The Effect of Wild Rice on Colon Cancer in Rats

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Abstract

Colon cancer is one of the leading causes of cancer-related deaths. Diet is a major environmental factor that can alter the risk of colon cancer. Antioxidants, such as ferulic acid and y-oryzanol, which are found within wild rice, have been reported to reduce risk of colon cancer in mice models. However, there are few studies that look at the effect of whole grains rich in antioxidants, like wild rice, on early morphological markers of colon cancer risk, such as colonic aberrant crypt foci, or on biochemical markers such as DCLK1. The purpose of this study was to examine the effect of wild rice on aberrant crypt foci (ACF) number and DCLK1 expression in carcinogen treated rats fed the Total Western Diet as a background diet. The rats were adapted to a basal diet for 10 days, during which they were injected with dimethylhydrazine, a mutagen, to initiate colon cancer. The rats were then split into three groups, a Basal diet group, Total Western Diet group, and a Total Western Diet with Wild Rice group and fed their experimental diets for 12 weeks. At the end of the 12 weeks, the rats were anesthetized, and the tissues were harvested for data collection and further analysis. ACF were enumerated in the distal colon using brightfield microscopy after staining with methylene blue. DCLK1 protein expressing was examined immunohistochemically. There were no statistically significant differences among the groups in ACF number in the distal colon. However, there was a reduction in DCLK1 staining within the Total Western Diet with wild rice group when compared to the Total Western Diet group. As DCLK1-expressing ACF are thought to be more dysplastic, a state that is considered at greater risk for tumor development, this suggests that wild rice feeding reduced the number of dysplastic ACF and therefore may have reduced colon cancer risk.

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Chapter 1: Review of Literature

Colon Cancer

Incidence

Cancer is the second leading cause of death behind cardiovascular disease, with colon cancer being the third most diagnosed cancer within the United States and globally (1). In 2019 there was an estimated 101,420 new cases of colon cancer and more than 50,000 estimated deaths (2). Incidence of colorectal cancer is almost equal between men and women, with men being slightly more at risk than women. According to the CDC, colon cancer is more common within the black community than among other races in the United States (2). As with many cancers, the risk of being diagnosed with colorectal cancer is greater within developed countries (1). Cancer risk varies substantially across the world but studies have shown that colon cancer is more prevalent within more "westernized" countries with a higher incidence in Asia, Europe, and North America (3). The lowest rates of colon cancer are found in Africa and South-Central Asia, where the population consumes a more vegetable-based diet including whole grains (4).

Environment plays a role in the risk for developing colon cancer. Research examining the link between environmental risk and colon cancer has ascertained greater colon cancer risk in those emigrating from a low risk country to a high-risk country. For example, one study found that US born Japanese men experienced twice the risk as native-born Japanese men and a 60% increase compared to US born white men (5). It has also been found that consumption of red and processed meat increased the risk of developing colon cancer in Japanese men who were living in Japan, providing more evidence that components of a western-style diet influences cancer risk (6). Within a large population-based study comparing dietary patterns in Japan it was found that a westernized diet increased the risk and incidence of colon cancer, whereas a diet consisting of high intakes of vegetables, fruits, soy products, and noodles decreased the risk (7). The risk of colon cancer has been found to be roughly 30% higher in those who consume a "western" dietary pattern compared to those who consumed a healthy dietary pattern (8). Other studies have found a link between lower socioeconomic status and increased risk for colon cancer, which may be because behavioral risk factors vary between people who have higher educational status or economic status. For example, the adoption of healthier lifestyles and behaviors is more likely within neighborhoods of higher socioeconomic status (9). Factors that reduce the risk of colon cancer include access to healthy foods, healthy lifestyle patterns, and access to health care and screening techniques.

Although some risk factors that can be controlled, like dietary habits and lifestyle, genetics also predispose to an increased risk for colon cancer. Familial Adenomatous Polyposis (FAP) and Lynch syndrome account for some of the inherited syndromes that increase a person's risk for colon cancer (10). Those with FAP have a risk of colon cancer between 1-10%, whereas people with Lynch syndrome have a 24-75% increased risk of developing colon cancer (11). Those who have inflammatory bowel disease and Crohn's disease are also at an increased risk due to their elevated state of colonic inflammation (12).

Relation to diet

Red and processed meat

Many studies show a link between diet and colon cancer, both regarding prevention and risk factors. Westernized diets have been found to increase risk of colon cancer. A westernized diet is defined as high intake of saturated fat, red and processed meats, sugar, and a low intake of dietary fiber (13). Population-based studies comparing diets high in red and processed meats versus those made up of more fruits and vegetables have shown that diets with increased meat consumption correlate with an increased risk of colon cancer (14). An analysis of dietary patterns within Western New York found that a high-fat diet was positively associated with increased colon cancer risk in men (15). Other studies have shown that diets lower in red meat consumption reduce the risk of developing colon cancer (16, 17). A hypothesized mechanism for this is the increase in bile acids within the gastrointestinal tract (18). Bile acids are involved in absorption of lipids and fat-soluble vitamins, and some studies have found that a high dietary fat intake increases the quantity of bile acids within the gastrointestinal tract (18). Within the colon, the bile acids are metabolized by the gut flora and converted into secondary bile acids, which are thought to be a cause of genetic instability within the colon, increasing the likelihood that malignant cells develop within the colon (19). Other research shows that the high intake of fat is linked to the development of bacterial flora that degrades the bile salts into potentially carcinogenic compounds (3).

Obesity and insulin resistance

Obesity due to consumption of a westernized diet leads to an increased colon cancer risk (20). Obesity leads to metabolic stress and induces a state of low level, chronic inflammation that increases cell proliferation while decreasing apoptosis, leading to colon cancer growth (20). Insulin resistance often occurs secondary to obesity and is characterized by an impaired response to insulin, resulting in greater insulin secretion (21). Insulin resistance is linked with changes in DNA synthesis as well as gene expression. Studies have found that insulin resistance increases levels of insulin growth factor (IGF), which promotes intestinal epithelial cell proliferation, increasing the likelihood of a mutation to occur leading to carcinogenesis within the colon (21). Furthermore, obesity and insulin resistance increase oxidative stress, thereby increasing TNF-α, an inflammatory cytokine, which has been shown to increase the risk of carcinogenesis within the colon (21).

Dietary Fiber

A diet that follows the westernized pattern usually lacks in consumption of fibrous foods, like fruits, vegetables, and whole grains. Fiber increases stool mass and decreases transit time, which could reduce the time of contact of carcinogens with the colon. However, not all fiber is created equal, and the viscous, fermentable fiber may have more preventative properties than other fiber in colon cancer prevention (22). Fermentable fiber, as well as resistant starch, is broken down by bacteria within the gut, leading to the production of short-chain fatty acids (SCFA), butyrate, acetate, propionate, which have anti-inflammatory effects, and help maintain health within the gastrointestinal tract (22). Butyrate helps to promote the healthy growth of colonocytes and inhibits the growth of cancer cells (23). It is proposed the butyrate may induce apoptosis and repair damaged colonocytes during the initiation phase of oncogenesis and reduces the production of pro-inflammatory mediators (19, 24). The effects of butyrate on colon cancer in azoxymethane treated rats shown to significantly reduce tumor size and reduce colon cancer risk (24). A low intake of dietary fiber reduces the colonic microbiota diversity, thus reducing the amount of SCFAs, and this dysbiosis of the microbiome may increase inflammation and cancer risk (19). However, increasing dietary fiber consumption changes the colonic microbiota and increases the amount of SCFAs produced (25). A study assessing how a high-fiber, low-fat diet could alter the colonic microbiota, found that after the two weeks of eating the high-fiber, low-fat diet an increase in colonic microbiota and a reduction in inflammation (26). Consuming whole grains and a high-fiber diet is found to have a protective effect against inflammation in the colon, which reduces the risk of mutations in the colonic epithelium. Populations that consume a high-fiber diet are found to have a decreased risk colon cancer and other cancers (27, 28).

Characteristics of Colon Cancer

Colon cancer can vary within the colon with right sided colon cancer and left sided colon cancers. Those who have right sided colon cancer have a worse prognosis than those who have left sided colon cancer (29). This could be due to better diagnosis with left sided colon cancer since the symptoms of left sided colon cancer include rectal bleeding and change in bowel habits, which could prompt more people to get tested. Patients with right sided colon cancer were found more likely to be older than those with left sided colon cancer and have more comorbidities, which was found to be attributed to their poor prognosis (29). Clinically, colon cancer symptoms depend on where the colon cancer is found, size and if there are metastases. The most common symptoms are abdominal pain, change in bowel habits, like diarrhea and constipation, blood within the stool, black stools, fatigue, or involuntary weight loss (30).

The pathophysiology of colon cancer begins with the development of neoplastic polyps within the mucosal lining of the colon. These can develop into adenomas which may turn into a malignant tumor, referred to as adenocarcinomas (30). Colon cancer is thought to be the result of the accumulation of several genetic abnormalities that contribute to the rapid and unregulated cell division within the colon leading to dysplasia within the colon. Genetic instability, found during the initiation phase of adenoma, could be activated by proto-oncogenes and the inactivation of tumor suppression genes, such as the adenomatous polyposis coli (APC) gene (31). A mutation within the APC gene is found to be one of the most common mutations that leads to increased risk of colon cancer (30). When functioning properly the APC gene is responsible for tumor suppression, however, in colon cancer a mutation to the APC gene is found, which contributes to the tumor initiation and the promotion within the colon (32). When there is a mutation to the APC gene, rendering the gene inactive, it leads to an accumulation of beta-catenin within the nucleus, which activates other transcription factors leading to intestinal tumorigenesis (33). This genetic instability is seen in aberrant crypt foci (ACF), early neoplastic lesions in colon cancer, and is thought to be the earliest stage of the adenoma-carcinoma sequence of colon cancer (34, 35). A greater number of ACFs within the mucosal lining of the colon is correlated with the increased risk of the abnormal crypts giving rise to carcinomas (36).

Measures of Colon Cancer Risk

A well-studied, although controversial measure of colon cancer, are aberrant crypt foci (ACF), which are defined as crypts that have altered luminal openings, exhibit thickened epithelia, and are larger than surrounding normal crypts (36). Aberrant crypt foci are the earliest morphological changes found in the epithelium during the progression to colon cancer and have been found in both carcinogen treated mice as well as humans (37). Increased ACF multiplicity, ACFs with multiple crypts, is shown to be predictive of tumor incidence within the colon (38). ACF are categorized as either hyperplastic or dysplastic lesions, with the dysplastic lesions exhibiting more carcinogenic changes when compared to hyperplastic ACFs (37). A review of epidemiological studies showed that increased prevalence of ACFs and a higher proportion of dysplastic ACFs was found in subjects with colon cancer (39). Hyperplastic ACF are more slow-growing and show normal beta-catenin expression, leading some to believe that they are not involved in tumorigenesis (40). Dysplastic ACFs are characterized by increased crypt multiplicity, dysregulation of the Wnt pathway, increased accumulation of beta-catenin within the nucleus, and mucin depletion, and are associated with tumor development within both animal models and human models of colon cancer (35, 37, 40).

Dysplastic crypts are identified in animal studies by several different methods. One method is to observe sections of the colon after staining with methylene blue and rinsing; it is thought that ACF which retain the dye after rinsing are dysplastic lesions (37). The colons then go through a second round of staining to categorize them as mucin depleted crypts or beta-catenin-accumulated crypts. Within humans, dysplastic lesions are detected through magnifying chemoendoscopes, which can also detect mucin depletion and beta-catenin-accumulation (37). The number of ACF within the human colon increase with age and it has been shown that polyps overlap with aberrant crypts giving evidence that ACF are possible precursors to cancer (41). People with confirmed colon cancer had higher prevalence of aberrant crypts compared to those without cancer, and dysplastic features of aberrant crypts were correlated with increased polyps (41). Mice that were treated with dimethylhydrazine (a carcinogen) were found to have increased ACF multiplicity as treatment progressed and showed mucin-depletion, supporting the idea that dysplastic ACFs are markers for carcinogenesis within the colon (42).

Aberrant crypt foci have been shown to be valid makers for colon cancer, however, other markers are being studied that are thought to be more useful. Some markers are being explored through the cancer stem cell hypothesis, stem cells that undergo mutations and give rise to malignant cells with the ability to self-renew (43). One pathway that is being explored in the regulation of self-renewal and oncogenesis is the Wnt pathway. Wnt proteins are intracellular proteins that regulate development and can lead to cancer development when these proteins cause dysregulation (44). Studies looking at epidermal and gut progenitors suggest that the Wnt pathway may regulate the stem cell self-renewal pathway and increased levels of β-catenin, which has been associated with carcinogenesis (44). Increased levels of β-catenin are found within ACFs and are thought to be part of the increased risk of the aberrant crypt progressing into a cancerous lesion. Wnt signaling promotes proliferation within the intestinal epithelium and within around 90% of colon cancers there is a mutation within the Wnt/β-catenin pathway (45). Specifically, the mutations are found within the APC gene which leads to the Wnt/β-catenin pathway activation. This leads to an accumulation of β-catenin within the nucleus which is detected in a majority of colon cancer tumors and higher levels are correlated with a poor prognosis in colon cancer patients (45).

DCLK1, another colon cancer marker, is expressed in tuft cells, which are found within the intestinal epithelium and located near the intestinal stem cells (46). The tuft cells expressing DCLK1 have been shown to increase substantially during inflammation, such as the beginning stages of cancer (46). The short isoform of DCLK1 is expressed in human colorectal tumors, while the long isoform of DCLK1 is expressed by normal colonocytes (47). Within dysplastic crypts where DCLK1 was expressed, the crypts expressed more β-catenin within the nucleus when compared to normal crypts (48). Other studies have shown that high levels of DCLK1 induce tumorigenesis through various mechanisms. One study looked at DCLK1 and the relationship with miR-200c, a tumor suppressive miRNA, and found that when DCLK1 was present there was a reduction in miR-200c levels, showing that the DCLK1 negatively regulated miR-200c, leading to tumor activity (49). Because it is thought that DCLK1 is a cancer stem cell marker, these cancer cells have the ability to self-renew and resist apoptosis through pro-survival signaling (44). One study utilized a heterozygous mutation in the APC gene (APC min/+) mouse model to examine the relationship between DCLK1 and pro-survival signaling, since the adenomatous polyposis coli (APC) gene is found to be mutated in most colon cancer tumors (32, 50). They found that within the tumor stem cells there was significantly more DCLK1 staining than in the wild type mice with no APC mutation showing that DCLK1 levels were correlated with a poor prognosis (50).

Cereals and Colon Cancer

Cereal composition

Cereals, or cereal grains, make up at least half of the world's population calories. The major cereal grains are wheat, rice, and maize, and oats, while the minor grains are rye, barley, buckwheat, sorghum, and millet (51). Cereal grains are composed of the bran, endosperm, and germ. The bran are rich in vitamins and minerals and is considered the fiber of the grain; the nutrient content of the cereal is influenced by how much of the bran is removed during the milling process (52). Starch and protein is concentrated in the endosperm of the grain and is less affected by grain processing (52). The germ, or embryo, of the grain contains the genetic material and much of the grain's lipids (52). Cereal grains contain starch and protein as their major dietary components as well as other bioactive compounds, like lipids, non-starch carbohydrates, phytic acid, vitamins and minerals as the minor components (53). Whole-grain cereals are a source of dietary fiber and other bioactive compounds. Dietary fibers encompass the carbohydrates and lignin that are not digested readily in the small intestine but are fermented to different degrees by the microbes within the colon, producing metabolites such as short chain fatty acids. However, the types of fiber vary with the type of grain, as they have different proportions of non-starch polysaccharides, resistant starch, oligosaccharides, and lignin (54). Dietary fiber is classified as insoluble or soluble, and can vary between 3%-15% of the grain composition depending on the grain and its processing (53). Cereal grains also contain antioxidants like arabinoxylans and vitamin E. Arabinoxylans, a type of dietary fiber, contain phenolic compounds such as ferulic acid, which is found to have antioxidant activity. Ferulic acid residues within the arabinoxylans act as anti-inflammatory compounds as well as decrease the oxidative harm from free radicals and lipids (55). Cereal grains are also rich in tocotrienols, which may be anticarcinogenic, as they been shown to affect many pathways linked to tumorigenesis (56). Antioxidant activity is important since reactive oxygen species (ROS) has been shown to increase the risk of cancer (57). ROS can be produced by an inflammatory response or through environmental mutagens and can induce DNA damage or mutations (12). Antioxidants act to neutralize the ROS and reduce the damage that they can do within the body.

Composition of Wild Rice

Rice is a type of cereal grain with many subtypes, varying across region. Wild rice is an aquatic grass that is primarily found in the Great Lakes region and was historically the staple food for the local Native American tribes (58). Wild rice is a rich source of dietary fiber and antioxidants, including tocotrienol and ferulic acid, and vitamins and minerals, when compared to white rice (58). There is a greater amount of γ-oryzanol, a mixture of ferulic acid esters and triterpene alcohols and sterols, and bioactive components in wild rice than brown rice (59). Due to the antioxidant properties of ferulic acid, γ-oryzanol has been studied for its anticarcinogen properties and potential prevention of chronic diseases. γ-Oryzanol, in rodent models, has been shown to lower circulating blood glucose levels and circulating levels of cholesterol, showing potential benefits for cardiovascular disease and diabetes (60). Within cell and rodent models ferulic acid and γ-oryzanol have been shown to reduce lung, colorectal, and breast carcinogenesis (60).

Wild Rice and Colon Cancer Risk

Epidemiological

There have been no epidemiological studies of the association between wild rice consumption and colon cancer risk. However, it has been found that consumption of brown rice once per week was associated with a decreased risk of polyp formation (61). Brown rice and other rice varieties, like purple rice and wild rice, contain ferulic acid, flavonoids, and γ-oryzanol in higher concentrations than white rice (61, 62). These compounds have been shown to decrease inflammation and are hypothesized to reduce cancer development through a variety of mechanisms. Consuming whole grains, due to their antioxidant properties, have been found to have a protective effect against inflammation, which may reduce the risk of mutations in the colonic epithelium (63).

Experimental

There are no published animal studies examining wild rice as a potential chemopreventive agent against colon cancer. There are, however, studies examining the effect of compounds found in wild rice on colon cancer risk. Dietary rice bran, which contains dietary fiber and chemopreventative compounds, like γ-oryzanol and ferulic acid, has been studied in animal studies for its potential to prevent cancer (61). A global gene expression analysis on Caco-2 cells, a colon cancer cell, found that ferulic acid disrupted genes that regulated the colon cancer cell cycle (64). Some researchers examined the effects of ferulic acid on colon cancer within a rodent model and found that ferulic acid significantly lowered aberrant crypt foci development. A second study was done by introducing ferulic acid in the initiation phase and found that the ferulic acid had an inhibitory effect against neoplasms within the colon (65). Another study sought to examine the ability of γ-oryzanol, as well as ferulic acid and phytic acid, to reduce tumor growth in mice transplanted with CT-26 colon cancer cells (66). γ-Oryzanol and phytic acid lead to a significant dose-dependent reduction in tumor growth. Thus, compounds present in wild rice appear to have chemopreventive properties. However, the ability of these compounds to reduce colon cancer risk when present within a food matrix, such as wild rice, is unknown.

Chapter 2: The Effect of Wild Rice on Colon Cancer Risk in Rats

Introduction

Colon cancer is the third most commonly diagnosed cancer globally and one of the leading causes of death (3). Colon cancer incidence is concentrated more in developed and “westernized” countries, with the highest rates in the United States, Australia, and Western Europe (3). Though some risk factors are inherent, many colon cancer risk factors are preventable (3). Nutrition is a modifiable risk factor and studies have shown that a diet composed of red and processed meat, high-fat, refined grains, and added sugar, otherwise known as a “westernized dietary pattern”, increases the risk of developing colon cancer (67). Various population based studies have shown that a diet high in fat and red or processed meats is linked to higher incidence of colon cancer (15, 17, 67, 68). Dietary patterns that include higher intakes of whole grains, fruits, and vegetables and lower intakes of red meat are correlated with a decreased risk of colon cancer (7).

There are a number of measures of colon cancer risk, such as dysplastic aberrant crypt foci, β-catenin, and DCLK1 (35, 69, 70). Aberrant crypt foci that have increased multiplicity (e.g. more aberrant crypts per foci) are more likely to progress into neoplastic lesions and are known as dysplastic aberrant crypt foci (71). These dysplastic crypts have increased nuclear accumulation of β-catenin, which is correlated with tumorigenesis (37). DCLK1 is found to be expressed in various cancers and its expression is thought to be important for the progression of tumor growth (70). DCLK1 suppression halted colon cancer cell development, and when expressed, it was correlated with accumulation of β-catenin (48, 70).

Nutritional components found in whole grains, fruits, and vegetables have been shown to have a positive effect against colon cancer. Antioxidants, such as ferulic acid and γ-oryzanol within wild rice, decrease tumor growth when concentrated amounts are fed to mice with colon cancer (72). Unfortunately, there are few studies that look at the effect that antioxidants from whole grains, like wild rice, have on aberrant crypt foci and DCLK1. The purpose of this study was to examine the effect of wild rice on aberrant crypt foci and DCLK1 expression in carcinogen treated rats.

Materials and Methods

Animals

Forty male Wistar rats weighing 100-124g were purchased from Envigo labs and housed individually in a 12-hour light-dark cycle, environmentally controlled room. Food and water were provided to the animals ad libitum for the duration of the study. Animal handling and housing was in accordance with the National Institutes of Health guidelines. Experimental procedures were approved by the University of Minnesota Animal Care and Use Committee.

Diet composition

The rats were adapted to the control diet, AIN-93G diet, for 10 days before they were assigned to their experimental diets. The control diet was composed of (g/kg): sucrose, 100.0; corn starch, 397.5; maltodextrin 132.0; soybean oil, 70.0; casein, 200.0; cellulose, 50.0; mineral mix, 35.0; vitamin mix, 10.0; NaCl, 0; L-cystine, 3.0; cholesterol, 0.4; choline bitartrate, 2.5; tert-butylhydroquinone, 0.014 (73). After the adaptation period the rats were injected with a colon-specific carcinogen, as described below, separated into three groups, then given the experimental diets: the control diet, the Total Western Diet, and Total Western Diet with 30% Wild Rice. The Total Western Diet is an animal diet formulated to mimic the Westernized dietary pattern, and therefore is a high fat, high sugar diet (7, 74). To accomplish this, the Total Western Diet had more sucrose and soybean oil, for a high sugar and high fat diet, and less cellulose, casein, L-cystine, and choline bitartrate. Traditionally harvested and processed wild rice was obtained from the Fond du Lac Band of Lake Superior Chippewa and a proximate analysis of the wild rice was done showing that the wild rice had 227 g/kg carbohydrate, 8.7 g/kg fiber, 40.2 g/kg protein, and 3.7 g/kg fat. This was considered when the wild rice was incorporated to the Total Western Diet to ensure that they were matched for macro nutrients. The rice was cooked, using tap water and a metal pot, until done and then dried in an oven on low heat for 24 hours. It was then ground into a fine powder using a grain mill and incorporated into the Total Western Diet at a final concentration of 30% of the diet. Mineral and vitamin mixes formulated for the Total Western Diet were used for both the experimental diets. Experimental diets were matched for caloric content but had a greater caloric density compared to the control diet.

