and nonnutrient supplementation designed to address a deficiency or overcome an alteration in absorption or utilization of endogenous and exogenous nutrients should be monitored routinely, as with any other medication therapy. Specific nutrient supplementation is addressed in several patient education forums and publications shown in Figure 2.

Dietetics professionals should have a good understanding of both the potential benefits and the problems that may be associated with the use of vitamin and mineral supplements. For instance, although there is a lack of case-controlled study evidence, case reports of high-dose intravenous regimens that include B vitamins and L-carnitine or oral vitamin C, B-complex, and L-carnitine or coenzyme Q supplementation along with the discontinuation of antiretroviral medications have suggested a need for this type of research (151).

Nutrient supplementation has been suggested in resource-limited settings to reduce the rate of mother-to-child transmission of HIV. Although single nutrients were initially explored, recent research suggests a role for multiple nutrient interventions. For instance, children with HIV infection who received multivitamin intervention were compared with those receiving vitamin A alone. The multivitamin group showed a better effect on diarrhea than the groups receiving vitamin A alone or no micronutrient supplementation (152).

In developed countries, specialized nutrition support has been explored to determine health impact. Restoration of intestinal function and immune cell counts was improved in severely malnourished children receiving complete nutrition support through total parenteral nutrition and enteral nutrition (153). Enteral nutrition showed even better results than parenteral nutrition for survival, weight gain, and improvement of CD4 cell counts. The study investigators noted that such intervention should take place before terminal stages.

#### Symptom Management

Nutrition-related side effects have been shown to correlate negatively with quality-of-life measures in people infected with HIV (154). Nutrition-related symptoms and side effects could have a significant effect on dietary intake and antiretroviral therapy adherence. Symptoms that may affect nutritional status may include nausea, vomiting, diarrhea, anorexia, pain, chewing/swallowing difficulties, taste changes, and others. Providing specific strategies to support clients through these challenges is an important part of nutrition therapy. Dietary strategies are the topic of many consumer guidelines and patient education publications shown in Figure 2.

#### Nonnutrient-based Therapies

Nonnutrient therapies are recommended both to improve nutritional status and to augment HIV-related therapies. Risk-vs-benefit analysis should be conducted before the use of these adjunctive therapies, with careful attention to potential interactions with antiretroviral and other medications. Supplemental nutrients, herbs, and other medications may be processed by and otherwise affect the pathways that are used by antiretroviral medications. These substances may decrease or increase levels of an-