Table 1. Diet Composition.

Nutrient (g/kg)	Basal	Total Western Diet	Total Western Diet with Wild Rice
Wild rice	0	0	300
Sucrose	100.0	261.4	261.4
Corn Starch	397.5	230.0	52
Maltodextrin	132.0	70.0	20.3
Soybean Oil or Oil Mixture	70.0	165.0	161.3
Casein	200.0	190.0	149.85
Cellulose	50	30	21.3
Mineral Mix	35	35	35
Vitamin Mix	10	10	10
NaCl	0	4	4
L-Cystine	3	2.85	2.85
Cholesterol	0.4	0.4	0.4

Choline Bitartrate	2.5	1.4	1.4
TBHQ	in oils		
Total Weight	1000.4	1000.05	1019.8

Table 2. Caloric content of the diets

Diet component (kcal/kg)	Basal	Total Western Diet	Total Western Diet with Wild Rice
Carbohydrates	2518	2245.6	2245.6
Fiber	100	60	60
Protein	812	771.4	771.4
Fat	630	1485	1485
Total kcal/kg	4060	4562	4562

Experimental Design

The rats were adapted to a basal diet for 10 days, during this time they underwent two injections with a carcinogen, dimethylhydrazine, to initiate colon cancer. Each rat was injected with a dose of 50 mg/mL·kg body weight dissolved in 0.9% sodium chloride solution and brought to neutral pH. Five days after the second injection of carcinogen, the rats were divided into three dietary groups of 12 animals each. Twelve rats were continued on the control diet, twelve rats were fed the Total Western Diet, and twelve rats were fed the Total Western Diet with 30% Wild Rice. They were fed their subsequent experimental diets for twelve weeks and had their body weights and 24-hour food intakes recorded weekly. Two rats from the Total Western Diet were not included in the study because of injuries and illnesses that might have skewed the data. At the end of the twelve weeks the rats were fasted for 8 hours, beginning at midnight, and anesthetized with isoflurane. Blood was collected in EDTA-containing syringe by cardiac puncture and tissues were harvested. Blood samples were centrifuged at 3000 g for 20 minutes at 4°C and the plasma was collected and stored at -80°C until analysis. Liver, colon, cecum, cecal contents, and epididymal fat pads were collected, weighed and frozen using dry ice and stored at -80°C. Cecal contents pH was recorded before being emptied. Colons were kept on ice in phosphate buffer solution (PBS) until fixation.

Colon fixation

The colons were rinsed in a phosphate buffer solution (PBS) and slid onto a glass rod. The tissues were frequently bathed in PBS to keep from drying out. While on the glass rod, the tissues were submerged in 10% formalin for fixation and then cut open with a razor blade, so the mucosal side was exposed. A 2 cm x 1 cm section of each colon was taken from the distal aspect of the colon to be embedded in paraffin for immunohistochemistry. The tissue was then transferred to a pre-wet labelled piece of filter paper and the fixing was continued overnight in formalin.

Aberrant crypt foci enumeration

After being fixed in formalin for 24 hours the tissues were transferred to 70% ethanol for methylene blue staining. The tissues were stained with 0.2% methylene blue in PBS to quantify ACFs as described by Kim et al. (75). After staining, the tissue was kept wet and examined, mucosal side up, with a standard light microscope using magnification 40x. Colons were coded with a two-letter code until the end of the experiment to reduce any experimental bias. The colons were examined and ACFs were quantified based on ACF multiplicity and area of distal colon examined.

Immunohistochemistry

Slides with paraffin-embedded *en face* sectioned (µm thickness) distal colons were heated at 60° C for 15 minutes and washed in xylene three times for 5 minutes each. They were transferred to 100% ethanol and rehydrated in diluted ethanol in water solutions. Once rehydrated, the sections were covered with Hydrogen Peroxide Block (Abcam) for 10 minutes to ensure that any endogenous peroxidase activity is inhibited. Antigen retrieval for DCLK1 was performed in a Decloaking Chamber at 99° C for 18 minutes in citrate buffer. The sections were treated with Protein Block (Abcam) for 17 minutes to reduce non-specific background staining. Sections were incubated with a 1:1250 dilution of rabbit polyclonal anti-DCLK1 antibody (ab31704, Abcam) at 4° C for 24 hours. Sections were rinsed and incubated with a secondary biotinylated-conjugated antibody (Abcam) for 10 minutes followed by streptavidin peroxidase (Abcam) for another 10 minutes. They were then covered with DAB chromogen (Abcam) and stained with hematoxylin. Slides were dehydrated with xylene, permounted, and slip-covered for microscopy.

Imaging and analysis

All slides were examined under a standard microscope at 40X with an attached camera. Images of all ACFs found on each DCLK1 stained slide were acquired and saved. The images were analyzed with ImageJ plug-in, Color Deconvolution for H-DAB images (NIH). This allowed separation of the DAB-hematoxylin stain from the discrete DCLK1 stained points within the ACF. Each ACF was analyzed using this software to determine the average DCLK1 area for each tissue section. Using the saved images, the ACF was outlined within ImageJ giving the full area of the ACF. The highlighted ACF is then analyzed with the Color Deconvolution for H-DAB and the threshold was manually adjusted to highlight the stained portion of DCLK1 within the ACF. The areas of the ACF and the DCLK1 stained were calculated by the software and the percent DCLK1 per ACF was calculated with this information.

Statistics

All results were analyzed by analysis of variance using SAS 9.4. ACF and DCLK1 variables were ranked and analyzed by analysis of variance. A non-parametric Spearman's correlation was used to determine the relationship between ACF number and percent DCLK1 staining. Difference among means were determined using Duncan's multiple range test. A p-value of less than 0.05 was determined to be statistically significant.

Results

Body weight and energy intake

Body weights and energy intakes were analyzed for each week of the study. There were no significant differences among the groups in body weight over the course of the 10 weeks, although the Basal group did show a slightly lower average weight than the other two groups, starting in week 3 of the experiment (figure 1). The groups did not differ in their weekly energy intake throughout the experiment and showed no significant difference in mean energy intake (figures 2 and 3).

Liver weight, epididymal fat pad weight

Liver weight was significantly lower in the Basal group than Total Western Diet and Total Western Diet with Wild Rice (figure 5). The rats fed the Basal diet had the lowest liver weight followed by the group fed the Total Western Diet with Wild Rice. Epididymal fat pads were measured to estimate whole body adiposity. The epididymal fat pads within the Basal group were significantly lower than two other groups (figure 6). This was expected as the Total Western Diet and Total Western Diet with Wild Rice were high-fat diets.

Cecal contents pH and cecal weight

Cecal contents pH and cecal weight are shown in figures 7 and 8. Cecal contents pH and cecal weight (empty of contents) are indicators of large intestinal fermentation. There were no significant differences in cecal contents pH or cecal weight among the three groups.

Aberrant crypt foci (ACF)

The basal group had significantly more ACFs with a multiplicity of 2, however, there was no difference between any of the three groups among other ACF multiplicities (figure 9). Though the basal diet group had more ACF per area compared to the Total Western diet and Total Western Diet with Wild Rice groups, there was no significant difference among the groups (figure 10). All ACF data was ranked due to larger variability between the groups.

DCLK1

There was a significant reduction in the percentage of DCLK1 immunostaining per ACF area found in the Total Western Diet with Wild Rice group compared to the Total Western Diet group (figure 11). While the Total Western Diet group with Wild Rice had reduced DCLK1 percentage per ACF area compared to the Basal group, there was no significant difference found (figure 11).

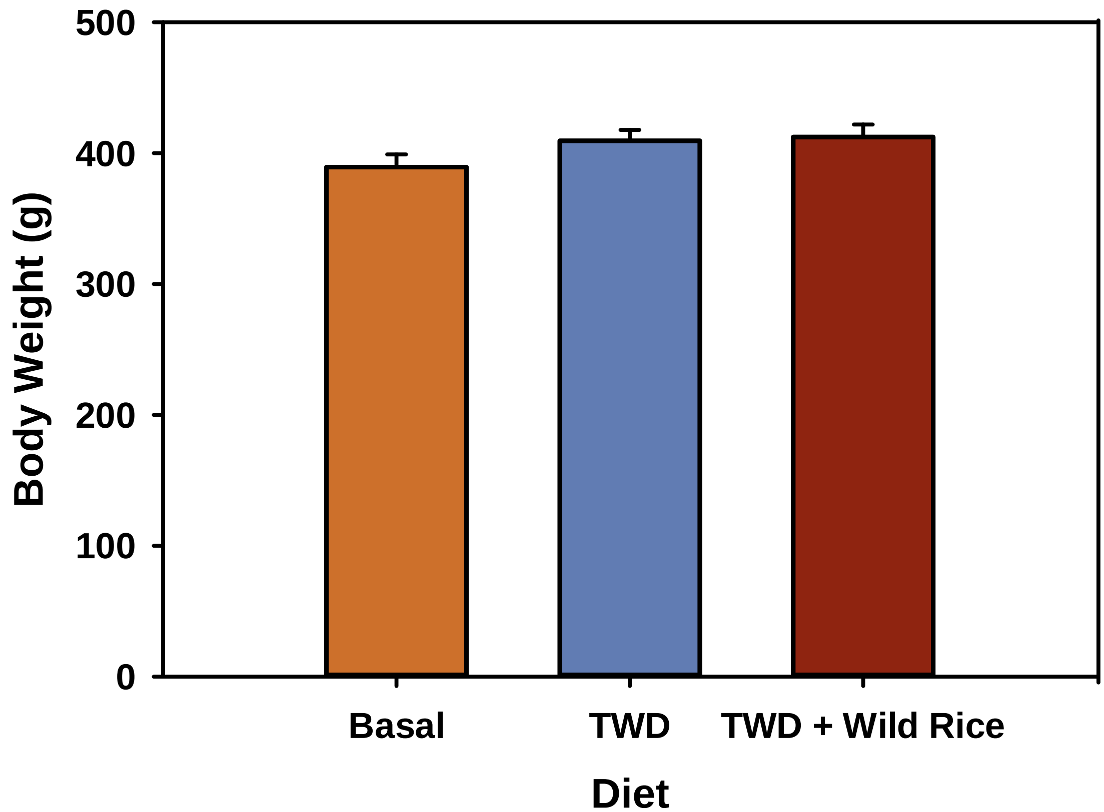


Figure 1. Final Body weight. Values represent means ± SEM, n=10-12.

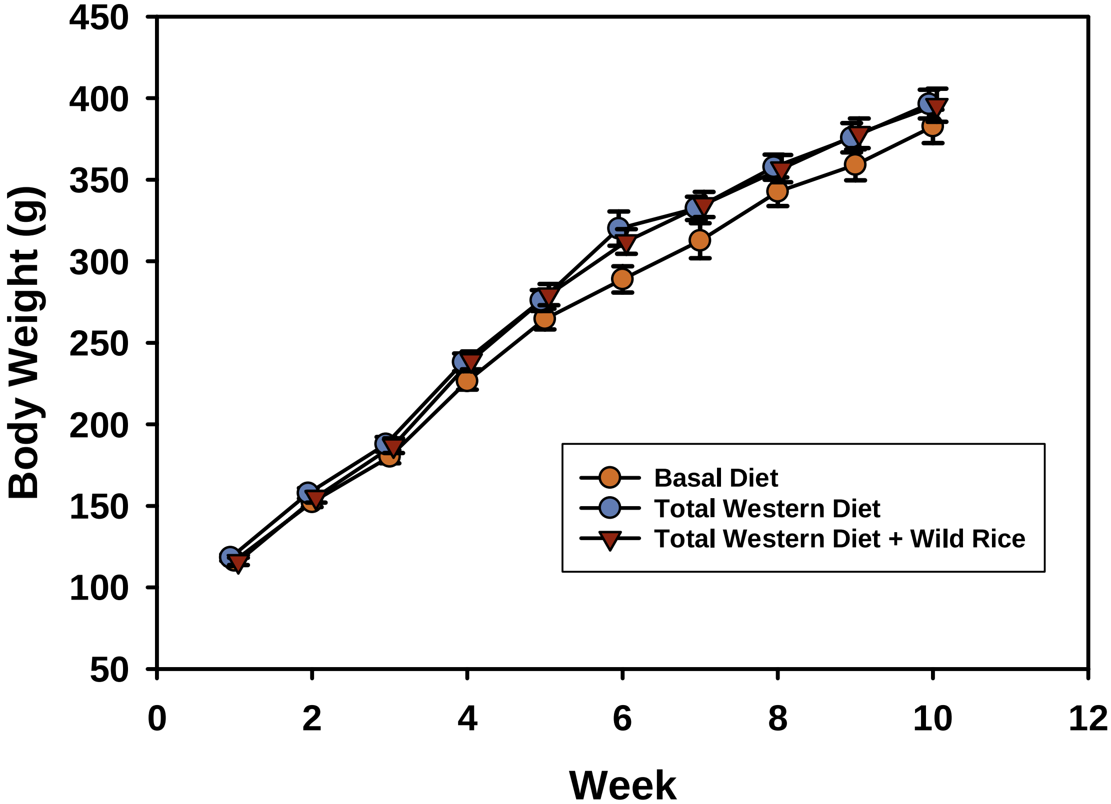


Figure 2. Weekly body weight. Values represent means ± SEM, n=10-12.

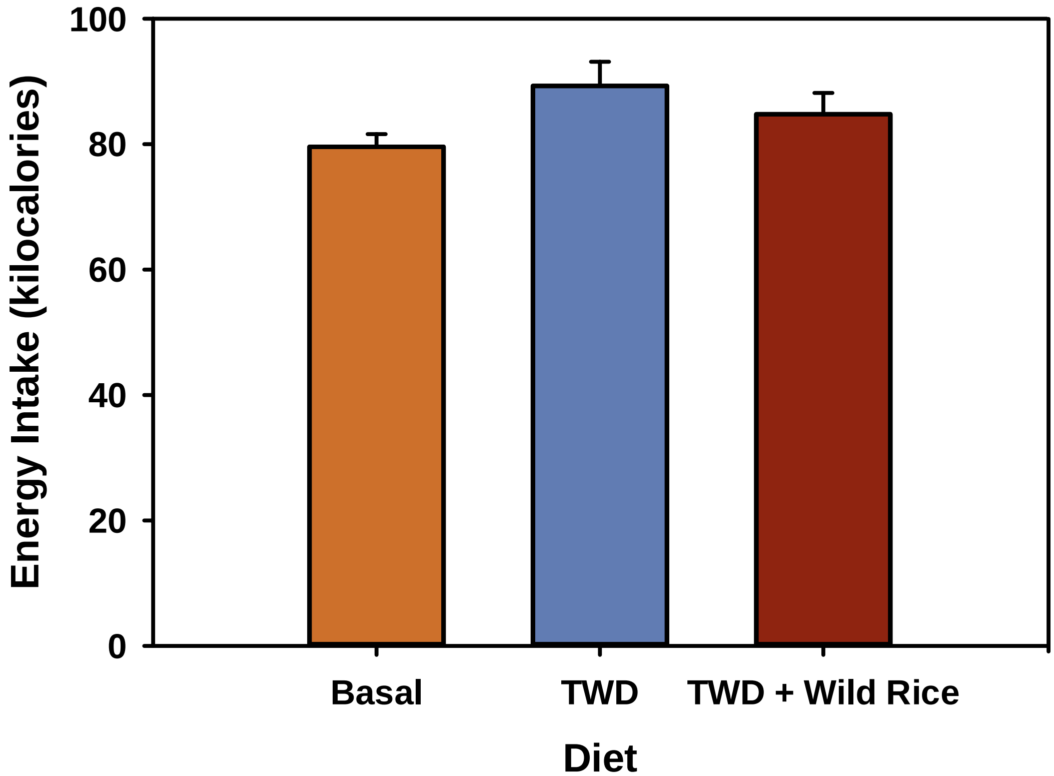


Figure 3. Average daily energy intake. Values represent means ± SEM, n=10-12.

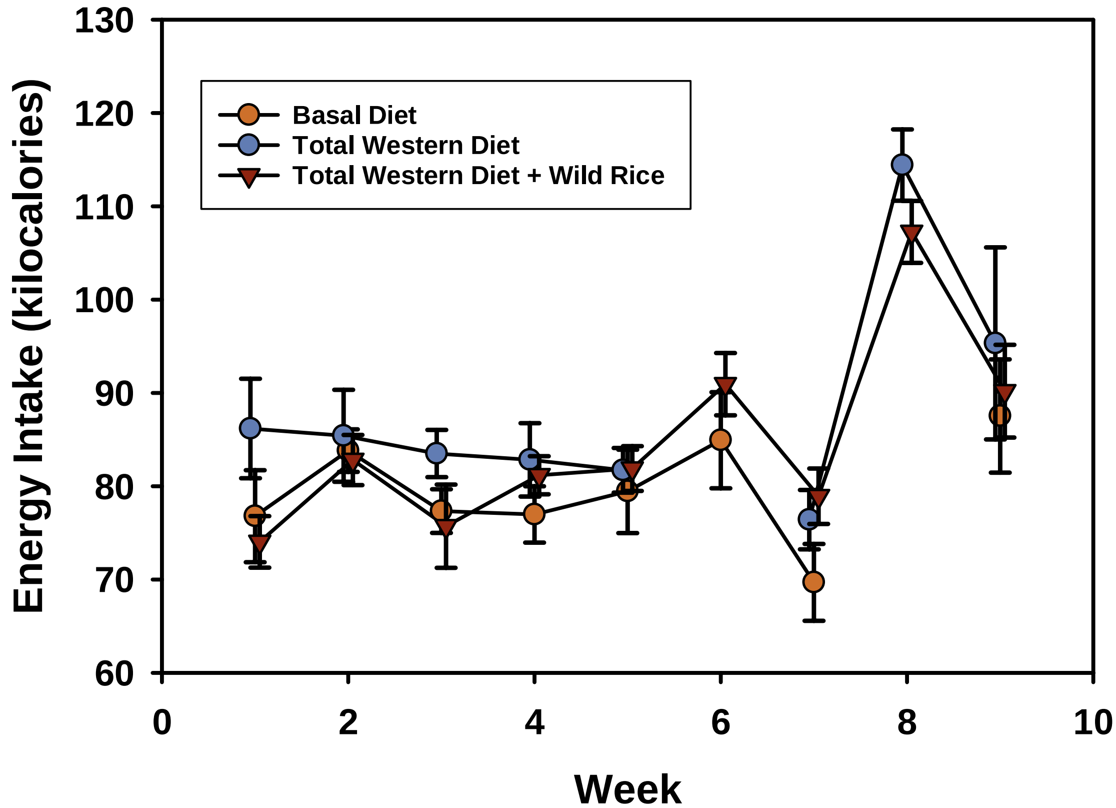


Figure 4. Daily energy intake by week. Values represent means ± SEM, n=10-12.

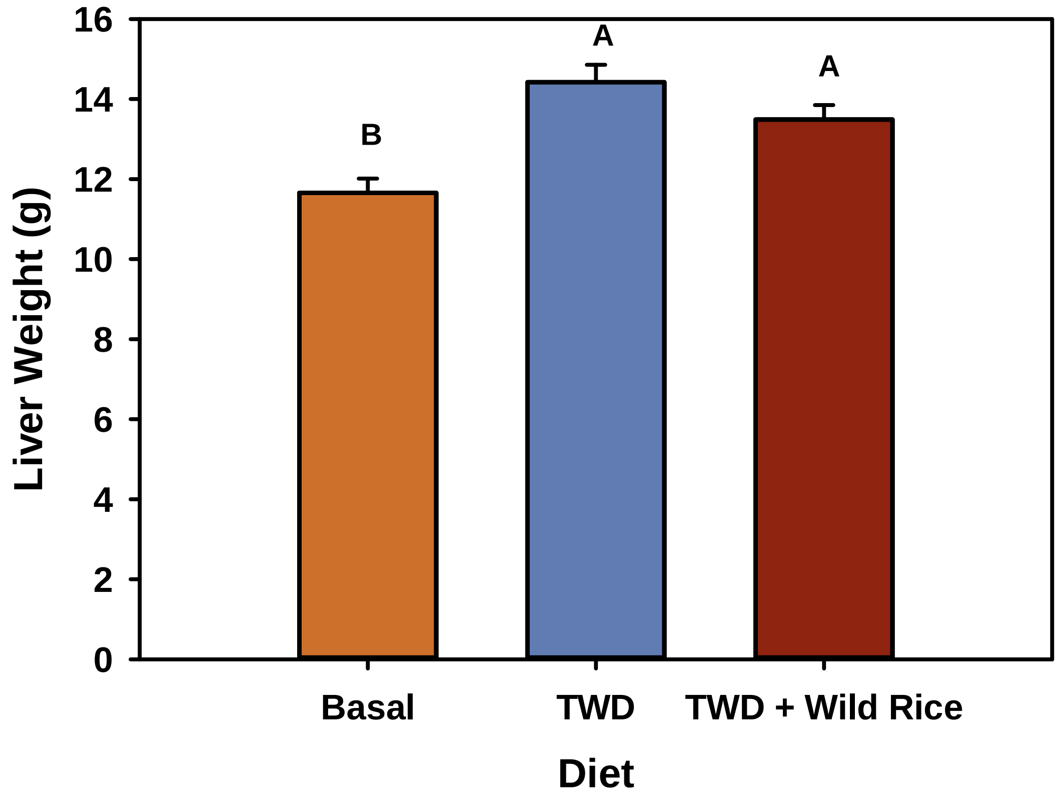


Figure 5. Liver weight. Values represent means ± SEM, n=10-12. Values that do not share a common letter are significantly different, p<0.05.

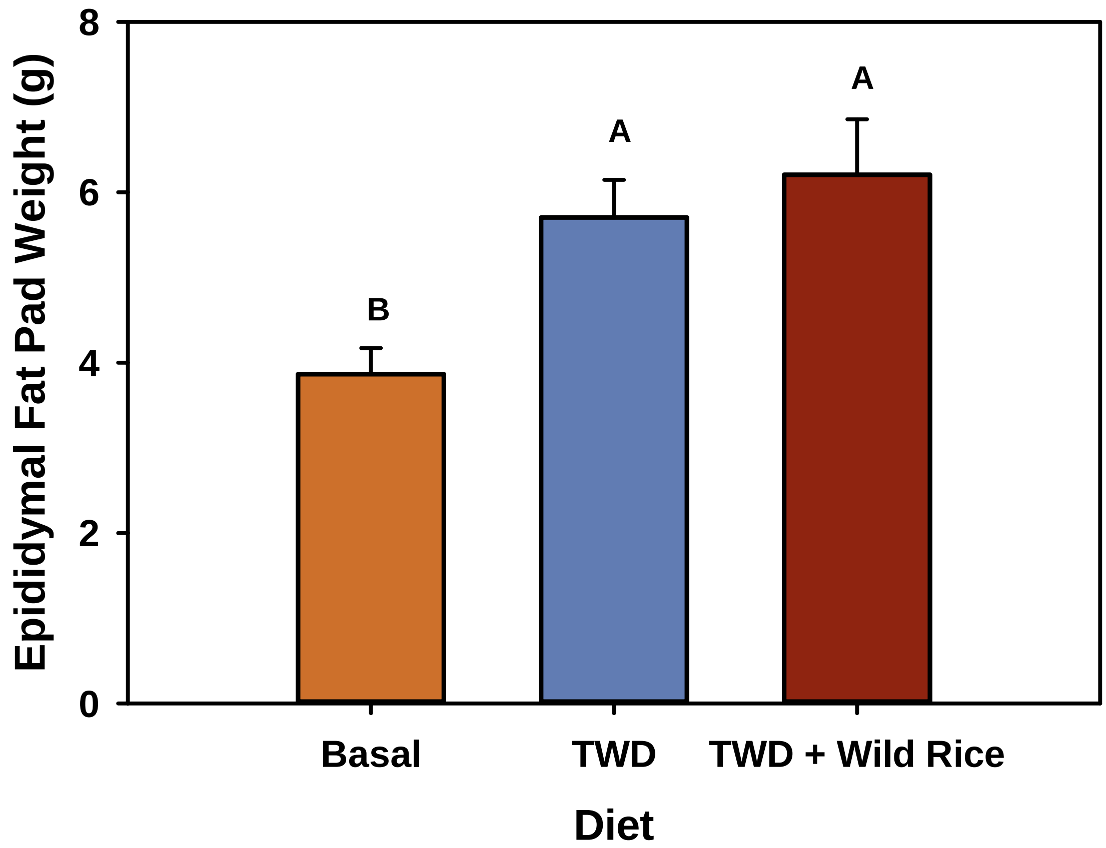


Figure 6. Epididymal fat pad weight. Values represent means ± SEM, n=10-12. Values that do not share a common letter are significantly different, p<0.05.

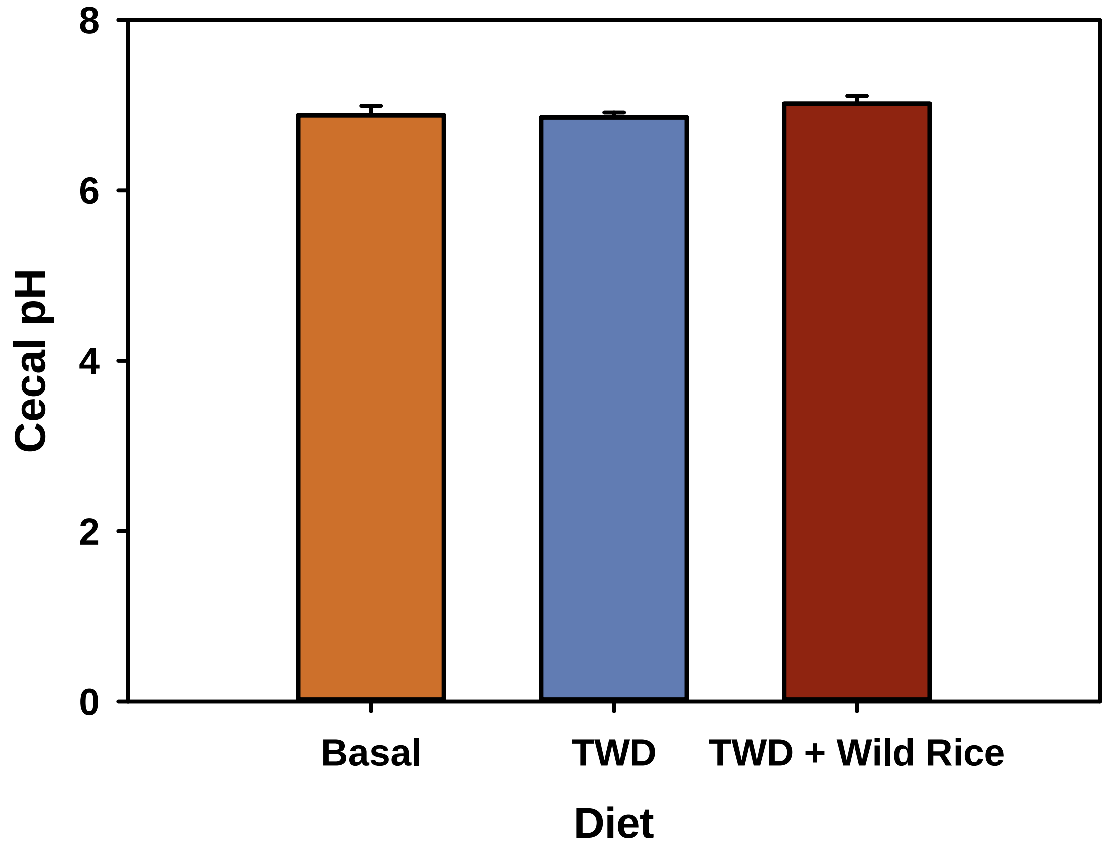


Figure 7. Cecal contents pH. Values represent means ± SEM, n=10-12.

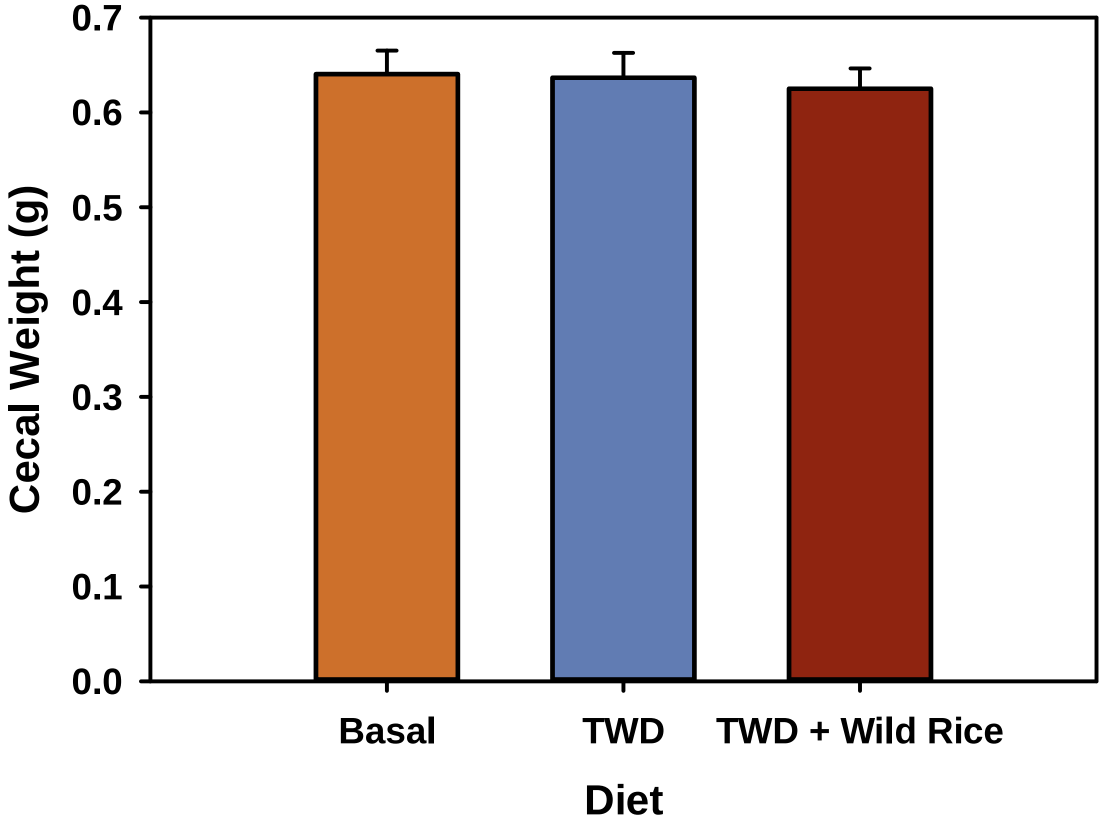


Figure 8. Cecal weight. Values represent means ± SEM, n=10-12.

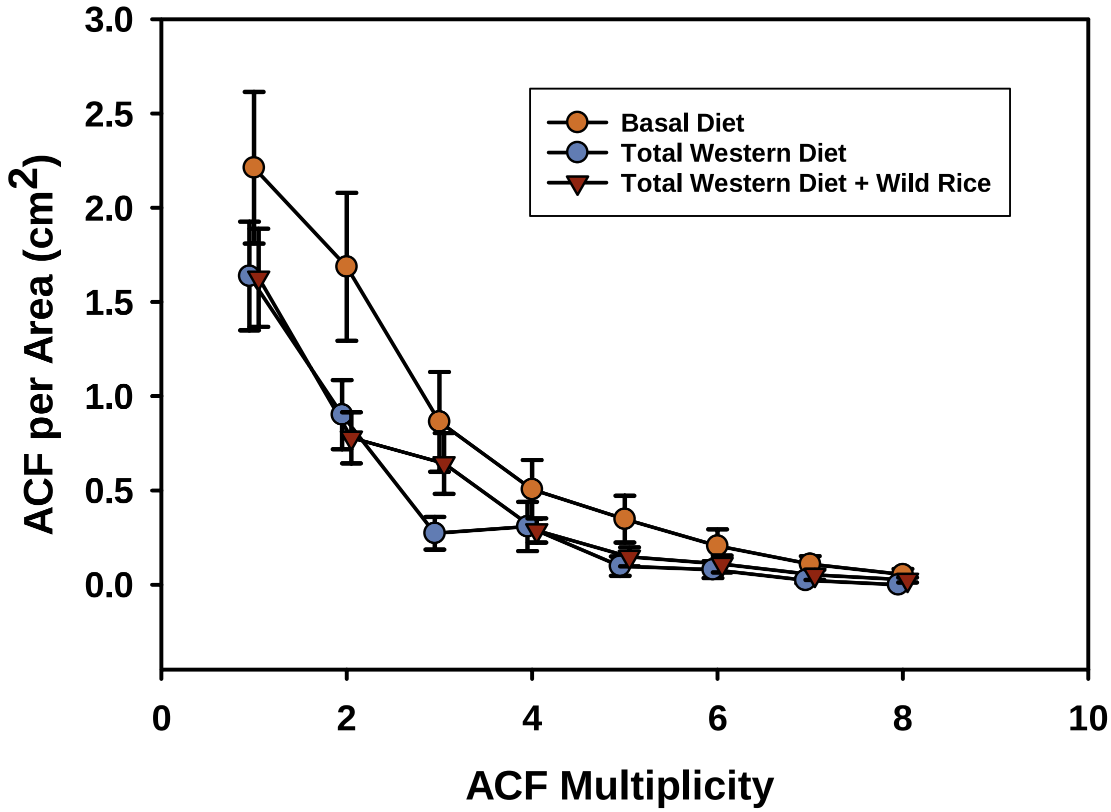


Figure 9. ACF multiplicity per distal colon area. Values represent means ± SEM, n=10-12.

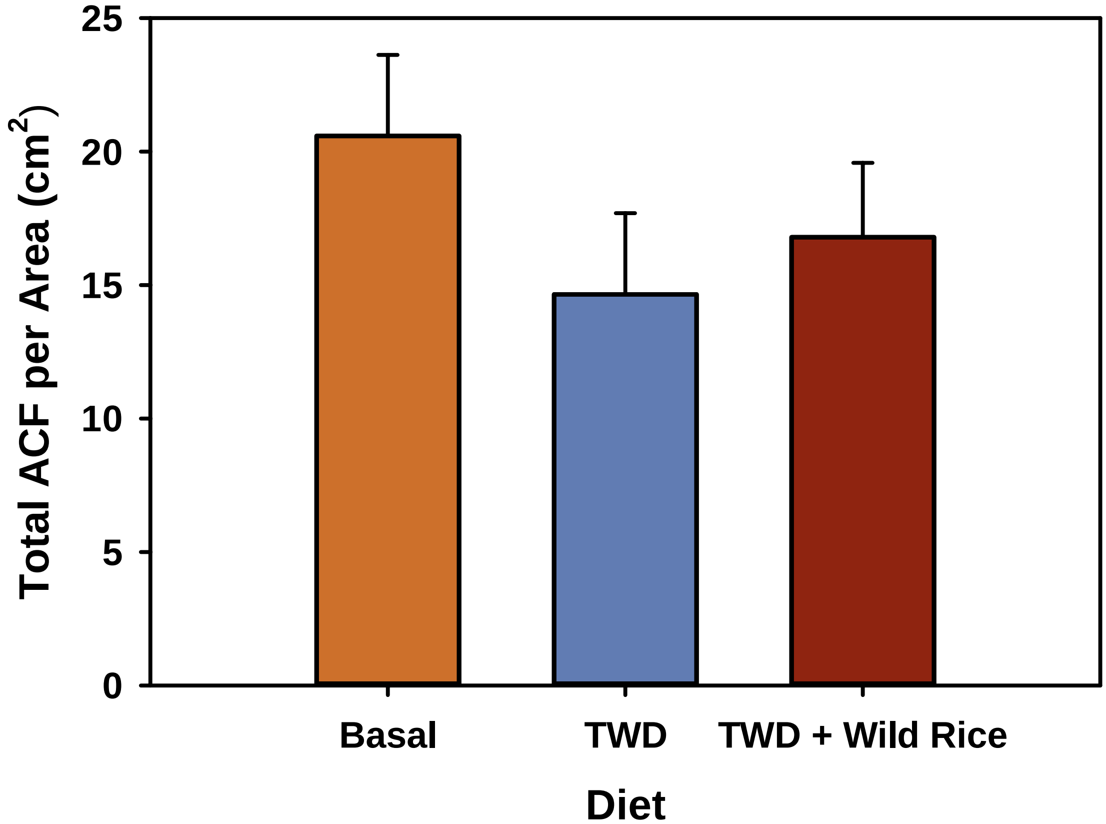


Figure 10. Total ACF per distal colon area. Values represent mean ± SEM, n=10-12.

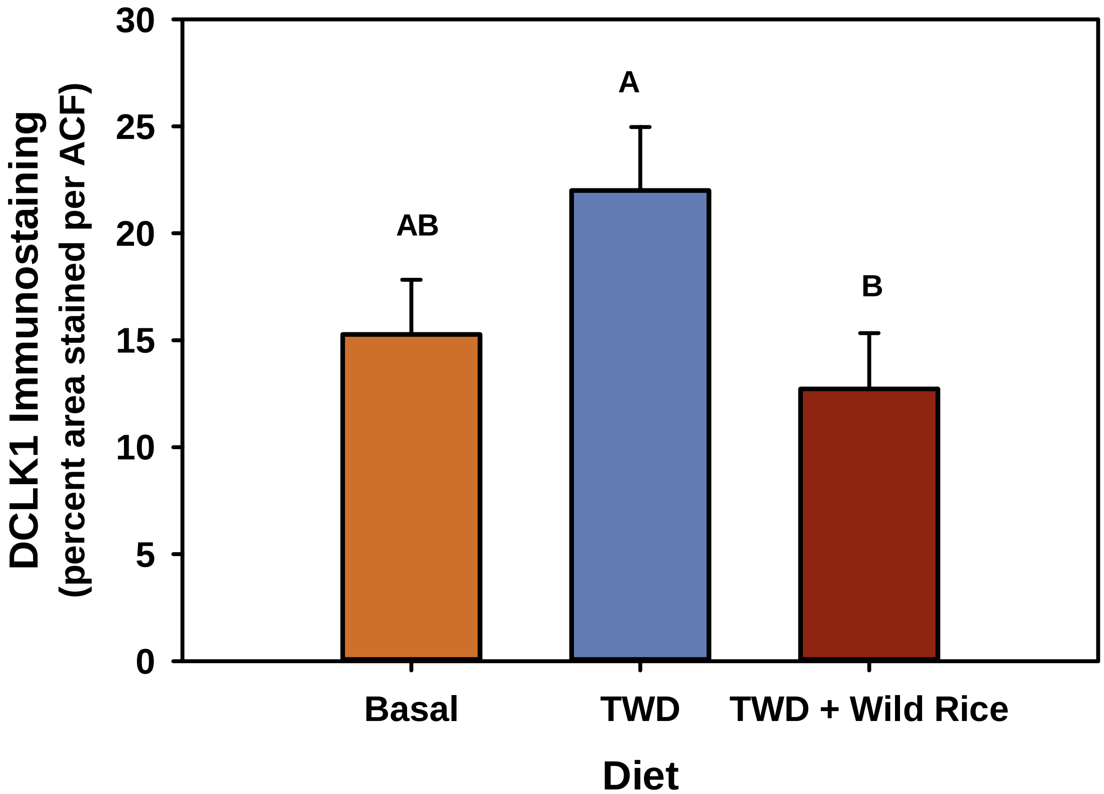


Figure 21. Percent DCLK1 area stained per ACF. Values represent mean± SEM, n=32. Values that do not share a common letter are significantly different, p<0.05.

Discussion

Colon cancer is one of the leading causes of deaths in the world and is strongly related to diet and lifestyle (68). Dietary risk factors include consuming a westernized dietary pattern characterized by a high intake of processed red meat, high-fat, and high-sugar foods, and low consumption of fruits, vegetables, and fiber. Population-based studies show that colon cancer incidence increases with consumption of a westernized dietary pattern. For example, people who immigrate from a low risk country to a high risk country, like the United States, have an increased risk of colon cancer (5, 7, 14, 15, 17, 26, 67, 68). The westernized dietary pattern increases the incidence of obesity and oxidative stress, both of which are correlated with increased colon cancer risk (20, 76). Antioxidants have been shown to reduce inflammation by neutralizing free radicals induced by inflammation, which reduces the risk of DNA damage (77). Wild rice has been found to have higher concentrations of γ-oryzanol and ferulic acid, both exhibiting antioxidant and chemopreventive properties, than other types of rice (66). Rats fed ferulic acid were found to have developed significantly lower ACFs and when fed ferulic acid during the initiation phase, it inhibited the growth of intestinal neoplasms (65). Mice treated with γ-oryzanol were found to have reduced tumor size and it was found that the tumors shrank significantly more when the γ-oryzanol was given in a dose-dependent manner (66). The purpose of this study was to test the effects of wild rice on colon cancer markers in dimethylhydrazine (DMH) treated rats in the background of a westernized diet.

The Total Western Diet, a rodent diet formulated to represent the westernized dietary pattern, is higher in fat and sugar and lower in fiber and micronutrients compared to commonly used rodent diets. Animals consuming this diet may show an increase in body weight since it is a diet with higher fat, however, this is more likely if it is matched with an increase in energy intake (74). There were a few time points when the Basal diet group consumed less energy than the Total Western Diet group, however, this was not significant, and there was no significant difference among the three groups for energy intake. The lack of a significant difference in body weight among the three groups would therefore be expected since they had similar energy intakes. It would be expected to show a difference in body weight if there was a significant increase in energy intake of the Total Western Diet or the Total Western Diet with Wild Rice, since high fat diets have been shown to induce obesity (78). In the present study, the Basal group had a significantly lighter epidydimal fat pad weight compared to the Total Western Diet and Total Western and Wild Rice groups. Studies have shown that the Total Western Diet increases adiposity as indicated by heavier fat pads compared to control diets (79). Cecal weight and cecal contents pH are indicators of fermentation within the large intestine, and when a fiber is fermentable, the pH decreases while the cecal tissue weight increases (80). There were no differences shown among the three groups for cecal weight or cecal contents pH showing that the wild rice was not fermentable to a measurable degree. Higher fat diets, like a Total Western Diet, have been shown to increase liver fat deposition and liver weight (81, 82). The Total Western Diet and Total Western Diet with Wild Rice groups had significantly higher liver weights compared to the Basal group, which would be expected due to the high-fat composition of the diet. Though not significant, there was a slight reduction in liver weight in the Total Western Diet with Wild Rice group compared to the Total Western Diet group. Liver lipids were not analyzed as part of this experiment, however, it has been shown that wild rice reduces liver cholesterol levels, and could possibly explain the slight reduction between groups (83).

There was no significant decrease in the total ACF per distal colon number among the three groups, however, there were fewer ACFs with greater multiplicity. It has been shown that ACFs with greater multiplicity, are often dysplastic ACFs, and are correlated with tumorigenesis (71). Since all the groups had more ACFs with multiplicity lower than 4 (figure 9) it is less likely that they would develop into tumors and show reduced colon cancer risk (35, 38). Determining the degree of dysplasia would likely help clarify the chemopreventive effect of wild rice, since total ACF as a measure of colon cancer risk has significant limitations. It is possible that the ratio of dysplastic to hyperplastic ACFs could differ, such that the Total Western Diet group had more dysplasia, but analyzing other markers, like DCLK1, might be more indicative in determining degree of dysplasia within the crypts.

DCLK1 is a marker for intestinal tuft cells, which line the intestinal epithelium, and have been found to be important in the modulation of the intestinal immune response (46). DCLK1-expressing tuft cells are overexpressed in response to chronic inflammation, which is correlated with carcinogenesis (70, 84). It has also been shown that knockdown or inhibition of DCLK1 through nanoparticle-based siRNAs may result in suppression of tumor growth in rodents and colon cancer cell lines (84, 85). Knockdown of DCLK1 decreases cell cycle progression and increases apoptosis within colon cancer cell lines (49). DCLK1 can also promote epithelial-mesenchymal transition (EMT), which is associated with colon cancer tumors and metastasis, by downregulating tumor suppressing microRNAs (49, 86). The Total Western Diet with Wild Rice group showed significant reduction in DCLK1 per ACF compared to the Total Western Diet group, showing a potential chemopreventive effect of wild rice.