| Organization | Description | Contact information |
|---|---|---|
| AIDS Project Los Angeles (APLA) | Client education materials; HIV[a] nutrition provider certification program. | www.apla.org |
| American Dietetic Association | Living Well with HIV and AIDS[b]: A Guide to Nutrition (2003). | www.eatright.org |
| Association of Nutrition Services Providers (ANSA) | Client educational materials and technical assistance for AIDS meal provider organizations. | www.aidsnutrition.org |
| Canadian Aboriginal AIDS Network (CAAN) | A nonprofit coalition of individuals and organizations that provides leadership, support, and advocacy for Aboriginal people living with and affected by HIV/AIDS. | www.caan.ca |
| Canadian AIDS Society (CAS) | A coalition of 115 community-based AIDS organizations across Canada. Works in advocacy, and facilitating program and resource development in its member organizations. | www.cdnaids.ca |
| Canadian AIDS Treatment Information Exchange (CATIE) | Funded by Health Canada with treatment information, fact sheets, event listings, and a comprehensive e-library. | www.catie.ca |
| Canadian Health Network | Web site with up-to-date AIDS-related news and treatment information, with links to discussion groups and AIDS hotlines. | www.canadian-health-network.ca |
| Canadian HIV/AIDS Information Centre | A clearinghouse of HIV information, for clients and professionals with resources to order, borrow and download. Funded by Health Canada. | www.clearinghouse.cpha.ca |
| Dietetics @ Work | Hepatitis C Nutrition Care Guidelines. | www.dieteticsatwork.com/hepC_moreinfo.asp |
| Dietitians of Canada | Resources to download and a "find a dietitian in your area" service for clients. | www.dietitians.ca |
| Gay Men's Health Crisis (GMHC) | Client education. | www.gmhc.org |
| God's Love We Deliver (GLWD) | Client education. | www.glwd.org |
| Health Resources and Services Administration, HIV/AIDS Bureau. | Client education and nutrition manual; funding for education and training. | www.aids-etc.org/aidsetc?page=et-30-20-01 |
| HIV and Hepatitis | Conference and research updates and reviews. | www.hivandhepatitis.com |
| HIV/AIDS Dietetic Practice Group | Dietetics professionals' resources including continuing education. | www.hivaidsdpg.org |
| Interagency Coalition on AIDS and Development | A Canadian group that mobilizes human and financial resources to respond to AIDS in resource-limited communities and countries. Publishes a *Guide to Twinning* to assist AIDS service organizations interested in cross-border learning and action from their counterpart organizations. | www.hc-sc.gc.ca/hppb/hiv_aids/can_strat/international/twinning.html |
| Live Positive | Youth targeted Web site produced by CATIE. | www.livepositive.ca |
| Medscape Infectious Disease forum | Conference reviews, peer-reviewed articles, continuing education. | www.medscape.com |
| New Mexico AIDS Infonet | Client handout downloads. | www.aidsinfonet.org |
| Women, Children, and HIV | Web site with information resources concentrated on maternal health, vertical transmission, and orphans and vulnerable children. | www.womenchildrenHIV.org |

[a]HIV=human immunodeficiency virus.
[b]AIDS=acquired immunodeficiency syndrome.

**Figure 2.** Selected resources for professionals and other educational materials relating to nutrition and HIV infection.

tiretroviral medications and can also decrease or increase expected levels of the supplemental nutrients, herbs, or other medications. This can lead to a decreased level of and efficacy of the medications and/or increased toxicities. Examples of potential interactions of supplements with medications include the reduction of drug efficacy during the concomitant use of St. John's Wort, garlic, and Echinacea with protease inhibitors and/or nonnucleoside reverse transcriptase inhibitor antiretroviral drugs. Other potentially interacting herbal substances include ginseng, melatonin, milk thistle, geniposide, and skullcap (155).

There are many other issues related to HIV disease and side effects of medication therapy that may require nutrition intervention. With the development of HAART, life spans are increasing and people with HIV are facing new sets of challenges. Lipodystrophy has emerged as a complex issue in HIV care. Body composition and serum levels of total and free testosterone should be monitored regularly for changes that indicate a decrease in lean body mass. Dietetics professionals and other clinicians may also wish to discuss the psychosocial impact of lipodystrophy with the client. Some clients may consider stopping treatment because of body image issues. Nutrition interventions should support the client's medication treatment goals while reducing any negative nutrition-related health impacts of the disease and the medication regimens. Coinfections, such as hepatitis C infection, may require specific attention to organ systems and the potential for additional therapies to interact with nutritional status, food, and other medications (156).

Along with lipodystrophy, an increased risk of cardiovascular disease and decreased insulin resistance are important issues with nutrition implications (157,158). Increases in blood lipids should be regularly monitored. Increases in risk factors for cardiovascular disease related to antiretroviral therapies are likely to require exercise and lipid-lowering medications in addition to dietary modification (159-161). Following a heart-healthy diet and exercise program has been shown to reduce blood lipid levels in HIV-positive patients (162). Clients require support to attain a healthful body weight and to reduce their intake of saturated fat, *trans*-fatty acids, salt, and dietary cholesterol. Clients with hypertriglyceridemia would benefit from increasing fiber intake, limiting simple carbohydrates, and avoiding alcohol (163).