Conclusions

Based on our experiment it is unclear if wild rice can prevent colon cancer. ACF are classified as hyperplastic and dysplastic, and dysplastic ACF are found to be more indicative of colon cancer as they often progress into tumors (37). Because of this, analyzing total ACF is less informative when discussing prevention of colon cancer risk by wild rice since there was no significant reduction in the total amount of ACFs among the three groups. Quantifying the amount of dysplastic ACF compared to hyperplastic ACF through analyzing characteristics of dysplastic ACF is potentially more indicative of colon cancer risk. Percent DCLK1 per ACF was found to be significantly reduced in the Total Western Diet with Wild Rice group compared to the Total Western Diet group. It is possible that DCLK1 is marking the dysplastic ACFs within our experiment and, therefore, shows that wild rice may have a protective effect against colon cancer risk (48). DCLK1 has been shown to increase nuclear β-catenin, a marker of dysplastic crypts, within ACFs and future studies should be done to know if wild rice reduces this, as nuclear β-catenin was not analyzed during this experiment (48, 70, 71). Ferulic acid and γ-oryzanol, components of wild rice have been found to have anti-inflammatory effects and further research could be done to see if any inflammatory markers were significantly reduced within the Total Western Diet with Wild Rice group.

It was also found that the Total Western Diet with Wild Rice liver weight was slightly lower than the Total Western Diet group, though not significantly. It has been shown that wild rice can reduce liver cholesterol levels and increase fecal cholesterol excretion, and this would be an opportunity for future experiments (83).

References

1. Jemal A, Bray F, Center MM, Ferlay J, Ward E, Forman D. Global cancer statistics. CA Cancer J Clin 2011;61:69-90.

2. Siegel RL, Miller KD, Jemal A. Cancer statistics, 2019. CA Cancer J Clin 2019;69:7-34.

3. Haggar FA, Boushey RP. Colorectal cancer epidemiology: incidence, mortality, survival, and risk factors. Clin Colon Rectal Surg 2009;22:191-7.

4. Global Burden of Disease Cancer C, Fitzmaurice C, Allen C, Barber RM, Barregard L, Bhutta ZA, Brenner H, Dicker DJ, Chimed-Orchir O, Dandona R, et al. Global, Regional, and National Cancer Incidence, Mortality, Years of Life Lost, Years Lived With Disability, and Disability-Adjusted Life-years for 32 Cancer Groups, 1990 to 2015: A Systematic Analysis for the Global Burden of Disease Study. JAMA Oncol 2017;3:524-48.

5. Flood DM, Weiss NS, Cook LS, Emerson JC, Schwartz SM, Potter JD. Colorectal cancer incidence in Asian migrants to the United States and their descendants. Cancer Causes Control 2000;11:403-11.

6. Wada K, Oba S, Tsuji M, Tamura T, Konishi K, Goto Y, Mizuta F, Koda S, Hori A, Tanabashi S, et al. Meat consumption and colorectal cancer risk in Japan: The Takayama study. Cancer Sci 2017;108:1065-70.

7. Shin S, Saito E, Sawada N, Ishihara J, Takachi R, Nanri A, Shimazu T, Yamaji T, Iwasaki M, Sasazuki S, et al. Dietary patterns and colorectal cancer risk in middle-aged adults: A large population-based prospective cohort study. Clin Nutr 2018;37:1019-26.

8. Magalhaes B, Peleteiro B, Lunet N. Dietary patterns and colorectal cancer: systematic review and meta-analysis. Eur J Cancer Prev 2012;21:15-23.

9. Kim D, Masyn KE, Kawachi I, Laden F, Colditz GA. Neighborhood socioeconomic status and behavioral pathways to risks of colon and rectal cancer in women. Cancer 2010;116:4187-96.

10. Burt RW, DiSario JA, Cannon-Albright L. Genetics of colon cancer: impact of inheritance on colon cancer risk. Annu Rev Med 1995;46:371-9.

11. Al-Sukhni W, Aronson M, Gallinger S. Hereditary colorectal cancer syndromes: familial adenomatous polyposis and lynch syndrome. Surg Clin North Am 2008;88:819-44, vii.

12. Terzic J, Grivennikov S, Karin E, Karin M. Inflammation and colon cancer. Gastroenterology 2010;138:2101-14 e5.

13. Statovci D, Aguilera M, MacSharry J, Melgar S. The Impact of Western Diet and Nutrients on the Microbiota and Immune Response at Mucosal Interfaces. Front Immunol 2017;8:838.

14. Chen Z, Wang PP, Woodrow J, Zhu Y, Roebothan B, McLaughlin JR, Parfrey PS. Dietary patterns and colorectal cancer: results from a Canadian population-based study. Nutr J 2015;14:8.

15. Randall E, Marshall JR, Brasure J, Graham S. Dietary patterns and colon cancer in western New York. Nutr Cancer 1992;18:265-76.

16. Slattery ML, Boucher KM, Caan BJ, Potter JD, Ma KN. Eating patterns and risk of colon cancer. Am J Epidemiol 1998;148:4-16.

17. Rada-Fernandez de Jauregui D, Evans CEL, Jones P, Greenwood DC, Hancock N, Cade JE. Common dietary patterns and risk of cancers of the colon and rectum: Analysis from the United Kingdom Women's Cohort Study (UKWCS). Int J Cancer 2018;143:773-81.

18. Ajouz H, Mukherji D, Shamseddine A. Secondary bile acids: an underrecognized cause of colon cancer. World J Surg Oncol 2014;12:164.

19. Zeng H, Umar S, Rust B, Lazarova D, Bordonaro M. Secondary Bile Acids and Short Chain Fatty Acids in the Colon: A Focus on Colonic Microbiome, Cell Proliferation, Inflammation, and Cancer. Int J Mol Sci 2019;20:1214.

20. O'Neill AM, Burrington CM, Gillaspie EA, Lynch DT, Horsman MJ, Greene MW. High-fat Western diet-induced obesity contributes to increased tumor growth in mouse models of human colon cancer. Nutr Res 2016;36:1325-34.

21. Despina Komninou AA, John P. Rickie, Basil Rigas. Insulin Resistance and Its Contribution to Colon Carcinogenesis. Exp Biol Med (Maywood) 2003.

22. Zeng H, Lazarova DL, Bordonaro M. Mechanisms linking dietary fiber, gut microbiota and colon cancer prevention. World J Gastrointest Oncol 2014;6:41-51.

23. Le Leu RK, Brown IL, Hu Y, Esterman A, Young GP. Suppression of azoxymethane-induced colon cancer development in rats by dietary resistant starch. Cancer Biol Ther 2007;6:1621-6.

24. Clarke JM, Topping DL, Bird AR, Young GP, Cobiac L. Effects of high-amylose maize starch and butyrylated high-amylose maize starch on azoxymethane-induced intestinal cancer in rats. Carcinogenesis 2008;29:2190-4.

25. Bishehsari F, Engen PA, Preite NZ, Tuncil YE, Naqib A, Shaikh M, Rossi M, Wilber S, Green SJ, Hamaker BR, et al. Dietary Fiber Treatment Corrects the Composition of Gut Microbiota, Promotes SCFA Production, and Suppresses Colon Carcinogenesis. Genes (Basel) 2018;9:102.

26. O'Keefe SJ, Li JV, Lahti L, Ou J, Carbonero F, Mohammed K, Posma JM, Kinross J, Wahl E, Ruder E, et al. Fat, fibre and cancer risk in African Americans and rural Africans. Nat Commun 2015;6:6342.

27. Kanadaswami C, Lee L-T, Lee P-PH, Hwang J-J, Ke F-C, Huang Y-T, Lee M-T. The Antitumor Activities of Flavonoids. In Vivo 2005.

28. Chen J, Vitetta L. Inflammation-Modulating Effect of Butyrate in the Prevention of Colon Cancer by Dietary Fiber. Clin Colorectal Cancer 2018;17:e541-e4.

29. Yahagi M, Okabayashi K, Hasegawa H, Tsuruta M, Kitagawa Y. The Worse Prognosis of Right-Sided Compared with Left-Sided Colon Cancers: a Systematic Review and Meta-analysis. J Gastrointest Surg 2016;20:648-55.

30. Cappell MS. Pathophysiology, clinical presentation, and management of colon cancer. Gastroenterol Clin North Am 2008;37:1-24, v.

31. Armaghany T, Wilson JD, Chu Q, Mills G. Genetic alterations in colorectal cancer. Gastrointest Cancer Res 2012;5:19-27.

32. Fodde R, Smits R, Clevers H. APC, signal transduction and genetic instability in colorectal cancer. Nat Rev Cancer 2001;1:55-67.

33. Aoki K, Taketo MM. Adenomatous polyposis coli (APC): a multi-functional tumor suppressor gene. J Cell Sci 2007;120:3327-35.

34. Hinoi T, Akyol A, Theisen BK, Ferguson DO, Greenson JK, Williams BO, Cho KR, Fearon ER. Mouse model of colonic adenoma-carcinoma progression based on somatic Apc inactivation. Cancer Res 2007;67:9721-30.

35. Orlando FA, Tan D, Baltodano JD, Khoury T, Gibbs JF, Hassid VJ, Ahmed BH, Alrawi SJ. Aberrant crypt foci as precursors in colorectal cancer progression. J Surg Oncol 2008;98:207-13.

36. Yamada Y, Mori H. Pre-cancerous lesions for colorectal cancers in rodents: a new concept. Carcinogenesis 2003;24:1015-9.

37. Clapper ML, Chang WL, Cooper HS. Dysplastic Aberrant Crypt Foci: Biomarkers of Early Colorectal Neoplasia and Response to Preventive Intervention. Cancer Prev Res (Phila) 2020;13:229-40.

38. Pretlow TP, O'Riordan MA, Somich GA, Amini SB, Pretlow TG. Aberrant crypts correlate with tumor incidence in F344 rats treated with azoxymethane and phytate. Carcinogenesis 1992;13:1509-12.

39. Stevens RG, Swede H, Rosenberg DW. Epidemiology of colonic aberrant crypt foci: review and analysis of existing studies. Cancer Lett 2007;252:171-83.

40. Paulsen JE, Steffensen IL, Namork E, Alexander J. Scanning electron microscopy of aberrant crypt foci in rat colon. Carcinogenesis 1994;15:2371-3.

41. Takayama T, Katsuki S, Takahashi Y, Ohi M, Nojiri S, Sakamaki S, Kato J, Kogawa K, Miyake H, Niitsu Y. Aberrant crypt foci of the colon as precursors of adenoma and cancer. N Engl J Med 1998;339:1277-84.

42. Moulahoum H, Nagy AL, Djerdjouri B, Clichici S. Precancerous ACF induction affects their regional distribution forsaking oxidative stress implication in 1,2-dimethylhydrazine-induced colon carcinogenesis model. Inflammopharmacology 2018;26:457-68.

43. Gil J, Stembalska A, Pesz KA, Sasiadek MM. Cancer stem cells: the theory and perspectives in cancer therapy. J Appl Genet 2008;49:193-9.

44. Reya T, Morrison SJ, Clarke MF, Weissman IL. Stem cells, cancer, and cancer stem cells. Nature 2001;414:105-11.

45. Sebio A, Kahn M, Lenz HJ. The potential of targeting Wnt/beta-catenin in colon cancer. Expert Opin Ther Targets 2014;18:611-5.

46. Middelhoff M, Westphalen CB, Hayakawa Y, Yan KS, Gershon MD, Wang TC, Quante M. Dclk1-expressing tuft cells: critical modulators of the intestinal niche? Am J Physiol Gastrointest Liver Physiol 2017;313:G285-G99.

47. Sarkar S, Popov VL, O'Connell MR, Stevenson HL, Lee BS, Obeid RA, Luthra GK, Singh P. A novel antibody against cancer stem cell biomarker, DCLK1-S, is potentially useful for assessing colon cancer risk after screening colonoscopy. Lab Invest 2017;97:1245-61.

48. May R, Riehl TE, Hunt C, Sureban SM, Anant S, Houchen CW. Identification of a novel putative gastrointestinal stem cell and adenoma stem cell marker, doublecortin and CaM kinase-like-1, following radiation injury and in adenomatous polyposis coli/multiple intestinal neoplasia mice. Stem Cells 2008;26:630-7.

49. Mohammadi Y, Tavangar SM, Saidijam M, Amini R, Etemadi K, Karimi Dermani F, Najafi R. DCLK1 plays an important role in colorectal cancer tumorgenesis through the regulation of miR-200c. Biomed Pharmacother 2018;103:301-7.

50. Chandrakesan P, Yao J, Qu D, May R, Weygant N, Ge Y, Ali N, Sureban SM, Gude M, Vega K, et al. Dclk1, a tumor stem cell marker, regulates pro-survival signaling and self-renewal of intestinal tumor cells. Mol Cancer 2017;16:30.

51. Singhal P, Kaushik G. Therapeutic Effect of Cereal Grains: A Review. Crit Rev Food Sci Nutr 2016;56:748-59.

52. McKevith B. Nutritional aspects of cereals. Nutrition Bulletin 2004;29:111-42.

53. Tacer-Caba Z, Nilufer-Erdil D, Ai Y. Chemical Composition of Cereals and Their Products. Handbook of Food Chemistry; 2015. p. 1-23.

54. Bach Knudsen KE. Microbial degradation of whole-grain complex carbohydrates and impact on short-chain fatty acids and health. Adv Nutr 2015;6:206-13.

55. Bartlomiej S, Justyna RK, Ewa N. Bioactive compounds in cereal grains - occurrence, structure, technological significance and nutritional benefits - a review. Food Sci Technol Int 2012;18:559-68.

56. Kannappan R, Gupta SC, Kim JH, Aggarwal BB. Tocotrienols fight cancer by targeting multiple cell signaling pathways. Genes Nutr 2012;7:43-52.

57. Prasad S, Gupta SC, Tyagi AK. Reactive oxygen species (ROS) and cancer: Role of antioxidative nutraceuticals. Cancer Lett 2017;387:95-105.

58. Surendiran G, Alsaif M, Kapourchali FR, Moghadasian MH. Nutritional constituents and health benefits of wild rice (Zizania spp.). Nutr Rev 2014;72:227-36.

59. Aladedunye F, Przybylski R, Rudzinska M, Klensporf-Pawlik D. gamma-Oryzanols of North American Wild Rice (Zizania palustris). J Am Oil Chem Soc 2013;90:1101-9.

60. Szczesniak KA, Ostaszewski P, Ciecierska A, Sadkowski T. Investigation of nutriactive phytochemical - gamma-oryzanol in experimental animal models. J Anim Physiol Anim Nutr (Berl) 2016;100:601-17.

61. Henderson AJ, Ollila CA, Kumar A, Borresen EC, Raina K, Agarwal R, Ryan EP. Chemopreventive properties of dietary rice bran: current status and future prospects. Adv Nutr 2012;3:643-53.

62. Wongjaikam S, Summart R, Chewonarin T. Apoptosis induction in colon cancer cell lines and alteration of aberrant crypt foci in rat colon by purple rice (Oryza sativa L. var. glutinosa) extracts. Nutr Cancer 2014;66:690-9.

63. Lefevre M, Jonnalagadda S. Effect of whole grains on markers of subclinical inflammation. Nutr Rev 2012;70:387-96.

64. Janicke B, Hegardt C, Krogh M, Onning G, Akesson B, Cirenajwis HM, Oredsson SM. The antiproliferative effect of dietary fiber phenolic compounds ferulic acid and p-coumaric acid on the cell cycle of Caco-2 cells. Nutr Cancer 2011;63:611-22.

65. Kawabata K, Yamamoto T, Hara A, Shimizu M, Yamada Y, Matsunaga K, Tanaka T, Mori H. Modifying effects of ferulic acid on azoxymethane-induced colon carcinogenesis in F344 rats. Cancer Lett 2000;157:15-21.

66. Kim SP, Kang MY, Nam SH, Friedman M. Dietary rice bran component gamma-oryzanol inhibits tumor growth in tumor-bearing mice. Mol Nutr Food Res 2012;56:935-44.

67. Mehta RS, Song M, Nishihara R, Drew DA, Wu K, Qian ZR, Fung TT, Hamada T, Masugi Y, da Silva A, et al. Dietary Patterns and Risk of Colorectal Cancer: Analysis by Tumor Location and Molecular Subtypes. Gastroenterology 2017;152:1944-53 e1.

68. Fung TT, Brown LS. Dietary Patterns and the Risk of Colorectal Cancer. Curr Nutr Rep 2013;2:48-55.

69. Horst D, Reu S, Kriegl L, Engel J, Kirchner T, Jung A. The intratumoral distribution of nuclear beta-catenin is a prognostic marker in colon cancer. Cancer 2009;115:2063-70.

70. Westphalen CB, Quante M, Wang TC. Functional implication of Dclk1 and Dclk1-expressing cells in cancer. Small GTPases 2017;8:164-71.

71. Caderni G, Giannini A, Lancioni L, Luceri C, Biggeri A, Dolara P. Characterisation of aberrant crypt foci in carcinogen-treated rats: association with intestinal carcinogenesis. Br J Cancer 1995;71:763-9.

72. Han S, Zhang H, Qin L, Zhai C. Effects of dietary carbohydrate replaced with wild rice (Zizania latifolia (Griseb) Turcz) on insulin resistance in rats fed with a high-fat/cholesterol diet. Nutrients 2013;5:552-64.

73. Reeves PG. Components of the AIN-93 diets as improvements in the AIN-76A diet. J Nutr 1997;127:838S-41S.

74. Hintze KJ, Benninghoff AD, Ward RE. Formulation of the Total Western Diet (TWD) as a basal diet for rodent cancer studies. J Agric Food Chem 2012;60:6736-42.

75. Kim S, Guo J, O'Sullivan MG, Gallaher DD, Turesky RJ. Comparative DNA adduct formation and induction of colonic aberrant crypt foci in mice exposed to 2-

amino-9H-pyrido[2,3-b]indole, 2-amino-3,4-dimethylimidazo[4,5-f]quinoline, and azoxymethane. Environ Mol Mutagen 2016;57:125-36.

76. Erdelyi I, Levenkova N, Lin EY, Pinto JT, Lipkin M, Quimby FW, Holt PR. Western-style diets induce oxidative stress and dysregulate immune responses in the colon in a mouse model of sporadic colon cancer. J Nutr 2009;139:2072-8.

77. Garcia-Lafuente A, Guillamon E, Villares A, Rostagno MA, Martinez JA. Flavonoids as anti-inflammatory agents: implications in cancer and cardiovascular disease. Inflamm Res 2009;58:537-52.

78. Pinheiro-Castro N, Silva LBAR, Novaes GM, Ong TP. Hypercaloric Diet-Induced Obesity and Obesity-Related Metabolic Disorders in Experimental Models. Advances in Experimental Medicine and Biology: Springer International Publishing; 2019. p. 149-61.

79. Woodie L, Blythe S. The differential effects of high-fat and high-fructose diets on physiology and behavior in male rats. Nutr Neurosci 2018;21:328-36.

80. Rémésy C, Behr SR, Levrat M-A, Demigne C. Fiber fermentability in the rat cecum and its physiological consequences. Nutrition Research 1992;12:1235-44.

81. Roberts MD, Mobley CB, Toedebush RG, Heese AJ, Zhu C, Krieger AE, Cruthirds CL, Lockwood CM, Hofheins JC, Wiedmeyer CE, et al. Western diet-induced hepatic steatosis and alterations in the liver transcriptome in adult Brown-Norway rats. BMC Gastroenterol 2015;15:151.

82. Jegatheesan P, Beutheu S, Freese K, Waligora-Dupriet AJ, Nubret E, Butel MJ, Bergheim I, De Bandt JP. Preventive effects of citrulline on Western diet-induced non-alcoholic fatty liver disease in rats. Br J Nutr 2016;116:191-203.

83. Surendiran G, Goh C, Le K, Zhao Z, Askarian F, Othman R, Nicholson T, Moghadasian P, Wang YJ, Aliani M, et al. Wild rice (Zizania palustris L.) prevents atherogenesis in LDL receptor knockout mice. Atherosclerosis 2013;230:284-92.

84. Gao T, Wang M, Xu L, Wen T, Liu J, An G. DCLK1 is up-regulated and associated with metastasis and prognosis in colorectal cancer. J Cancer Res Clin Oncol 2016;142:2131-40.

85. Sureban SM, May R, Mondalek FG, Qu D, Ponnurangam S, Pantazis P, Anant S, Ramanujam RP, Houchen CW. Nanoparticle-based delivery of siDCAMKL-1 increases microRNA-144 and inhibits colorectal cancer tumor growth via a Notch-1 dependent mechanism. J Nanobiotechnology 2011;9:40.

86. Liu W, Wang S, Sun Q, Yang Z, Liu M, Tang H. DCLK1 promotes epithelial-mesenchymal transition via the PI3K/Akt/NF-kappaB pathway in colorectal cancer. Int J Cancer 2018;142:2068-79.

Appendices

Image analysis using ImageJ

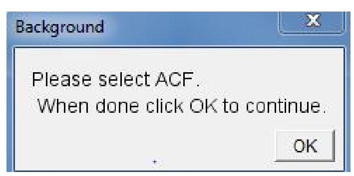
<u>Colour Deconvolution Macro for H-DAB</u>

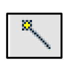
- Open **FIJI**
- Open the image that you would like to work with, make sure this is correctly labelled → Load this to FIJI
- On **plugins** tab, choose *run*. The file you will run is under: **G:Drive → Gallaher → Lab Methods → Histology → Colour Deconvolution for H-DAB images.ijm.** *This macro automatically sets you up to do the following:*

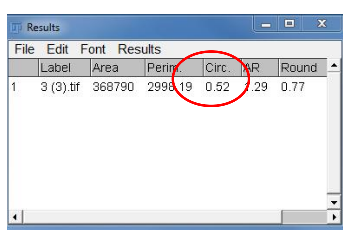
Part I:

Select the area of the entire ACF that you wish to measure

You will see the following:



- Using the wand tool, , click on a portion of the ACF that allows you to <u>outline the entire ACF</u> that you wish to analyze. ***[Note: You may have to click on the ACF more than once to get the correct region highlighted]***
- Once you are finished, press OK. A **results** window opens. You will see the area of the entire ACF:



You are now ready to start the colour deconvolution analysis

The colour deconvolution program automatically sets your image into 3 individual color channels.

However, this macro will only use 2. Thus, when you choose to run this macro, the image is automatically separated into 2 different channels:

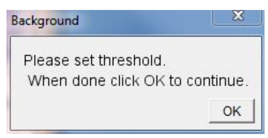
- 1 will be hematoxylin-stained portion of the ACF: (Colour_1),
- 1 will be 3,3'-diaminobenzidine (DAB)-stained portion of the ACF: (Colour_2)

Make sure you keep your original image open. This will allow you compare your two separate color-channel images to the original!

PART II:

Colour_1: Hematoxylin-stained portion of the ACF

You will see the following:

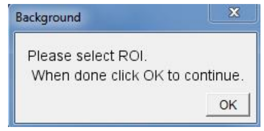


- Make sure Colour_1: hematoxylin-stained portion of the ACF - window is selected, and go to **Image → Adjust → Threshold.**
- When the **Threshold** window pops up, you should automatically be set to: 'Default, Red'
- The default setting is the one you are trying to measure. This red color is what the program senses as **hematoxylin staining**. In order to eliminate unwanted variability due user error, use the program's default settings. *[If you move the slide bars, pressing 'Auto' will revert all settings back to the default setting you want]*

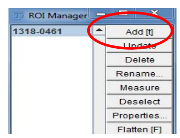
It is a good idea to compare the red filtering that shows the color adjustment with your original image.

- Once you finish, press OK. The ACF where you adjusted the threshold gets filled in automatically (the color changes from red to black).

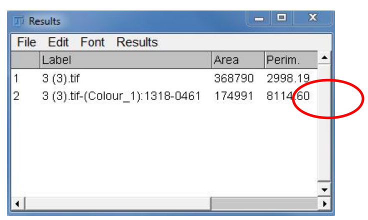
You will then see the following:



- Using the wand tool,  , click on the ROI (region of interest is the ACF stained with DAB) that you wish to measure for area. This of the ACF will be outlined in yellow. To select multiple areas, hold down the shift button while you are selecting the ROI.
- Once this is selected, press OK. The **ROI** window will pop up automatically. You will see:



- These are the x-y coordinates of the ACF were you have selected the ROI. This information is useful if you need the location of the ROI, *not the area.*
- However, you will also see a **Results** window appear. ***This window is the one that you need***. <u>This shows you the **area of Colour_1**</u>: the hematoxylin-stained portion of the ACF

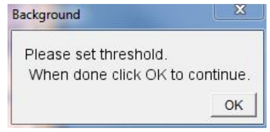


You are now ready to start threshold analysis for the DAB-stained portion of the ACF

Part III

<u>Colour_2: the DAB-stained portion of the ACF</u>

Again, you should see the following:



Make sure Colour_2: DAB-stained portion of the ACF - window is selected,

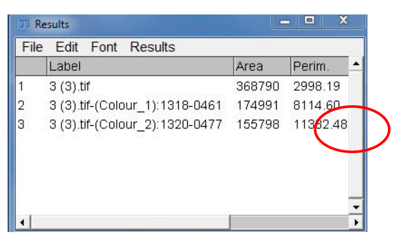
The threshold window should already be opened from Colour_1, if it is not go to

Image → Adjust → Threshold.

- When the **Threshold** window pops up, you should automatically be set to: 'Default, Red'
- Again, use the default settings. The program automatically senses all areas that are stained with DAB.
- On the bottom slider, you will see a number which indicates the number of the threshold analysis. In the middle left area, you will see a percentage which indicates this as well. Make sure to record these numbers for you statistical analysis.

This is the threshold adjustment that determined the area of DAB staining, which you will use in your final analysis. Make sure to record this number, as it will be useful in your final analysis.

- Once you finish, press OK.
- This macro is programmed so that once you do this, all images disappear. However, you will see the results window appear with third area. This is the area of the 3rd threshold adjustment (the DAB-stained portion of the ACF). You will notice that is labeled Colour_2:



Created by: Vanessa Thyne, 8-2015

Wild Rice and Colon Cancer Risk

-- Diet=basal diet --

Obs	Rat_no	Code	FI1	FI2	FI3	FI4	FI5	FI6	FI7	FI8	FI9	BW1	BW2	BW3
1	1	MT	14.91	18.0	16.97	18.0	16.9	20.1	14.68	26.2	18.7	107.6	136.4	155.1
2	2	TX	17.93	21.3	20.63	16.3	19.8	26.3	20.40	30.0	30.7	117.2	150.6	178.0
3	3	BE	17.04	20.8	19.21	21.2	19.0	21.0	17.60	21.9	20.2	107.4	149.4	176.2
4	4	PE	21.42	23.6	21.40	19.2	21.1	22.2	22.70	25.8	28.5	129.1	167.3	202.1
5	5	CU	30.06	23.2	21.08	25.4	27.2	29.4	20.40	128.7	19.0	126.8	165.8	200.2
6	6	LE	14.37	18.6	17.51	17.7	18.2	15.7	14.30	28.4	12.3	115.5	147.6	174.9
7	7	ET	17.32	20.7	19.67	18.1	20.7	22.6	17.70	26.2	24.8	118.7	159.7	186.7
8	8	BK	17.56	18.3	15.51	16.0	10.7	17.3	10.40	19.5	17.5	128.0	162.4	190.7
9	9	HG	17.44	19.7	18.72	18.8	17.8	20.9	14.70	26.5	17.7	105.6	140.5	164.0
10	10	AM	22.73	21.8	21.99	21.1	21.2	20.0	21.00	25.8	25.9	102.8	137.8	167.4
11	11	ER	18.52	22.7	17.26	18.1	21.4	22.5	16.30	24.8	21.3	117.2	153.3	183.3
12	12	TJ	17.66	19.0	18.63	17.6	20.8	13.0	15.80	27.0	22.1	120.6	156.5	183.2

Obs	BW4	BW5	BW6	BW7	BW8	BW9	BW10	Body_ Weight_g	Liver_ weight_g	Epididymal_ fat_pad_ weight_g	Cecal_ pH
1	192.2	227.2	264.3	290.4	308.7	332.6	357.8	362.6	9.8187	3.0639	6.60
2	230.5	277.0	315.3	339.8	348.7	374.9	417.0	411.1	11.7238	4.2967	6.48
3	220.9	263.8	298.6	323.0	345.7	363.2	379.0	393.8	11.2736	4.2604	6.75
4	254.5	296.5	238.4	356.9	382.7	398.5	421.0	421.9	12.2838	4.3387	6.51
5	253.8	303.6	340.8	371.2	401.1	423.8	446.0	448.2	13.6745	6.0860	7.30
6	211.0	235.3	255.0	264.8	291.6	301.8	320.0	322.0	9.7521	1.9190	6.63
7	231.0	269.2	301.9	326.3	353.7	369.9	393.0	402.3	12.6532	4.9141	6.62
8	228.2	257.1	281.4	301.5	320.3	335.4	354.0	363.0	11.1005	4.1013	7.42
9	209.4	248.2	276.8	297.2	316.7	328.3	347.0	367.7	11.8185	3.4110	6.85
10	218.3	260.7	292.3	324.3	350.5	352.3	394.0	404.8	12.3940	3.7150	7.05
11	234.5	270.1	305.5	238.8	352.4	372.1	394.0	401.3	13.0297	3.2654	6.74
12	232.3	265.6	296.0	317.0	339.4	356.1	369.0	372.0	10.3090	3.0040	7.62

Obs	Cecal_ Weight_g	Area_cm2	ACF1	ACF2	ACF3	ACF4	ACF5	ACF6	ACF7	ACF8_ plus	Total ACF	Percent_ Total ACF_A	DCLK1_ ACF
1	0.6011	9.00	32	42	30	18	13	8	2	2	146	16.3333	5.7400
2	0.5201	7.92	11	7	1	6	3	4	2	0	34	4.2929	4.5730
3	0.6112	9.00	14	2	1	0	0	1	0	0	18	2.0000	4.4375
4	0.7537	11.00	9	6	5	7	3	1	0	0	24	2.8182	.
5	0.7072	9.00	39	29	9	5	8	6	2	0	98	10.8889	2.0033
6	0.5809	9.45	7	4	2	0	0	1	0	0	14	1.4815	3.9846
7	0.5262	6.58	31	15	3	2	1	0	0	0	52	7.9027	7.2062
8	0.5622	9.20	9	6	1	1	2	0	0	0	19	2.0652	5.3762
9	0.7210	10.00	18	19	10	4	1	0	0	0	51	5.2000	31.4158
10	0.7589	9.60	32	28	16	7	5	0	4	0	92	9.5833	5.6920
11	0.6367	7.98	13	9	8	3	0	0	0	1	34	4.2607	3.9582
12	0.7034	10.00	17	14	9	2	2	1	2	3	50	5.0000	2.6366

Obs	ACF1_A	ACF2_A	ACF3_A	ACF4_A	ACF5_A	ACF6_A	ACF7_A	ACF8_A
1	3.55556	4.66667	3.33333	2.00000	1.44444	0.88889	0.22222	0.22222
2	1.38889	0.88384	0.12626	0.75758	0.37879	0.50505	0.25253	0.00000
3	1.55556	0.22222	0.11111	0.00000	0.00000	0.11111	0.00000	0.00000
4	0.81818	0.54545	0.45455	0.63636	0.27273	0.09091	0.00000	0.00000
5	4.33333	3.22222	1.00000	0.55556	0.88889	0.66667	0.22222	0.00000
6	0.74074	0.42328	0.21164	0.00000	0.00000	0.10582	0.00000	0.00000

7	4.71125	2.27964	0.45593	0.30395	0.15198	0.00000	0.00000	0.00000
8	0.97826	0.65217	0.10870	0.10870	0.21739	0.00000	0.00000	0.00000
9	1.80000	1.90000	1.00000	0.40000	0.10000	0.00000	0.00000	0.00000
10	3.33333	2.91667	1.66667	0.72917	0.52083	0.00000	0.41667	0.00000
11	1.62907	1.12782	1.00251	0.37594	0.00000	0.00000	0.00000	0.12531
12	1.70000	1.40000	0.90000	0.20000	0.20000	0.10000	0.20000	0.30000

Wild Rice and Colon Cancer Risk

----------------------------------- Diet=Total Western diet -----------------------------------

Obs	Rat_no	Code	FI1	FI2	FI3	FI4	FI5	FI6	FI7	FI8	FI9	BW1	BW2	BW3
13	13	TY	16.35	18.9	17.53	19.50	18.2	18.3	17.5	22.6	18.0	105.3	151.7	170.1
14	14	NV	17.23	16.3	18.01	20.30	16.7	21.6	17.4	27.4	18.0	112.6	150.3	179.5
15	16	DJ	15.99	17.6	16.57	17.60	17.3	20.0	14.8	27.2	18.0	119.9	152.9	179.4
16	18	YE	26.76	20.7	18.44	19.10	18.5	21.9	17.0	24.8	16.7	119.1	163.5	196.4
17	19	PP	17.57	21.2	17.73	19.40	19.7	21.2	16.0	27.0	21.8	124.9	163.6	196.5
18	20	VV	14.29	15.1	17.45	16.80	15.5	16.5	18.3	26.3	19.9	112.1	151.8	183.5
19	21	SK	17.81	21.7	18.85	19.65	18.5	47.9	14.0	23.0	22.0	120.8	166.2	202.3
20	22	TT	19.22	14.0	16.70	13.20	17.3	5.3	17.6	20.7	15.2	117.2	141.2	166.8
21	23	YW	20.87	16.7	19.04	14.20	16.3	16.2	13.8	23.0	19.0	125.3	159.7	191.7
22	24	RA	22.81	25.0	22.71	21.80	21.1	25.4	21.1	28.8	40.3	125.6	176.2	211.0

Obs	BW4	BW5	BW6	BW7	BW8	BW9	BW10	Body_ Weight_g	Liver_ weight_g	Epididymal_ fat_pad_ weight_g	Cecal_ pH
13	223.2	259.7	393.8	316.2	346.1	357.6	374	384.1	13.4901	4.2810	6.74
14	231.8	268.4	305.4	326.1	354.1	375.2	399	414.0	14.9671	4.5506	6.80
15	216.5	248.9	277.9	303.0	326.1	336.2	359	370.0	12.8019	3.5899	6.60
16	252.0	292.6	328.8	356.3	381.4	401.0	424	436.0	16.0558	7.7178	6.97
17	246.2	288.7	320.3	346.0	373.1	389.7	404	426.0	15.4274	5.4589	6.75
18	232.0	269.0	302.0	321.5	344.4	365.3	389	403.4	16.6419	5.4446	6.94
19	254.3	297.0	331.5	350.0	375.4	390.0	404	421.9	13.8956	7.1716	6.65
20	216.5	255.4	291.7	315.0	339.6	357.0	379	395.0	13.0304	5.0613	7.21
21	240.1	268.5	300.9	316.5	333.6	352.0	376	388.1	12.9490	6.6912	6.88
22	267.5	310.9	347.9	373.5	402.9	433.0	455	455.0	14.9487	7.0820	7.01

Obs	Cecal_ Weight_g	Area_cm2	ACF1	ACF2	ACF3	ACF4	ACF5	ACF6	ACF7	ACF8_ plus	Total ACF	Total ACF_A	Percent_ DCLK1_ ACF
13	0.5253	9.00	11	6	2	0	0	0	0	0	18	2.11111	27.5589
14	0.6134	7.60	7	3	0	1	0	0	0	0	11	1.44737	7.9036
15	0.5987	10.00	37	21	1	10	1	0	0	0	69	7.00000	10.9261
16	0.7043	9.60	16	14	1	4	0	0	0	0	35	3.64583	2.4032
17	0.6033	8.74	6	1	4	1	3	3	0	0	18	2.05950	6.1136
18	0.5344	8.00	15	8	5	1	0	1	1	0	31	3.87500	6.8933
19	0.6441	8.60	19	7	0	0	0	0	0	0	26	3.02326	2.6949
20	0.7762	10.50	23	13	7	2	1	0	0	0	46	4.38095	9.3335
21	0.6191	6.65	6	3	0	0	0	0	0	0	9	1.35338	8.4329
22	0.7459	9.00	9	7	5	10	4	3	1	0	39	4.33333	6.5465

Obs	ACF1_A	ACF2_A	ACF3_A	ACF4_A	ACF5_A	ACF6_A	ACF7_A	ACF8_A
13	1.22222	0.66667	0.22222	0.00000	0.00000	0.00000	0.00000	0
14	0.92105	0.39474	0.00000	0.13158	0.00000	0.00000	0.00000	0
15	3.70000	2.10000	0.10000	1.00000	0.10000	0.00000	0.00000	0
16	1.66667	1.45833	0.10417	0.41667	0.00000	0.00000	0.00000	0
17	0.68650	0.11442	0.45767	0.11442	0.34325	0.34325	0.00000	0
18	1.87500	1.00000	0.62500	0.12500	0.00000	0.12500	0.12500	0
19	2.20930	0.81395	0.00000	0.00000	0.00000	0.00000	0.00000	0
20	2.19048	1.23810	0.66667	0.19048	0.09524	0.00000	0.00000	0
21	0.90226	0.45113	0.00000	0.00000	0.00000	0.00000	0.00000	0
22	1.00000	0.77778	0.55556	1.11111	0.44444	0.33333	0.11111	0

Wild Rice and Colon Cancer Risk

------------------------------------ Diet=TWD with wild rice ------------------------------------

Obs	Rat_no	Code	FI1	FI2	FI3	FI4	FI5	FI6	FI7	FI8	FI9	BW1	BW2	BW3
23	25	HJ	14.99	15.6	14.12	15.5	17.5	17.6	19.0	17.8	19.6	116.8	155.6	184.3
24	26	XM	17.20	15.5	14.31	16.5	16.8	14.2	17.1	23.1	18.3	116.3	149.7	174.6
25	27	UT	12.66	16.2	15.81	16.0	14.7	22.2	17.0	23.0	17.0	105.3	135.7	162.2
26	28	PS	15.23	18.6	18.68	17.7	19.5	22.2	20.1	22.9	21.0	125.7	171.8	208.4
27	29	TZ	15.10	17.2	17.27	18.3	17.4	18.7	13.0	21.0	14.6	113.3	153.3	185.1
28	30	LA	14.05	18.1	18.79	19.3	17.6	18.1	17.0	23.0	19.1	118.8	150.6	180.1
29	31	FV	15.06	18.5	8.15	16.0	18.8	20.4	18.0	23.0	17.0	107.3	145.7	175.0
30	32	HS	17.97	21.7	20.18	20.2	19.1	21.4	21.6	24.0	23.0	123.5	167.4	197.8
31	33	HB	19.80	18.9	20.73	18.4	21.5	23.6	16.8	26.4	19.5	129.8	176.4	220.8
32	34	LX	16.12	16.5	17.82	17.9	17.3	19.5	16.0	24.7	18.6	117.3	155.7	187.1
33	35	JW	17.89	20.0	17.59	17.8	15.8	21.1	15.0	27.2	29.7	108.8	150.5	182.1
34	36	PL	18.66	21.0	15.70	19.9	19.4	20.2	17.0	26.0	19.8	108.9	151.4	185.9

Obs	BW4	BW5	BW6	BW7	BW8	BW9	BW10	Body_ Weight_g	Liver_ weight_g	Epididymal_ fat_pad_ Cecal_ weight_g	pH
23	233.1	273.3	303.6	330.6	352.9	367	376	392.5	15.0056	4.0151	6.84
24	225.8	259.4	296.9	322.0	346.7	365	372	388.2	13.5252	4.4652	7.55
25	210.7	245.8	271.2	288.8	307.9	330	345	373.8	11.8470	5.0748	7.31
26	264.3	306.3	345.2	366.2	389.6	416	446	465.0	13.8180	8.9989	6.74
27	232.1	266.8	292.1	315.3	327.6	350	364	376.0	12.0360	4.6620	6.84
28	228.9	273.9	313.2	343.5	376.1	400	416	434.6	13.9068	7.7820	6.69
29	228.3	268.1	300.2	326.1	345.4	367	390	400.8	14.4296	4.7844	6.72
30	251.6	302.7	334.1	357.8	374.3	400	430	432.6	14.8564	7.9630	7.62
31	281.2	324.6	363.2	385.7	412.1	440	454	468.3	14.8761	10.1447	6.95
32	230.1	262.1	286.9	305.6	326.8	345	356	378.7	11.2838	3.3336	6.96
33	241.6	290.7	321.9	339.3	360.0	383	400	425.6	13.1649	8.1962	6.90
34	242.4	280.6	317.2	337.1	362.0	379	399	410.0	13.1148	5.0353	7.08

Obs	Cecal_ Weight_g	Area_cm2	ACF1	ACF2	ACF3	ACF4	ACF5	ACF6	ACF7	ACF8_ plus	Total ACF	Percent_ Total ACF_A	DCLK1_ ACF
23	0.6857	8.40	11	8	2	0	0	0	0	0	20	2.50000	2.9526
24	0.6289	10.00	23	9	17	4	2	3	0	0	57	5.80000	3.8092
25	0.5948	7.20	4	1	0	0	0	0	1	0	6	0.83333	3.4752
26	0.6367	8.82	31	9	12	4	0	1	0	0	55	6.46259	.
27	0.7383	8.61	11	7	5	2	2	1	0	1	28	3.36818	11.7831
28	0.5482	11.00	10	2	4	4	0	0	0	0	20	1.81818	4.9124
29	0.6955	7.20	10	2	2	0	1	0	0	0	15	2.08333	5.9765
30	0.5038	9.60	12	4	2	1	1	0	0	0	20	2.08333	3.1229
31	0.7065	10.00	31	18	15	4	6	5	3	1	81	8.30000	0.7009
32	0.6385	11.50	10	11	5	4	1	2	1	1	35	3.04348	4.6956
33	0.5958	8.80	12	7	4	4	1	1	0	0	29	3.29545	2.0880
34	0.5253	10.00	17	11	6	7	3	0	1	0	44	4.50000	5.7785

Obs	ACF1_A	ACF2_A	ACF3_A	ACF4_A	ACF5_A	ACF6_A	ACF7_A	ACF8_A
23	1.30952	0.95238	0.23810	0.00000	0.00000	0.00000	0.00000	0.00000
24	2.30000	0.90000	1.70000	0.40000	0.20000	0.30000	0.00000	0.00000
25	0.55556	0.13889	0.00000	0.00000	0.00000	0.00000	0.13889	0.00000
26	3.51474	1.02041	1.36054	0.45351	0.00000	0.11338	0.00000	0.00000
27	1.27758	0.81301	0.58072	0.23229	0.23229	0.11614	0.00000	0.11614
28	0.90909	0.18182	0.36364	0.36364	0.00000	0.00000	0.00000	0.00000

29	1.38889	0.27778	0.27778	0.00000	0.13889	0.00000	0.00000	0.00000
30	1.25000	0.41667	0.20833	0.10417	0.10417	0.00000	0.00000	0.00000
31	3.10000	1.80000	1.50000	0.40000	0.60000	0.50000	0.30000	0.10000
32	0.86957	0.95652	0.43478	0.34783	0.08696	0.17391	0.08696	0.08696
33	1.36364	0.79545	0.45455	0.45455	0.11364	0.11364	0.00000	0.00000
34	1.70000	1.10000	0.60000	0.70000	0.30000	0.00000	0.10000	0.00000