Abnormal glucose tolerance has also been associated with HAART (164). Clients with insulin resistance may benefit from participation in diabetes education programs that can be integrated into their health care and in which they can learn strategies for regulating their blood glucose through diet and exercise. The potential benefit in the treatment of insulin resistance with oral antidiabetic drugs has been explored with some promising and mixed results. Metformin has shown some promise for the reduction of central fat accumulation, whereas the glitazones are under investigation for their potential to slow or reverse facial and peripheral subcutaneous fat losses (165-167). Furthermore, medication support may be indicated to help reduce blood lipid levels and insulin resistance and to increase lean body mass.

Although the causes are still unclear, HIV-positive clients may experience a progressive loss of bone mineral density leading to osteopenia or osteoporosis. Many HIV-positive clients have lower bone mineral density than expected for their age. Clients may have multiple risk factors for loss of bone mineral density, including some or all of the following: low body mass index, a history of weight loss, steroid use, a history of nucleoside reverse transcriptase inhibitor use, and smoking. Bone density should be monitored through the use of routine bone density tests such as dual energy x-ray absorptiometry. Modifiable risk factor reduction may include one or more of the following:

- maintaining an optimal weight and preventing rapid weight loss;
- reducing or discontinuing smoking, alcohol, and caffeine consumption;
- reducing or balancing the consumption of foods and beverages high in phosphoric acid by choosing calcium-rich beverages (eg, milk or fortified soy beverages) instead of high-phosphorous carbonated beverages and eating a variety of protein foods (168);
- working with primary care providers to adjust HAART to minimize side effects;
- engaging in regular weight-bearing or resistance exercise; and
- eating calcium-rich and vitamin D-fortified foods and supplementing with 500 to 1,200 mg/day calcium (169).

Vitamin K, vitamin C, and zinc are also important for bone formation and should be included in counseling on an adequate diet (170).

Nutritional counseling, nutrient supplements, and appetite stimulants have been successful in improving weight status, including fat and lean tissue volumes, for both adults and children (171-175). The health care plan also may include medication therapy together with diet strategies to reduce the adverse effects of nutrition-related disease complications. Increased protein intake, weight-bearing exercise, and the use of growth hormones, anabolic steroids, insulin-sensitizing agents, and others have been shown to positively correlate with improved body composition and quality-of-life parameters (24,176,177).

Further support may be indicated to help reduce blood lipid levels, improve insulin sensitivity, and increase lean body mass. Dietetics professionals and other clinicians should be familiar with both nutrient-based and medication treatments for improving nutritional status and nutrient metabolism and storage ranging from exercise and complementary therapies to pharmacologic modulation. Exercise has shown efficacy in improving the restoration of lean tissues and has been recommended as an adjunctive therapy to improve body shape alterations and metabolic alterations such as insulin resistance (178,179). Increases in weight-bearing exercise and lean body mass may help to stimulate bone formation and require further study (180).

Testosterone replacement and anabolic steroids have been explored to assist in the restoration of body weight and body cell mass in addition to improving strength and quality of life (181). Potential for liver toxicity and changes in lipid profiles exists for anabolic steroid treatment.

Recombinant human growth hormone has been explored in the treatment of wasting and central fat accumulation (182). Growth hormone has been used at higher doses to recover from HIV-related wasting by restoring body cell mass and at lower doses to reduce central fat accumulation.

Anti-cytokine therapy, such as thalidomide, has been explored for treating tuberculosis and HIV-related wasting. At present, the use of thalidomide is limited by the potential for teratogenicity, peripheral neuropathy, and other adverse effects (183).

Research is important to establishing standardized practice guidelines on the integration of nutrition-related interventions into medical management. Training on nutrition-related issues in evaluation and treatment in HIV infection should be an ongoing process for care providers. Collaboration with and referral to other specialties may help to overcome challenges with mental health, drug addiction, and economic constraints.

Goals for nutrition interventions are individualized according to the problems identified. Suggestions are shown in medical nutrition protocols for adults and children with HIV disease (120,131). Among these goals are achieving healthy body weight, body composition, and laboratory values. Other goals include a reduction in nutrition-related side effects and complications, enhanced quality of life, and expanded access to nutrition services. Dietetics professionals have the opportunity to play an important role in advocating for food and nutrition security in collaboration with others (15).