-- Diet=basal diet --

The MEANS Procedure

Variable	Label	N	Mean	Std Error
Rat_no	Rat number	12	6.5000000	1.0408330
FI1	food intake week 1 (g)	12	18.9133333	1.2139026
FI2	food intake week 2 (g)	12	20.6416667	0.5610405
FI3	food intake week 3 (g)	12	19.0483333	0.5767750
FI4	food intake week 4 (g)	12	18.9583333	0.7427894
FI5	food intake week 5 (g)	12	19.5666667	1.1028430
FI6	food intake week 6 (g)	12	20.9166667	1.2685492
FI7	food intake week 7 (g)	12	17.1650000	1.0134912
FI8	food intake week 8 (g)	12	34.2333333	8.6240971
FI9	food intake week 9 (g)	12	21.5583333	1.4952175
BW1	body weight week 1 (g)	12	116.3750000	2.5952499
BW2	body weight week 2 (g)	12	152.2750000	3.0380697
BW3	body weight week 3(g)	12	180.1500000	4.0413675
BW4	body weight week 4 (g)	12	226.3833333	5.1298714
BW5	body weight week 5 (g)	12	264.5250000	6.3621886
BW6	body weight week 6 (g)	12	288.8583333	8.0238514
BW7	body weight week 7 (g)	12	312.6000000	10.7212901
BW8	body weight week 8 (g)	12	342.6250000	8.8280212
BW9	body weight week 9 (g)	12	359.0750000	9.4715053
BW10	body weight week 10 (g)	12	382.6500000	10.2479007
Body_Weight_g	Body weight (g)	12	389.2250000	9.6453641
Liver_weight_g	Liver weight (g)	12	11.6526167	0.3609244
Epididymal_fat_pad_weight_g	Epididymal fat pad weight (g)	12	3.8646250	0.3066747
Cecal_pH		12	6.8808333	0.1096583
Cecal_Weight_g	Ceal weight (empty) (g)	12	0.6402167	0.0248307
Area_cm2	Area of colon counted (cm2)	12	9.0608333	0.3328173
ACF1	ACF with 1 AC	12	19.3333333	3.2035334
ACF2	ACF with 2 AC	12	15.0833333	3.5493455
ACF3	ACF with 3 Ac	12	7.9166667	2.4166667
ACF4	ACF with 4 AC	12	4.5833333	1.4166667
ACF5	ACF with 5 AC	12	3.1666667	1.1202904
ACF6	ACF with 6 AC	12	1.8333333	0.7768754
ACF7	ACF with 7 AC	12	1.0000000	0.3892495
ACF8_plus	ACF with 8 or more AC	12	0.5000000	0.2886751
TotalACF	Total ACF	12	52.6666667	11.5708184
TotalACF_A	Total ACF per cm2	12	5.9855627	1.2813940
Percent_DCLK1_ACF		11	7.0021308	2.4806870
ACF1_A		12	2.2120141	0.4018743
ACF2_A		12	1.6866650	0.3921643
ACF3_A		12	0.8642240	0.2645849
ACF4_A		12	0.5056040	0.1556295
ACF5_A		12	0.3479207	0.1241163
ACF6_A		12	0.2057039	0.0880635
ACF7_A		12	0.1094697	0.0419544
ACF8_A		12	0.0539613	0.0301693

Variable	Label	Minimum	Maximum
Rat_no	Rat number	1.0000000	12.0000000
FI1	food intake week 1 (g)	14.3700000	30.0600000
FI2	food intake week 2 (g)	18.0000000	23.6000000
FI3	food intake week 3 (g)	15.5100000	21.9900000
FI4	food intake week 4 (g)	16.0000000	25.4000000
FI5	food intake week 5 (g)	10.7000000	27.2000000
FI6	food intake week 6 (g)	13.0000000	29.4000000
FI7	food intake week 7 (g)	10.4000000	22.7000000
FI8	food intake week 8 (g)	19.5000000	128.7000000

FI9	food intake week 9 (g)	12.3000000	30.7000000
BW1	body weight week 1 (g)	102.8000000	129.1000000
BW2	body weight week 2 (g)	136.4000000	167.3000000
BW3	body weight week 3(g)	155.1000000	202.1000000
BW4	body weight week 4 (g)	192.2000000	254.5000000
BW5	body weight week 5 (g)	227.2000000	303.6000000
BW6	body weight week 6 (g)	238.4000000	340.8000000
BW7	body weight week 7 (g)	238.8000000	371.2000000
BW8	body weight week 8 (g)	291.6000000	401.1000000

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------------------------------------- Diet=basal diet -------------------------------------

The MEANS Procedure

Variable	Label	Minimum	Maximum
BW9	body weight week 9 (g)	301.8000000	423.8000000
BW10	body weight week 10 (g)	320.0000000	446.0000000
Body_Weight_g	Body weight (g)	322.0000000	448.2000000
Liver_weight_g	Liver weight (g)	9.7521000	13.6745000
Epididymal_fat_pad_weight_g	Epididymal fat pad weight (g)	1.9190000	6.0860000
Cecal_pH		6.4800000	7.6200000
Cecal_Weight_g	Ceal weight (empty) (g)	0.5201000	0.7589000
Area_cm2	Area of colon counted (cm2)	6.5800000	11.0000000
ACF1	ACF with 1 AC	7.0000000	39.0000000
ACF2	ACF with 2 AC	2.0000000	42.0000000
ACF3	ACF with 3 Ac	1.0000000	30.0000000
ACF4	ACF with 4 AC	0	18.0000000
ACF5	ACF with 5 AC	0	13.0000000
ACF6	ACF with 6 AC	0	8.0000000
ACF7	ACF with 7 AC	0	4.0000000
ACF8_plus	ACF with 8 or more AC	0	3.0000000
TotalACF	Total ACF	14.0000000	146.0000000
TotalACF_A	Total ACF per cm2	1.4814815	16.3333333
Percent_DCLK1_ACF		2.0032688	31.4158298
ACF1_A		0.7407407	4.7112462
ACF2_A		0.2222222	4.6666667
ACF3_A		0.1086957	3.3333333
ACF4_A		0	2.0000000
ACF5_A		0	1.4444444
ACF6_A		0	0.8888889
ACF7_A		0	0.4166667
ACF8_A		0	0.3000000

----------------------------------- Diet=Total Western diet -----------------------------------

Variable	Label	N	Mean	Std Error
Rat_no	Rat number	10	19.0000000	1.1832160
FI1	food intake week 1 (g)	10	18.8900000	1.1691336
FI2	food intake week 2 (g)	10	18.7200000	1.0801029
FI3	food intake week 3 (g)	10	18.3030000	0.5537249
FI4	food intake week 4 (g)	10	18.1550000	0.8609572
FI5	food intake week 5 (g)	10	17.9100000	0.5246057
FI6	food intake week 6 (g)	10	21.4300000	3.4000016
FI7	food intake week 7 (g)	10	16.7500000	0.6970175
FI8	food intake week 8 (g)	10	25.0800000	0.8363678
FI9	food intake week 9 (g)	10	20.8900000	2.2567159
BW1	body weight week 1 (g)	10	118.2800000	2.0987721
BW2	body weight week 2 (g)	10	157.7100000	3.1759670
BW3	body weight week 3(g)	10	187.7200000	4.5037219
BW4	body weight week 4 (g)	10	238.0100000	5.3970867
BW5	body weight week 5 (g)	10	275.9100000	6.3972642
BW6	body weight week 6 (g)	10	320.0200000	10.4933291
BW7	body weight week 7 (g)	10	332.4100000	7.1461015
BW8	body weight week 8 (g)	10	357.6700000	7.7363220
BW9	body weight week 9 (g)	10	375.7000000	8.9638285
BW10	body weight week 10 (g)	10	396.3000000	8.8141931
Body_Weight_g	Body weight (g)	10	409.3500000	8.2525181
Liver_weight_g	Liver weight (g)	10	14.4207900	0.4353690
Epididymal_fat_pad_weight_g	Epididymal fat pad weight (g)	10	5.7048900	0.4403002
Cecal_pH		10	6.8550000	0.0582571

Cecal_Weight_g	Ceal weight (empty) (g)	10	0.6364700	0.0263093
Area_cm2	Area of colon counted (cm2)	10	8.7690000	0.3618853
ACF1	ACF with 1 AC	10	14.9000000	3.0603195
ACF2	ACF with 2 AC	10	8.3000000	1.9267128
ACF3	ACF with 3 Ac	10	2.5000000	0.8062258
ACF4	ACF with 4 AC	10	2.9000000	1.2423097
ACF5	ACF with 5 AC	10	0.9000000	0.4582576
ACF6	ACF with 6 AC	10	0.7000000	0.3958114
ACF7	ACF with 7 AC	10	0.2000000	0.1333333

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------------------------------------ Diet=Total Western diet ------------------------------------

The MEANS Procedure

Variable	Label	N	Mean	Std Error
ACF8_plus	ACF with 8 or more AC	10	0	0
TotalACF	Total ACF	10	30.2000000	5.7634866
TotalACF_A	Total ACF per cm2	10	3.3229734	0.5438713
Percent_DCLK1_ACF		10	8.8806558	2.2402834
ACF1_A		10	1.6373475	0.2883102
ACF2_A		10	0.9015108	0.1833857
ACF3_A		10	0.2731277	0.0867574
ACF4_A		10	0.3089249	0.1306455
ACF5_A		10	0.0982932	0.0514032
ACF6_A		10	0.0801583	0.0447590
ACF7_A		10	0.0236111	0.0157747
ACF8_A		10	0	0

Variable	Label	Minimum	Maximum
Rat_no	Rat number	13.0000000	24.0000000
FI1	food intake week 1 (g)	14.2900000	26.7600000
FI2	food intake week 2 (g)	14.0000000	25.0000000
FI3	food intake week 3 (g)	16.5700000	22.7100000
FI4	food intake week 4 (g)	13.2000000	21.8000000
FI5	food intake week 5 (g)	15.5000000	21.1000000
FI6	food intake week 6 (g)	5.3000000	47.9000000
FI7	food intake week 7 (g)	13.8000000	21.1000000
FI8	food intake week 8 (g)	20.7000000	28.8000000
FI9	food intake week 9 (g)	15.2000000	40.3000000
BW1	body weight week 1 (g)	105.3000000	125.6000000
BW2	body weight week 2 (g)	141.2000000	176.2000000
BW3	body weight week 3(g)	166.8000000	211.0000000
BW4	body weight week 4 (g)	216.5000000	267.5000000
BW5	body weight week 5 (g)	248.9000000	310.9000000
BW6	body weight week 6 (g)	277.9000000	393.8000000
BW7	body weight week 7 (g)	303.0000000	373.5000000
BW8	body weight week 8 (g)	326.1000000	402.9000000
BW9	body weight week 9 (g)	336.2000000	433.0000000
BW10	body weight week 10 (g)	359.0000000	455.0000000
Body_Weight_g	Body weight (g)	370.0000000	455.0000000
Liver_weight_g	Liver weight (g)	12.8019000	16.6419000
Epididymal_fat_pad_weight_g	Epididymal fat pad weight (g)	3.5899000	7.7178000
Cecal_pH		6.6000000	7.2100000
Cecal_Weight_g	Ceal weight (empty) (g)	0.5253000	0.7762000
Area_cm2	Area of colon counted (cm2)	6.6500000	10.5000000
ACF1	ACF with 1 AC	6.0000000	37.0000000
ACF2	ACF with 2 AC	1.0000000	21.0000000
ACF3	ACF with 3 Ac	0	7.0000000
ACF4	ACF with 4 AC	0	10.0000000
ACF5	ACF with 5 AC	0	4.0000000
ACF6	ACF with 6 AC	0	3.0000000
ACF7	ACF with 7 AC	0	1.0000000
ACF8_plus	ACF with 8 or more AC	0	0
TotalACF	Total ACF	9.0000000	69.0000000
TotalACF_A	Total ACF per cm2	1.3533835	7.0000000
Percent_DCLK1_ACF		2.4031659	27.5589316
ACF1_A		0.6864989	3.7000000
ACF2_A		0.1144165	2.1000000
ACF3_A		0	0.6666667
ACF4_A		0	1.1111111
ACF5_A		0	0.4444444

ACF6_A	0	0.3432494
ACF7_A	0	0.1250000
ACF8_A	0	0

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----------------------------------- Diet=TWD with wild rice -----------------------------------

The MEANS Procedure

Variable	Label	N	Mean	Std Error
Rat_no	Rat number	12	30.5000000	1.0408330
FI1	food intake week 1 (g)	12	16.2275000	0.6034410
FI2	food intake week 2 (g)	12	18.1500000	0.5902619
FI3	food intake week 3 (g)	12	16.5958333	0.9775669
FI4	food intake week 4 (g)	12	17.7916667	0.4481373
FI5	food intake week 5 (g)	12	17.9500000	0.5273576
FI6	food intake week 6 (g)	12	19.9333333	0.7329200
FI7	food intake week 7 (g)	12	17.3000000	0.6498252
FI8	food intake week 8 (g)	12	23.5083333	0.7284748
FI9	food intake week 9 (g)	12	19.7666667	1.0895741
BW1	body weight week 1 (g)	12	115.9833333	2.2203546
BW2	body weight week 2 (g)	12	155.3166667	3.2984577
BW3	body weight week 3(g)	12	186.9500000	4.5340045
BW4	body weight week 4 (g)	12	239.1750000	5.4709304
BW5	body weight week 5 (g)	12	279.5250000	6.5253831
BW6	body weight week 6 (g)	12	312.1416667	7.5210861
BW7	body weight week 7 (g)	12	334.8333333	7.6934873
BW8	body weight week 8 (g)	12	356.7833333	8.3670424
BW9	body weight week 9 (g)	12	378.5000000	9.0733543
BW10	body weight week 10 (g)	12	395.6666667	10.1804427
Body_Weight_g	Body weight (g)	12	412.1750000	9.5499732
Liver_weight_g	Liver weight (g)	12	13.4886833	0.3607451
Epididymal_fat_pad_weight_g	Epididymal fat pad weight (g)	12	6.2046000	0.6512313
Cecal_pH		12	7.0166667	0.0910156
Cecal_Weight_g	Ceal weight (empty) (g)	12	0.6248333	0.0214547
Area_cm2	Area of colon counted (cm2)	12	9.2608333	0.3878661
ACF1	ACF with 1 AC	12	15.1666667	2.5010099
ACF2	ACF with 2 AC	12	7.4166667	1.3896715
ACF3	ACF with 3 Ac	12	6.1666667	1.5851266
ACF4	ACF with 4 AC	12	2.8333333	0.6376250
ACF5	ACF with 5 AC	12	1.4166667	0.4993683
ACF6	ACF with 6 AC	12	1.0833333	0.4515685
ACF7	ACF with 7 AC	12	0.5000000	0.2611165
ACF8_plus	ACF with 8 or more AC	12	0.2500000	0.1305582
TotalACF	Total ACF	12	34.1666667	6.1997475
TotalACF_A	Total ACF per cm2	12	3.6739897	0.6334417
Percent_DCLK1_ACF		11	4.4813553	0.8693370
ACF1_A		12	1.6282153	0.2599489
ACF2_A		12	0.7794104	0.1356879
ACF3_A		12	0.6432029	0.1611730
ACF4_A		12	0.2879981	0.0642554
ACF5_A		12	0.1479947	0.0501319
ACF6_A		12	0.1097560	0.0448015
ACF7_A		12	0.0521538	0.0267156
ACF8_A		12	0.0252584	0.0133130

Variable	Label	Minimum	Maximum
Rat_no	Rat number	25.0000000	36.0000000
FI1	food intake week 1 (g)	12.6600000	19.8000000
FI2	food intake week 2 (g)	15.5000000	21.7000000
FI3	food intake week 3 (g)	8.1500000	20.7300000
FI4	food intake week 4 (g)	15.5000000	20.2000000
FI5	food intake week 5 (g)	14.7000000	21.5000000
FI6	food intake week 6 (g)	14.2000000	23.6000000
FI7	food intake week 7 (g)	13.0000000	21.6000000
FI8	food intake week 8 (g)	17.8000000	27.2000000

FI9	food intake week 9 (g)	14.6000000	29.7000000
BW1	body weight week 1 (g)	105.3000000	129.8000000
BW2	body weight week 2 (g)	135.7000000	176.4000000
BW3	body weight week 3(g)	162.2000000	220.8000000
BW4	body weight week 4 (g)	210.7000000	281.2000000
BW5	body weight week 5 (g)	245.8000000	324.6000000
BW6	body weight week 6 (g)	271.2000000	363.2000000
BW7	body weight week 7 (g)	288.8000000	385.7000000
BW8	body weight week 8 (g)	307.9000000	412.1000000

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------------------------------------ Diet=TWD with wild rice ------------------------------------

The MEANS Procedure

Variable	Label	Minimum	Maximum
BW9	body weight week 9 (g)	330.0000000	440.0000000
BW10	body weight week 10 (g)	345.0000000	454.0000000
Body_Weight_g	Body weight (g)	373.8000000	468.3000000
Liver_weight_g	Liver weight (g)	11.2838000	15.0056000
Epididymal_fat_pad_weight_g	Epididymal fat pad weight (g)	3.3336000	10.1447000
Cecal_pH		6.6900000	7.6200000
Cecal_Weight_g	Ceal weight (empty) (g)	0.5038000	0.7383000
Area_cm2	Area of colon counted (cm2)	7.2000000	11.5000000
ACF1	ACF with 1 AC	4.0000000	31.0000000
ACF2	ACF with 2 AC	1.0000000	18.0000000
ACF3	ACF with 3 Ac	0	17.0000000
ACF4	ACF with 4 AC	0	7.0000000
ACF5	ACF with 5 AC	0	6.0000000
ACF6	ACF with 6 AC	0	5.0000000
ACF7	ACF with 7 AC	0	3.0000000
ACF8_plus	ACF with 8 or more AC	0	1.0000000
TotalACF	Total ACF	6.0000000	81.0000000
TotalACF_A	Total ACF per cm2	0.8333333	8.3000000
Percent_DCLK1_ACF		0.7009283	11.7831369
ACF1_A		0.5555556	3.5147392
ACF2_A		0.1388889	1.8000000
ACF3_A		0	1.7000000
ACF4_A		0	0.7000000
ACF5_A		0	0.6000000
ACF6_A		0	0.5000000
ACF7_A		0	0.3000000
ACF8_A		0	0.1161440

The GLM Procedure

Class Level Information

Class	Levels	Values
Diet	3	TWD with wild rice Total Western diet basal diet

Data for Analysis of FI1 FI2 FI3 FI4 FI5 FI6 FI7 FI8 FI9 BW1 BW2 BW3 BW4 BW5 BW6 BW7 BW8 BW9 BW10 Body_Weight_g Liver_weight_g Epididymal_fat_pad_weight_g Cecal_pH Cecal_Weight_g ACF1 ACF2 ACF3 ACF4 ACF5 ACF6 ACF7 ACF8_plus TotalACF_A ACF1_A ACF2_A ACF3_A ACF4_A ACF5_A ACF6_A ACF7_A ACF8_A TotalACF_A

Number of Observations Read	34
Number of Observations Used	34

Data for Analysis of Percent_DCLK1_ACF

Number of Observations Read	34
Number of Observations Used	32

NOTE: Variables in each group are consistent with respect to the presence or absence of missing values.

The GLM Procedure

Dependent Variable: FI1 food intake week 1 (g)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	55.5737348	27.7868674	2.36	0.1115
Error	31	365.5950917	11.7933901		
Corrected Total	33	421.1688265			

R-Square	Coeff Var	Root MSE	FI1 Mean
0.131951	19.12267	3.434151	17.95853

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	55.57373480	27.78686740	2.36	0.1115

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	55.57373480	27.78686740	2.36	0.1115

The GLM Procedure

Dependent Variable: FI2 food intake week 2 (g)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	40.4745392	20.2372696	3.26	0.0520
Error	31	192.5351667	6.2108118		
Corrected Total	33	233.0097059			

R-Square	Coeff Var	Root MSE	FI2 Mean
0.173703	12.98194	2.492150	19.19706

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	40.47453922	20.23726961	3.26	0.0520

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	40.47453922	20.23726961	3.26	0.0520

The GLM Procedure

Dependent Variable: FI3 food intake week 3 (g)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	37.7211081	18.8605541	2.96	0.0667
Error	31	197.6514683	6.3758538		
Corrected Total	33	235.3725765			

R-Square	Coeff Var	Root MSE	FI3 Mean
0.160261	14.05651	2.525045	17.96353

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	37.72110814	18.86055407	2.96	0.0667

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	37.72110814	18.86055407	2.96	0.0667

The GLM Procedure

Dependent Variable: FI4 food intake week 4 (g)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	8.5083137	4.2541569	0.79	0.4609
Error	31	166.0505833	5.3564704		
Corrected Total	33	174.5588971			

R-Square	Coeff Var	Root MSE	FI4 Mean
0.048742	12.63991	2.314405	18.31029

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	8.50831373	4.25415686	0.79	0.4609

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	8.50831373	4.25415686	0.79	0.4609

The GLM Procedure

Dependent Variable: FI5 food intake week 5 (g)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	20.7616863	10.3808431	1.45	0.2502
Error	31	222.0256667	7.1621183		
Corrected Total	33	242.7873529			

R-Square	Coeff Var	Root MSE	FI5 Mean
0.085514	14.45912	2.676213	18.50882

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	20.76168627	10.38084314	1.45	0.2502

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	20.76168627	10.38084314	1.45	0.2502

The GLM Procedure

Dependent Variable: FI6 food intake week 6 (g)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	12.931255	6.465627	0.15	0.8601
Error	31	1323.724333	42.700785		
Corrected Total	33	1336.655588			

R-Square	Coeff Var	Root MSE	FI6 Mean
0.009674	31.53667	6.534584	20.72059

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	12.93125490	6.46562745	0.15	0.8601

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	12.93125490	6.46562745	0.15	0.8601

The GLM Procedure

Dependent Variable: FI7 food intake week 7 (g)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	1.7526882	0.8763441	0.12	0.8912
Error	31	235.0507000	7.5822806		
Corrected Total	33	236.8033882			

R-Square	Coeff Var	Root MSE	FI7 Mean
0.007401	16.11176	2.753594	17.09059

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	1.75268824	0.87634412	0.12	0.8912

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	1.75268824	0.87634412	0.12	0.8912

The GLM Procedure

Dependent Variable: FI8 food intake week 8 (g)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	791.59199	395.79600	1.23	0.3053
Error	31	9950.51183	320.98425		
Corrected Total	33	10742.10382			

R-Square	Coeff Var	Root MSE	FI8 Mean
0.073691	64.54860	17.91603	27.75588

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	791.5919902	395.7959951	1.23	0.3053

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	791.5919902	395.7959951	1.23	0.3053

The GLM Procedure

Dependent Variable: FI9 food intake week 9 (g)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	19.6257549	9.8128775	0.33	0.7184
Error	31	910.1648333	29.3601559		
Corrected Total	33	929.7905882			

R-Square	Coeff Var	Root MSE	FI9 Mean
0.021108	26.13919	5.418501	20.72941

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	19.62575490	9.81287745	0.33	0.7184

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	19.62575490	9.81287745	0.33	0.7184

The GLM Procedure

Dependent Variable: BW1 body weight week 1 (g)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	32.074539	16.037270	0.26	0.7752
Error	31	1936.255167	62.459844		
Corrected Total	33	1968.329706			

R-Square	Coeff Var	Root MSE	BW1 Mean
0.016295	6.766569	7.903154	116.7971

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	32.07453922	16.03726961	0.26	0.7752

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	32.07453922	16.03726961	0.26	0.7752

The GLM Procedure

Dependent Variable: BW2 body weight week 2 (g)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	163.656539	81.828270	0.71	0.4985
Error	31	3562.288167	114.912522		
Corrected Total	33	3725.944706			

R-Square	Coeff Var	Root MSE	BW2 Mean
0.043924	6.918315	10.71973	154.9471

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	163.6565392	81.8282696	0.71	0.4985

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	163.6565392	81.8282696	0.71	0.4985

The GLM Procedure

Dependent Variable: BW3 body weight week 3(g)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	400.185176	200.092588	0.93	0.4066
Error	31	6694.976000	215.966968		
Corrected Total	33	7095.161176			

R-Square	Coeff Var	Root MSE	BW3 Mean
0.056403	7.953293	14.69581	184.7765

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	400.1851765	200.0925882	0.93	0.4066

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	400.1851765	200.0925882	0.93	0.4066

The GLM Procedure

Dependent Variable: BW4 body weight week 4 (g)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	1174.90125	587.45062	1.81	0.1801
Error	31	10046.12817	324.06865		
Corrected Total	33	11221.02941			

R-Square	Coeff Var	Root MSE	BW4 Mean
0.104705	7.682694	18.00191	234.3176

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	1174.901245	587.450623	1.81	0.1801

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	1174.901245	587.450623	1.81	0.1801

The GLM Procedure

Dependent Variable: BW5 body weight week 5 (g)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	1456.54041	728.27021	1.54	0.2300
Error	31	14646.91400	472.48110		
Corrected Total	33	16103.45441			

R-Square	Coeff Var	Root MSE	BW5 Mean
0.090449	7.957249	21.73663	273.1676

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	1456.540412	728.270206	1.54	0.2300

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	1456.540412	728.270206	1.54	0.2300

The GLM Procedure

Dependent Variable: BW6 body weight week 6 (g)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	5942.30802	2971.15401	3.56	0.0406
Error	31	25875.15433	834.68240		
Corrected Total	33	31817.46235			

R-Square	Coeff Var	Root MSE	BW6 Mean
0.186762	9.434025	28.89087	306.2412

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	5942.308020	2971.154010	3.56	0.0406

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	5942.308020	2971.154010	3.56	0.0406

The GLM Procedure

Dependent Variable: BW7 body weight week 7 (g)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	3499.39051	1749.69525	1.97	0.1570
Error	31	27581.93567	889.73986		
Corrected Total	33	31081.32618			

R-Square	Coeff Var	Root MSE	BW7 Mean
0.112588	9.142178	29.82851	326.2735

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	3499.390510	1749.695255	1.97	0.1570

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	3499.390510	1749.695255	1.97	0.1570

The GLM Procedure

Dependent Variable: BW8 body weight week 8 (g)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	1650.66454	825.33227	1.03	0.3700
Error	31	24914.82017	803.70388		
Corrected Total	33	26565.48471			

R-Square	Coeff Var	Root MSE	BW8 Mean
0.062136	8.052807	28.34967	352.0471

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	1650.664539	825.332270	1.03	0.3700

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	1650.664539	825.332270	1.03	0.3700

The GLM Procedure

Dependent Variable: BW9 body weight week 9 (g)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	2601.27309	1300.63654	1.35	0.2749
Error	31	29940.16250	965.81169		
Corrected Total	33	32541.43559			

R-Square	Coeff Var	Root MSE	BW9 Mean
0.079937	8.380740	31.07751	370.8206

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	2601.273088	1300.636544	1.35	0.2749

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	2601.273088	1300.636544	1.35	0.2749

The GLM Procedure

Dependent Variable: BW10 body weight week 10 (g)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	1376.62569	688.31284	0.62	0.5456
Error	31	34535.33667	1114.04312		
Corrected Total	33	35911.96235			

R-Square	Coeff Var	Root MSE	BW10 Mean
0.038333	8.530743	33.37728	391.2588

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	1376.625686	688.312843	0.62	0.5456

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	1376.625686	688.312843	0.62	0.5456

The GLM Procedure

Dependent Variable: Body_Weight_g Body weight (g)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	3688.37382	1844.18691	1.88	0.1699
Error	31	30448.39000	982.20613		
Corrected Total	33	34136.76382			

R-Square	Coeff Var	Root MSE	Body_Weight_g Mean
0.108047	7.772009	31.34017	403.2441

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	3688.373824	1844.186912	1.88	0.1699

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	3688.373824	1844.186912	1.88	0.1699

The GLM Procedure

Dependent Variable: Liver_weight_g Liver weight (g)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	44.38932497	22.19466248	13.38	<.0001
Error	31	51.43241452	1.65911015		
Corrected Total	33	95.82173949			

R-Square	Coeff Var	Root MSE	Liver_weight_g Mean
0.463249	9.821451	1.288064	13.11481

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	44.38932497	22.19466248	13.38	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	44.38932497	22.19466248	13.38	<.0001

The GLM Procedure

Dependent Variable: Epididymal_fat_pad_weight_g Epididymal fat pad weight (g)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	36.0242293	18.0121146	6.50	0.0044
Error	31	85.8437944	2.7691547		
Corrected Total	33	121.8680236			

R-Square	Coeff Var	Root MSE	Epididymal_fat_pad_weight_g Mean
0.295600	31.80727	1.664078	5.231753

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	36.02422925	18.01211463	6.50	0.0044

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	36.02422925	18.01211463	6.50	0.0044

The GLM Procedure

Dependent Variable: Cecal_pH

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	0.17274461	0.08637230	0.90	0.4183
Error	31	2.98620833	0.09632930		
Corrected Total	33	3.15895294			

R-Square	Coeff Var	Root MSE	Cecal_pH Mean
0.054684	4.484348	0.310370	6.921176

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	0.17274461	0.08637230	0.90	0.4183

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	0.17274461	0.08637230	0.90	0.4183

The GLM Procedure

Dependent Variable: Cecal_Weight_g Ceal weight (empty) (g)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	0.00152974	0.00076487	0.12	0.8909
Error	31	0.20444306	0.00659494		
Corrected Total	33	0.20597280			

R-Square	Coeff Var	Root MSE	Cecal_Weight_g Mean
0.007427	12.81539	0.081209	0.633685

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	0.00152974	0.00076487	0.12	0.8909

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	0.00152974	0.00076487	0.12	0.8909

The GLM Procedure

Dependent Variable: ACF1 ACF with 1 AC

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	143.149020	71.574510	0.73	0.4882
Error	31	3023.233333	97.523656		
Corrected Total	33	3166.382353			

R-Square	Coeff Var	Root MSE	ACF1 Mean
0.045209	59.63833	9.875407	16.55882

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	143.1490196	71.5745098	0.73	0.4882

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	143.1490196	71.5745098	0.73	0.4882

The GLM Procedure

Dependent Variable: ACF2 ACF with 2 AC

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	414.096078	207.048039	2.85	0.0731
Error	31	2251.933333	72.643011		
Corrected Total	33	2666.029412			

R-Square	Coeff Var	Root MSE	ACF2 Mean
0.155323	82.09206	8.523087	10.38235

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	414.0960784	207.0480392	2.85	0.0731

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	414.0960784	207.0480392	2.85	0.0731

The GLM Procedure

Dependent Variable: ACF3 ACF with 3 Ac

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	163.975490	81.987745	2.19	0.1290
Error	31	1161.083333	37.454301		
Corrected Total	33	1325.058824			

R-Square	Coeff Var	Root MSE	ACF3 Mean
0.123750	107.2576	6.119992	5.705882

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	163.9754902	81.9877451	2.19	0.1290

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	163.9754902	81.9877451	2.19	0.1290

The GLM Procedure

Dependent Variable: ACF4 ACF with 4 AC

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	22.9872549	11.4936275	0.78	0.4677
Error	31	457.4833333	14.7575269		
Corrected Total	33	480.4705882			

R-Square	Coeff Var	Root MSE	ACF4 Mean
0.047843	110.6888	3.841553	3.470588

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	22.98725490	11.49362745	0.78	0.4677

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	22.98725490	11.49362745	0.78	0.4677

The GLM Procedure

Dependent Variable: ACF5 ACF with 5 AC

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	32.0460784	16.0230392	2.28	0.1188
Error	31	217.4833333	7.0155914		
Corrected Total	33	249.5294118			

R-Square	Coeff Var	Root MSE	ACF5 Mean
0.128426	140.7120	2.648696	1.882353

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	32.04607843	16.02303922	2.28	0.1188

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	32.04607843	16.02303922	2.28	0.1188

The GLM Procedure

Dependent Variable: ACF6 ACF with 6 AC

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	7.4343137	3.7171569	0.95	0.3959
Error	31	120.6833333	3.8930108		
Corrected Total	33	128.1176471			

R-Square	Coeff Var	Root MSE	ACF6 Mean
0.058027	159.7248	1.973071	1.235294

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	7.43431373	3.71715686	0.95	0.3959

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	7.43431373	3.71715686	0.95	0.3959

The GLM Procedure

Dependent Variable: ACF7 ACF with 7 AC

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	3.63529412	1.81764706	1.84	0.1755
Error	31	30.60000000	0.98709677		
Corrected Total	33	34.23529412			

R-Square	Coeff Var	Root MSE	ACF7 Mean
0.106186	168.8997	0.993527	0.588235

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	3.63529412	1.81764706	1.84	0.1755

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	3.63529412	1.81764706	1.84	0.1755

The GLM Procedure

Dependent Variable: ACF8_plus ACF with 8 or more AC

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	1.36764706	0.68382353	1.60	0.2181
Error	31	13.25000000	0.42741935		
Corrected Total	33	14.61764706			

R-Square	Coeff Var	Root MSE	ACF8_plus Mean
0.093561	246.9810	0.653773	0.264706

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	1.36764706	0.68382353	1.60	0.2181

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	1.36764706	0.68382353	1.60	0.2181

The GLM Procedure

Dependent Variable: TotalACF_A Total ACF per cm2

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	48.0869578	24.0434789	2.52	0.0972
Error	31	296.3265237	9.5589201		
Corrected Total	33	344.4134815			

R-Square	Coeff Var	Root MSE	TotalACF_A Mean
0.139620	70.48172	3.091750	4.386599

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	48.08695776	24.04347888	2.52	0.0972

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	48.08695776	24.04347888	2.52	0.0972

The GLM Procedure

Dependent Variable: ACF1_A

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	2.60933041	1.30466520	1.07	0.3546
Error	31	37.71912660	1.21674602		
Corrected Total	33	40.32845701			

R-Square	Coeff Var	Root MSE	ACF1_A Mean
0.064702	60.04863	1.103062	1.836948

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	2.60933041	1.30466520	1.07	0.3546

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	2.60933041	1.30466520	1.07	0.3546

The GLM Procedure

Dependent Variable: ACF2_A

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	5.71450118	2.85725059	3.44	0.0448
Error	31	25.75766314	0.83089236		
Corrected Total	33	31.47216432			

R-Square	Coeff Var	Root MSE	ACF2_A Mean
0.181573	80.27381	0.911533	1.135530

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	5.71450118	2.85725059	3.44	0.0448

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	5.71450118	2.85725059	3.44	0.0448

The GLM Procedure

Dependent Variable: ACF3_A

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	1.92342684	0.96171342	2.23	0.1241
Error	31	13.34702827	0.43054930		
Corrected Total	33	15.27045511			

R-Square	Coeff Var	Root MSE	ACF3_A Mean
0.125957	107.1522	0.656163	0.612365

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	1.92342684	0.96171342	2.23	0.1241

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	1.92342684	0.96171342	2.23	0.1241

The GLM Procedure

Dependent Variable: ACF4_A

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	0.33862380	0.16931190	0.99	0.3814
Error	31	5.27825052	0.17026615		
Corrected Total	33	5.61687432			

R-Square	Coeff Var	Root MSE	ACF4_A Mean
0.060287	111.2353	0.412633	0.370955

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	0.33862380	0.16931190	0.99	0.3814

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	0.33862380	0.16931190	0.99	0.3814

The GLM Procedure

Dependent Variable: ACF5_A

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	0.39793640	0.19896820	2.37	0.1102
Error	31	2.60299035	0.08396743		
Corrected Total	33	3.00092675			

R-Square	Coeff Var	Root MSE	ACF5_A Mean
0.132605	142.0874	0.289771	0.203939

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	0.39793640	0.19896820	2.37	0.1102

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	0.39793640	0.19896820	2.37	0.1102

The GLM Procedure

Dependent Variable: ACF6_A

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	0.09771145	0.04885572	1.03	0.3685
Error	31	1.46893233	0.04738491		
Corrected Total	33	1.56664378			

R-Square	Coeff Var	Root MSE	ACF6_A Mean
0.062370	161.3469	0.217681	0.134915

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	0.09771145	0.04885572	1.03	0.3685

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	0.09771145	0.04885572	1.03	0.3685

The GLM Procedure

Dependent Variable: ACF7_A

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	0.04280653	0.02140327	1.90	0.1664
Error	31	0.34894936	0.01125643		
Corrected Total	33	0.39175589			

R-Square	Coeff Var	Root MSE	ACF7_A Mean
0.109268	165.8065	0.106096	0.063988

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	0.04280653	0.02140327	1.90	0.1664

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	0.04280653	0.02140327	1.90	0.1664

The GLM Procedure

Dependent Variable: ACF8_A

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	0.01601801	0.00800900	1.73	0.1940
Error	31	0.14353932	0.00463030		
Corrected Total	33	0.15955733			

R-Square	Coeff Var	Root MSE	ACF8_A Mean
0.100390	243.3712	0.068046	0.027960

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	0.01601801	0.00800900	1.73	0.1940

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	0.01601801	0.00800900	1.73	0.1940

The GLM Procedure

Dependent Variable: TotalACF_A Total ACF per cm2

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	48.0869578	24.0434789	2.52	0.0972
Error	31	296.3265237	9.5589201		
Corrected Total	33	344.4134815			

R-Square	Coeff Var	Root MSE	TotalACF_A Mean
0.139620	70.48172	3.091750	4.386599

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	48.08695776	24.04347888	2.52	0.0972

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	48.08695776	24.04347888	2.52	0.0972

The GLM Procedure

Duncan's Multiple Range Test for FI1

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	11.79339
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	2.953	3.104

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	18.913	12	basal diet
A			
A	18.890	10	Total Western diet
A			
A	16.228	12	TWD with wild rice

The GLM Procedure

Duncan's Multiple Range Test for FI2

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	6.210812
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	2.143	2.252

Means with the same letter are not significantly different.

Duncan Grouping		Mean	N	Diet
	A	20.642	12	basal diet
	A			
B	A	18.720	10	Total Western diet
B				
B		18.150	12	TWD with wild rice

The GLM Procedure

Duncan's Multiple Range Test for FI3

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	6.375854
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	2.171	2.282

Means with the same letter are not significantly different.

Duncan Grouping		Mean	N	Diet
	A	19.048	12	basal diet
	A			
B	A	18.303	10	Total Western diet
B				
B		16.596	12	TWD with wild rice

The GLM Procedure

Duncan's Multiple Range Test for FI4

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	5.35647
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	1.990	2.092

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	18.9583	12	basal diet
A			
A	18.1550	10	Total Western diet
A			
A	17.7917	12	TWD with wild rice

The GLM Procedure

Duncan's Multiple Range Test for FI5

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	7.162118
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	2.301	2.419

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	19.567	12	basal diet
A			
A	17.950	12	TWD with wild rice
A			
A	17.910	10	Total Western diet

The GLM Procedure

Duncan's Multiple Range Test for FI6

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	42.70078
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	5.619	5.906

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	21.430	10	Total Western diet
A			
A	20.917	12	basal diet
A			
A	19.933	12	TWD with wild rice

The GLM Procedure

Duncan's Multiple Range Test for FI7

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	7.582281
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	2.368	2.489

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	17.300	12	TWD with wild rice
A			
A	17.165	12	basal diet
A			
A	16.750	10	Total Western diet

The GLM Procedure

Duncan's Multiple Range Test for FI8

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	320.9843
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	15.41	16.19

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	34.233	12	basal diet
A			
A	25.080	10	Total Western diet
A			
A	23.508	12	TWD with wild rice

The GLM Procedure

Duncan's Multiple Range Test for FI9

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	29.36016
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	4.660	4.897

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	21.558	12	basal diet
A			
A	20.890	10	Total Western diet
A			
A	19.767	12	TWD with wild rice

The GLM Procedure

Duncan's Multiple Range Test for BW1

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	62.45984
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	6.796	7.143

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	118.280	10	Total Western diet
A			
A	116.375	12	basal diet
A			
A	115.983	12	TWD with wild rice

The GLM Procedure

Duncan's Multiple Range Test for BW2

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	114.9125
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	9.218	9.688

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	157.710	10	Total Western diet
A			
A	155.317	12	TWD with wild rice
A			
A	152.275	12	basal diet

The GLM Procedure

Duncan's Multiple Range Test for BW3

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	215.967
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	12.64	13.28

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	187.720	10	Total Western diet
A			
A	186.950	12	TWD with wild rice
A			
A	180.150	12	basal diet

The GLM Procedure

Duncan's Multiple Range Test for BW4

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	324.0687
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	15.48	16.27

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	239.175	12	TWD with wild rice
A			
A	238.010	10	Total Western diet
A			
A	226.383	12	basal diet

The GLM Procedure

Duncan's Multiple Range Test for BW5

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	472.4811
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	18.69	19.64

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	279.525	12	TWD with wild rice
A			
A	275.910	10	Total Western diet
A			
A	264.525	12	basal diet

The GLM Procedure

Duncan's Multiple Range Test for BW6

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	834.6824
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	24.84	26.11

Means with the same letter are not significantly different.

Duncan Grouping		Mean	N	Diet
	A	320.02	10	Total Western diet
	A			
B	A	312.14	12	TWD with wild rice
B				
B		288.86	12	basal diet

The GLM Procedure

Duncan's Multiple Range Test for BW7

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	889.7399
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	25.65	26.96

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	334.83	12	TWD with wild rice
A			
A	332.41	10	Total Western diet
A			
A	312.60	12	basal diet

The GLM Procedure

Duncan's Multiple Range Test for BW8

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	803.7039
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	24.38	25.62

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	357.67	10	Total Western diet
A			
A	356.78	12	TWD with wild rice
A			
A	342.63	12	basal diet

The GLM Procedure

Duncan's Multiple Range Test for BW9

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	965.8117
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	26.72	28.09

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	378.50	12	TWD with wild rice
A			
A	375.70	10	Total Western diet
A			
A	359.08	12	basal diet

The GLM Procedure

Duncan's Multiple Range Test for BW10

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	1114.043
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	28.70	30.16

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	396.30	10	Total Western diet
A			
A	395.67	12	TWD with wild rice
A			
A	382.65	12	basal diet

The GLM Procedure

Duncan's Multiple Range Test for Body_Weight_g

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	982.2061
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	26.95	28.32

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	412.18	12	TWD with wild rice
A			
A	409.35	10	Total Western diet
A			
A	389.23	12	basal diet

The GLM Procedure

Duncan's Multiple Range Test for Liver_weight_g

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	1.65911
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	1.108	1.164

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	14.4208	10	Total Western diet
A			
A	13.4887	12	TWD with wild rice
B	11.6526	12	basal diet

The GLM Procedure

Duncan's Multiple Range Test for Epididymal_fat_pad_weight_g

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	2.769155
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	1.431	1.504

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	6.2046	12	TWD with wild rice
A			
A	5.7049	10	Total Western diet
B	3.8646	12	basal diet

The GLM Procedure

Duncan's Multiple Range Test for Cecal_pH

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	0.096329
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	.2669	.2805

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	7.0167	12	TWD with wild rice
A			
A	6.8808	12	basal diet
A			
A	6.8550	10	Total Western diet

The GLM Procedure

Duncan's Multiple Range Test for Cecal_Weight_g

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	0.006595
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	.06983	.07339

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	0.64022	12	basal diet
A			
A	0.63647	10	Total Western diet
A			
A	0.62483	12	TWD with wild rice

The GLM Procedure

Duncan's Multiple Range Test for ACF1

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	97.52366
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	8.492	8.925

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	19.333	12	basal diet
A			
A	15.167	12	TWD with wild rice
A			
A	14.900	10	Total Western diet

The GLM Procedure

Duncan's Multiple Range Test for ACF2

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	72.64301
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	7.329	7.703

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	15.083	12	basal diet
A			
A	8.300	10	Total Western diet
A			
A	7.417	12	TWD with wild rice

The GLM Procedure

Duncan's Multiple Range Test for ACF3

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	37.4543
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	5.263	5.531

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	7.917	12	basal diet
A			
A	6.167	12	TWD with wild rice
A			
A	2.500	10	Total Western diet

The GLM Procedure

Duncan's Multiple Range Test for ACF4

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	14.75753
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	3.303	3.472

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	4.583	12	basal diet
A			
A	2.900	10	Total Western diet
A			
A	2.833	12	TWD with wild rice

The GLM Procedure

Duncan's Multiple Range Test for ACF5

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	7.015591
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	2.278	2.394

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	3.167	12	basal diet
A			
A	1.417	12	TWD with wild rice
A			
A	0.900	10	Total Western diet

The GLM Procedure

Duncan's Multiple Range Test for ACF6

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	3.893011
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	1.697	1.783

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	1.8333	12	basal diet
A			
A	1.0833	12	TWD with wild rice
A			
A	0.7000	10	Total Western diet

The GLM Procedure

Duncan's Multiple Range Test for ACF7

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	0.987097
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	.8544	.8979

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	1.0000	12	basal diet
A			
A	0.5000	12	TWD with wild rice
A			
A	0.2000	10	Total Western diet

The GLM Procedure

Duncan's Multiple Range Test for ACF8_plus

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	0.427419
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	.5622	.5908

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	0.5000	12	basal diet
A			
A	0.2500	12	TWD with wild rice
A			
A	0.0000	10	Total Western diet

The GLM Procedure

Duncan's Multiple Range Test for TotalACF_A

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	9.55892
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	2.659	2.794

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	5.986	12	basal diet
A			
A	3.674	12	TWD with wild rice
A			
A	3.323	10	Total Western diet

The GLM Procedure

Duncan's Multiple Range Test for ACF1_A

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	1.216746
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	.9486	.9969

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	2.2120	12	basal diet
A			
A	1.6373	10	Total Western diet
A			
A	1.6282	12	TWD with wild rice