## RESOURCES

Technological capabilities and the Internet allow health care providers and clients alike to access resources worldwide. Although it is not within the scope of this article to review the literature on all potential therapies that affect nutritional status, there are many sources that explore these issues in detail for both health care professionals and consumers. Selected resources in the United States and Canada are shown in Figure 2.

## SUMMARY

Knowledge of HIV disease continues to grow. New treatment modalities continue to emerge, and the population's experience of the disease changes and becomes more complex. Health practitioners must work with clients to plan for and respond to these changes. Additional support for research is required to identify the best practices to accomplish appropriate outcomes in health status, quality of life, and disease management. Education for health care practitioners should be a continuous process that integrates research and best practices for clinical and other nutrition-related interventions. In addition, dietetics professionals should have adequate and continuous training in HIV-specific issues to ensure the availability and appropriateness of HIV-targeted and nutrition-related services. Practical issues such as food insecurity and reimbursement for nutrition-related services also need to be addressed to ensure effective and timely interventions for all people living with HIV infection (184). Collaboration between stakeholders to address education, research, adherence, and advocacy needs can leverage available time and funds.

Nutrition is an important element of HIV care. Nutrition interventions can increase quality of life, assist in symptom management, support medication therapy, and improve resistance against infections and complications. Nutrition-related complications in HIV-positive people are prevalent and impact disease progression and risk of mortality. All people infected with HIV should have the benefit of a nutrition care plan that includes both nutrition education and medical nutrition therapy as part of the multidisciplinary care plan. The client should have access to a dietetics professional for assessment and follow-up. Reimbursement for nutrition services is an important step in reducing barriers so that clients can access such care. Good nutrition as an essential part of HIV care can have a positive impact on all aspects of health.

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ADA position adopted by the House of Delegates on February 17, 1989, and reaffirmed on September 11, 1993, September 28, 1998, and September 8, 2002. This position was developed collaboratively between the ADA and Dietitians of Canada. This position will be in effect until December 31, 2008. The ADA and Dietitians of Canada authorize republication of the position, *in its entirety,* provided that full and proper credit is given. Requests to use portions of this position must be directed to ADA Headquarters at 1-800-877-1600, ext 4835, or ppapers@eatright.org or Dietitians of Canada Central Information Office at centralinfo@dietitians.ca. *Authors*: Cade Fields-Gardner, MS, RD (The Cutting Edge, Cary, IL) and Pamela Fergusson, RD (University College Chester, UK). *ADA Reviewers*: Celia R. Hayes, MPH, RD (US Public Health Service, Health Resources and Services Administration, Rockville, MD); *HIV/AIDS Dietetic Practice Group* (Melissa Sanders, RD); *Nutrition in Complementary Care Dietetic Practice Group* (Claudia Kelley, MPH, MS, RD, Pacifica Hospital of the Valley, Sun Valley, CA); *Public Health/Community Nutrition Dietetic Practice Group* (Cindy M. Brison, MS, RD, Douglas/Sarpy County Extension, Omaha, NE and Linda L. Knoll, PhD, RD, The University of Alabama, Tuscaloosa); Pamela Rothpletz-Puglia, MS, RD (Francois-Xavier Bagnoud Center, University of Medicine and Dentistry of New Jersey, Newark). *Dietitians of Canada Reviewers:* Anna M. Badenhorst, PhD, RD (University of Manitoba, Winnipeg); Gerry Kasten, RD (University of British Columbia, Vancouver); Stephanie De Maio, RD (St Michael's Hospital, Toronto, Ontario); J. M. McDermid, MSc (London School of Hygiene & Tropical Medicine, London, England); Maggie-Jane Marchand, RD (St. Michael's Hospital, Toronto, Ontario). *APC Workgroup:* Shortie McKinney, PhD, RD, FADA (chair); Abby Bloch, PhD, RD, FADA; Marcy Fenton, MS, RD (content advisor).