The GLM Procedure

Duncan's Multiple Range Test for ACF2_A

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	0.830892
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	.7838	.8238

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	1.6867	12	basal diet
B	0.9015	10	Total Western diet
B			
B	0.7794	12	TWD with wild rice

The GLM Procedure

Duncan's Multiple Range Test for ACF3_A

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	0.430549
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	.5643	.5930

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	0.8642	12	basal diet
A			
A	0.6432	12	TWD with wild rice
A			
A	0.2731	10	Total Western diet

The GLM Procedure

Duncan's Multiple Range Test for ACF4_A

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	0.170266
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	.3548	.3729

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	0.5056	12	basal diet
A			
A	0.3089	10	Total Western diet
A			
A	0.2880	12	TWD with wild rice

The GLM Procedure

Duncan's Multiple Range Test for ACF5_A

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	0.083967
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	.2492	.2619

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	0.3479	12	basal diet
A			
A	0.1480	12	TWD with wild rice
A			
A	0.0983	10	Total Western diet

The GLM Procedure

Duncan's Multiple Range Test for ACF6_A

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	0.047385
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	.1872	.1967

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	0.20570	12	basal diet
A			
A	0.10976	12	TWD with wild rice
A			
A	0.08016	10	Total Western diet

The GLM Procedure

Duncan's Multiple Range Test for ACF7_A

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	0.011256
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	.09123	.09588

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	0.10947	12	basal diet
A			
A	0.05215	12	TWD with wild rice
A			
A	0.02361	10	Total Western diet

The GLM Procedure

Duncan's Multiple Range Test for ACF8_A

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	0.00463
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	.05851	.06150

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	0.05396	12	basal diet
A			
A	0.02526	12	TWD with wild rice
A			
A	0.00000	10	Total Western diet

The GLM Procedure

Duncan's Multiple Range Test for TotalACF_A

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	9.55892
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	2.659	2.794

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	5.986	12	basal diet
A			
A	3.674	12	TWD with wild rice
A			
A	3.323	10	Total Western diet

The GLM Procedure

Dependent Variable: Percent_DCLK1_ACF

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	102.686517	51.343259	1.23	0.3074
Error	29	1211.749302	41.784459		
Corrected Total	31	1314.435819			

R-Square	Coeff Var	Root MSE	Percent_DCLK1_ACF Mean
0.078122	96.15385	6.464090	6.722653

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	102.6865170	51.3432585	1.23	0.3074

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	102.6865170	51.3432585	1.23	0.3074

The GLM Procedure

Duncan's Multiple Range Test for Percent_DCLK1_ACF

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	29
Error Mean Square	41.78446
Harmonic Mean of Cell Sizes	10.64516

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	5.730	6.022

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	8.881	10	Total Western diet
A			
A	7.002	11	basal diet
A			
A	4.481	11	TWD with wild rice

The GLM Procedure

Class Level Information

Class	Levels	Values
Diet	3	TWD with wild rice Total Western diet basal diet

Number of Observations Read	34
Number of Observations Used	34

The GLM Procedure

Dependent Variable: Liver_weight_g Liver weight (g)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	69.48626314	23.16208771	26.39	<.0001
Error	30	26.33547635	0.87784921		
Corrected Total	33	95.82173949			

R-Square	Coeff Var	Root MSE	Liver_weight_g Mean
0.725162	7.144108	0.936936	13.11481

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	44.38932497	22.19466248	25.28	<.0001
Body_Weight_g	1	25.09693818	25.09693818	28.59	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	24.44703983	12.22351991	13.92	<.0001
Body_Weight_g	1	25.09693818	25.09693818	28.59	<.0001

The GLM Procedure

Dependent Variable: Epididymal_fat_pad_weight_g Epididymal fat pad weight (g)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	94.3276968	31.4425656	34.25	<.0001
Error	30	27.5403269	0.9180109		
Corrected Total	33	121.8680236			

R-Square	Coeff Var	Root MSE	Epididymal_fat_pad_weight_g Mean
0.774015	18.31373	0.958129	5.231753

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	36.02422925	18.01211463	19.62	<.0001
Body_Weight_g	1	58.30346751	58.30346751	63.51	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	10.11338082	5.05669041	5.51	0.0092
Body_Weight_g	1	58.30346751	58.30346751	63.51	<.0001

The GLM Procedure

Dependent Variable: Cecal_pH

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	0.17804657	0.05934886	0.60	0.6217
Error	30	2.98090638	0.09936355		
Corrected Total	33	3.15895294			

R-Square	Coeff Var	Root MSE	Cecal_pH Mean
0.056363	4.554426	0.315220	6.921176

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	0.17274461	0.08637230	0.87	0.4296
Body_Weight_g	1	0.00530196	0.00530196	0.05	0.8189

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	0.17804436	0.08902218	0.90	0.4189
Body_Weight_g	1	0.00530196	0.00530196	0.05	0.8189

The GLM Procedure

Dependent Variable: Cecal_Weight_g Ceal weight (empty) (g)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	0.00824865	0.00274955	0.42	0.7419
Error	30	0.19772415	0.00659081		
Corrected Total	33	0.20597280			

R-Square	Coeff Var	Root MSE	Cecal_Weight_g Mean
0.040047	12.81137	0.081184	0.633685

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	0.00152974	0.00076487	0.12	0.8908
Body_Weight_g	1	0.00671891	0.00671891	1.02	0.3207

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	0.00372570	0.00186285	0.28	0.7558
Body_Weight_g	1	0.00671891	0.00671891	1.02	0.3207

The GLM Procedure

Duncan's Multiple Range Test for Liver_weight_g

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	30
Error Mean Square	0.877849
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	.8068	.8478

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	14.4208	10	Total Western diet
B	13.4887	12	TWD with wild rice
C	11.6526	12	basal diet

The GLM Procedure

Duncan's Multiple Range Test for Epididymal_fat_pad_weight_g

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	30
Error Mean Square	0.918011
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	.8250	.8670

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	6.2046	12	TWD with wild rice
A			
A	5.7049	10	Total Western diet
B	3.8646	12	basal diet

The GLM Procedure

Duncan's Multiple Range Test for Cecal_pH

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	30
Error Mean Square	0.099364
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	.2714	.2852

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	7.0167	12	TWD with wild rice
A			
A	6.8808	12	basal diet
A			
A	6.8550	10	Total Western diet

The GLM Procedure

Duncan's Multiple Range Test for Cecal_Weight_g

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	30
Error Mean Square	0.006591
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	.06991	.07346

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	0.64022	12	basal diet
A			
A	0.63647	10	Total Western diet
A			
A	0.62483	12	TWD with wild rice

-- Diet=basal diet --

Obs	Rat_no	Code	FI1	FI2	FI3	FI4	FI5	FI6	FI7	FI8	FI9	BW1	BW2	BW3
1	1	MT	14.91	18.0	16.97	18.0	16.9	20.1	14.68	26.2	18.7	107.6	136.4	155.1
2	2	TX	17.93	21.3	20.63	16.3	19.8	26.3	20.40	30.0	30.7	117.2	150.6	178.0
3	3	BE	17.04	20.8	19.21	21.2	19.0	21.0	17.60	21.9	20.2	107.4	149.4	176.2
4	4	PE	21.42	23.6	21.40	19.2	21.1	22.2	22.70	25.8	28.5	129.1	167.3	202.1
5	5	CU	30.06	23.2	21.08	25.4	27.2	29.4	20.40	128.7	19.0	126.8	165.8	200.2
6	6	LE	14.37	18.6	17.51	17.7	18.2	15.7	14.30	28.4	12.3	115.5	147.6	174.9
7	7	ET	17.32	20.7	19.67	18.1	20.7	22.6	17.70	26.2	24.8	118.7	159.7	186.7
8	8	BK	17.56	18.3	15.51	16.0	10.7	17.3	10.40	19.5	17.5	128.0	162.4	190.7
9	9	HG	17.44	19.7	18.72	18.8	17.8	20.9	14.70	26.5	17.7	105.6	140.5	164.0
10	10	AM	22.73	21.8	21.99	21.1	21.2	20.0	21.00	25.8	25.9	102.8	137.8	167.4
11	11	ER	18.52	22.7	17.26	18.1	21.4	22.5	16.30	24.8	21.3	117.2	153.3	183.3
12	12	TJ	17.66	19.0	18.63	17.6	20.8	13.0	15.80	27.0	22.1	120.6	156.5	183.2

Obs	BW4	BW5	BW6	BW7	BW8	BW9	BW10	Body_ Weight_g	Liver_ weight_g	Epididymal_ fat_pad_ weight_g	Cecal_ weight_g	pH
1	192.2	227.2	264.3	290.4	308.7	332.6	357.8	362.6	9.8187	3.0639	6.60	
2	230.5	277.0	315.3	339.8	348.7	374.9	417.0	411.1	11.7238	4.2967	6.48	
3	220.9	263.8	298.6	323.0	345.7	363.2	379.0	393.8	11.2736	4.2604	6.75	
4	254.5	296.5	238.4	356.9	382.7	398.5	421.0	421.9	12.2838	4.3387	6.51	
5	253.8	303.6	340.8	371.2	401.1	423.8	446.0	448.2	13.6745	6.0860	7.30	
6	211.0	235.3	255.0	264.8	291.6	301.8	320.0	322.0	9.7521	1.9190	6.63	
7	231.0	269.2	301.9	326.3	353.7	369.9	393.0	402.3	12.6532	4.9141	6.62	
8	228.2	257.1	281.4	301.5	320.3	335.4	354.0	363.0	11.1005	4.1013	7.42	
9	209.4	248.2	276.8	297.2	316.7	328.3	347.0	367.7	11.8185	3.4110	6.85	
10	218.3	260.7	292.3	324.3	350.5	352.3	394.0	404.8	12.3940	3.7150	7.05	
11	234.5	270.1	305.5	238.8	352.4	372.1	394.0	401.3	13.0297	3.2654	6.74	
12	232.3	265.6	296.0	317.0	339.4	356.1	369.0	372.0	10.3090	3.0040	7.62	

Obs	Cecal_ Weight_g	Area_cm2	ACF1	ACF2	ACF3	ACF4	ACF5	ACF6	ACF7	ACF8_ plus	Total ACF	Percent_ Total ACF_A	DCLK1_ ACF
1	0.6011	9.00	32	42	30	18	13	8	2	2	146	16.3333	19
2	0.5201	7.92	11	7	1	6	3	4	2	0	34	4.2929	14
3	0.6112	9.00	14	2	1	0	0	1	0	0	18	2.0000	13
4	0.7537	11.00	9	6	5	7	3	1	0	0	24	2.8182	.
5	0.7072	9.00	39	29	9	5	8	6	2	0	98	10.8889	2
6	0.5809	9.45	7	4	2	0	0	1	0	0	14	1.4815	12
7	0.5262	6.58	31	15	3	2	1	0	0	0	52	7.9027	25
8	0.5622	9.20	9	6	1	1	2	0	0	0	19	2.0652	17
9	0.7210	10.00	18	19	10	4	1	0	0	0	51	5.2000	32
10	0.7589	9.60	32	28	16	7	5	0	4	0	92	9.5833	18
11	0.6367	7.98	13	9	8	3	0	0	0	1	34	4.2607	11
12	0.7034	10.00	17	14	9	2	2	1	2	3	50	5.0000	5

Obs	ACF1_A	ACF2_A	ACF3_A	ACF4_A	ACF5_A	ACF6_A	ACF7_A	ACF8_A
1	3.55556	4.66667	3.33333	2.00000	1.44444	0.88889	0.22222	0.22222
2	1.38889	0.88384	0.12626	0.75758	0.37879	0.50505	0.25253	0.00000
3	1.55556	0.22222	0.11111	0.00000	0.00000	0.11111	0.00000	0.00000
4	0.81818	0.54545	0.45455	0.63636	0.27273	0.09091	0.00000	0.00000
5	4.33333	3.22222	1.00000	0.55556	0.88889	0.66667	0.22222	0.00000
6	0.74074	0.42328	0.21164	0.00000	0.00000	0.10582	0.00000	0.00000

7	4.71125	2.27964	0.45593	0.30395	0.15198	0.00000	0.00000	0.00000
8	0.97826	0.65217	0.10870	0.10870	0.21739	0.00000	0.00000	0.00000
9	1.80000	1.90000	1.00000	0.40000	0.10000	0.00000	0.00000	0.00000
10	3.33333	2.91667	1.66667	0.72917	0.52083	0.00000	0.41667	0.00000
11	1.62907	1.12782	1.00251	0.37594	0.00000	0.00000	0.00000	0.12531
12	1.70000	1.40000	0.90000	0.20000	0.20000	0.10000	0.20000	0.30000

----------------------------------- Diet=Total Western diet -----------------------------------

Obs	Rat_no	Code	FI1	FI2	FI3	FI4	FI5	FI6	FI7	FI8	FI9	BW1	BW2	BW3
13	13	TY	16.35	18.9	17.53	19.50	18.2	18.3	17.5	22.6	18.0	105.3	151.7	170.1
14	14	NV	17.23	16.3	18.01	20.30	16.7	21.6	17.4	27.4	18.0	112.6	150.3	179.5
15	16	DJ	15.99	17.6	16.57	17.60	17.3	20.0	14.8	27.2	18.0	119.9	152.9	179.4
16	18	YE	26.76	20.7	18.44	19.10	18.5	21.9	17.0	24.8	16.7	119.1	163.5	196.4
17	19	PP	17.57	21.2	17.73	19.40	19.7	21.2	16.0	27.0	21.8	124.9	163.6	196.5
18	20	VV	14.29	15.1	17.45	16.80	15.5	16.5	18.3	26.3	19.9	112.1	151.8	183.5
19	21	SK	17.81	21.7	18.85	19.65	18.5	47.9	14.0	23.0	22.0	120.8	166.2	202.3
20	22	TT	19.22	14.0	16.70	13.20	17.3	5.3	17.6	20.7	15.2	117.2	141.2	166.8
21	23	YW	20.87	16.7	19.04	14.20	16.3	16.2	13.8	23.0	19.0	125.3	159.7	191.7
22	24	RA	22.81	25.0	22.71	21.80	21.1	25.4	21.1	28.8	40.3	125.6	176.2	211.0

Obs	BW4	BW5	BW6	BW7	BW8	BW9	BW10	Body_ Weight_g	Liver_ weight_g	Epididymal_ fat_pad_ weight_g	Cecal_ pH
13	223.2	259.7	393.8	316.2	346.1	357.6	374	384.1	13.4901	4.2810	6.74
14	231.8	268.4	305.4	326.1	354.1	375.2	399	414.0	14.9671	4.5506	6.80
15	216.5	248.9	277.9	303.0	326.1	336.2	359	370.0	12.8019	3.5899	6.60
16	252.0	292.6	328.8	356.3	381.4	401.0	424	436.0	16.0558	7.7178	6.97
17	246.2	288.7	320.3	346.0	373.1	389.7	404	426.0	15.4274	5.4589	6.75
18	232.0	269.0	302.0	321.5	344.4	365.3	389	403.4	16.6419	5.4446	6.94
19	254.3	297.0	331.5	350.0	375.4	390.0	404	421.9	13.8956	7.1716	6.65
20	216.5	255.4	291.7	315.0	339.6	357.0	379	395.0	13.0304	5.0613	7.21
21	240.1	268.5	300.9	316.5	333.6	352.0	376	388.1	12.9490	6.6912	6.88
22	267.5	310.9	347.9	373.5	402.9	433.0	455	455.0	14.9487	7.0820	7.01

Obs	Cecal_ Weight_g	Area_cm2	ACF1	ACF2	ACF3	ACF4	ACF5	ACF6	ACF7	ACF8_ plus	Total ACF	Percent_ Total ACF_A	DCLK1_ ACF
13	0.5253	9.00	11	6	2	0	0	0	0	0	18	2.11111	31
14	0.6134	7.60	7	3	0	1	0	0	0	0	11	1.44737	26
15	0.5987	10.00	37	21	1	10	1	0	0	0	69	7.00000	29
16	0.7043	9.60	16	14	1	4	0	0	0	0	35	3.64583	4
17	0.6033	8.74	6	1	4	1	3	3	0	0	18	2.05950	22
18	0.5344	8.00	15	8	5	1	0	1	1	0	31	3.87500	24
19	0.6441	8.60	19	7	0	0	0	0	0	0	26	3.02326	6
20	0.7762	10.50	23	13	7	2	1	0	0	0	46	4.38095	28
21	0.6191	6.65	6	3	0	0	0	0	0	0	9	1.35338	27
22	0.7459	9.00	9	7	5	10	4	3	1	0	39	4.33333	23

Obs	ACF1_A	ACF2_A	ACF3_A	ACF4_A	ACF5_A	ACF6_A	ACF7_A	ACF8_A
13	1.22222	0.66667	0.22222	0.00000	0.00000	0.00000	0.00000	0
14	0.92105	0.39474	0.00000	0.13158	0.00000	0.00000	0.00000	0
15	3.70000	2.10000	0.10000	1.00000	0.10000	0.00000	0.00000	0
16	1.66667	1.45833	0.10417	0.41667	0.00000	0.00000	0.00000	0
17	0.68650	0.11442	0.45767	0.11442	0.34325	0.34325	0.00000	0
18	1.87500	1.00000	0.62500	0.12500	0.00000	0.12500	0.12500	0
19	2.20930	0.81395	0.00000	0.00000	0.00000	0.00000	0.00000	0
20	2.19048	1.23810	0.66667	0.19048	0.09524	0.00000	0.00000	0
21	0.90226	0.45113	0.00000	0.00000	0.00000	0.00000	0.00000	0
22	1.00000	0.77778	0.55556	1.11111	0.44444	0.33333	0.11111	0

------------------------------------ Diet=TWD with wild rice ------------------------------------

Obs	Rat_no	Code	FI1	FI2	FI3	FI4	FI5	FI6	FI7	FI8	FI9	BW1	BW2	BW3
23	25	HJ	14.99	15.6	14.12	15.5	17.5	17.6	19.0	17.8	19.6	116.8	155.6	184.3
24	26	XM	17.20	15.5	14.31	16.5	16.8	14.2	17.1	23.1	18.3	116.3	149.7	174.6
25	27	UT	12.66	16.2	15.81	16.0	14.7	22.2	17.0	23.0	17.0	105.3	135.7	162.2
26	28	PS	15.23	18.6	18.68	17.7	19.5	22.2	20.1	22.9	21.0	125.7	171.8	208.4
27	29	TZ	15.10	17.2	17.27	18.3	17.4	18.7	13.0	21.0	14.6	113.3	153.3	185.1
28	30	LA	14.05	18.1	18.79	19.3	17.6	18.1	17.0	23.0	19.1	118.8	150.6	180.1
29	31	FV	15.06	18.5	8.15	16.0	18.8	20.4	18.0	23.0	17.0	107.3	145.7	175.0
30	32	HS	17.97	21.7	20.18	20.2	19.1	21.4	21.6	24.0	23.0	123.5	167.4	197.8
31	33	HB	19.80	18.9	20.73	18.4	21.5	23.6	16.8	26.4	19.5	129.8	176.4	220.8
32	34	LX	16.12	16.5	17.82	17.9	17.3	19.5	16.0	24.7	18.6	117.3	155.7	187.1
33	35	JW	17.89	20.0	17.59	17.8	15.8	21.1	15.0	27.2	29.7	108.8	150.5	182.1
34	36	PL	18.66	21.0	15.70	19.9	19.4	20.2	17.0	26.0	19.8	108.9	151.4	185.9

Obs	BW4	BW5	BW6	BW7	BW8	BW9	BW10	Body_ Weight_g	Liver_ weight_g	Epididymal_ fat_pad_ weight_g	Cecal_ pH
23	233.1	273.3	303.6	330.6	352.9	367	376	392.5	15.0056	4.0151	6.84
24	225.8	259.4	296.9	322.0	346.7	365	372	388.2	13.5252	4.4652	7.55
25	210.7	245.8	271.2	288.8	307.9	330	345	373.8	11.8470	5.0748	7.31
26	264.3	306.3	345.2	366.2	389.6	416	446	465.0	13.8180	8.9989	6.74
27	232.1	266.8	292.1	315.3	327.6	350	364	376.0	12.0360	4.6620	6.84
28	228.9	273.9	313.2	343.5	376.1	400	416	434.6	13.9068	7.7820	6.69
29	228.3	268.1	300.2	326.1	345.4	367	390	400.8	14.4296	4.7844	6.72
30	251.6	302.7	334.1	357.8	374.3	400	430	432.6	14.8564	7.9630	7.62
31	281.2	324.6	363.2	385.7	412.1	440	454	468.3	14.8761	10.1447	6.95
32	230.1	262.1	286.9	305.6	326.8	345	356	378.7	11.2838	3.3336	6.96
33	241.6	290.7	321.9	339.3	360.0	383	400	425.6	13.1649	8.1962	6.90
34	242.4	280.6	317.2	337.1	362.0	379	399	410.0	13.1148	5.0353	7.08

Obs	Cecal_ Weight_g	Area_cm2	ACF1	ACF2	ACF3	ACF4	ACF5	ACF6	ACF7	ACF8_ plus	Total_ ACF	Percent_ Total_ ACF_A	DCLK1_ ACF
23	0.6857	8.40	11	8	2	0	0	0	0	0	20	2.50000	7
24	0.6289	10.00	23	9	17	4	2	3	0	0	57	5.80000	10
25	0.5948	7.20	4	1	0	0	0	0	1	0	6	0.83333	9
26	0.6367	8.82	31	9	12	4	0	1	0	0	55	6.46259	.
27	0.7383	8.61	11	7	5	2	2	1	0	1	28	3.36818	30
28	0.5482	11.00	10	2	4	4	0	0	0	0	20	1.81818	16
29	0.6955	7.20	10	2	2	0	1	0	0	0	15	2.08333	21
30	0.5038	9.60	12	4	2	1	1	0	0	0	20	2.08333	8
31	0.7065	10.00	31	18	15	4	6	5	3	1	81	8.30000	1
32	0.6385	11.50	10	11	5	4	1	2	1	1	35	3.04348	15
33	0.5958	8.80	12	7	4	4	1	1	0	0	29	3.29545	3
34	0.5253	10.00	17	11	6	7	3	0	1	0	44	4.50000	20

Obs	ACF1_A	ACF2_A	ACF3_A	ACF4_A	ACF5_A	ACF6_A	ACF7_A	ACF8_A
23	1.30952	0.95238	0.23810	0.00000	0.00000	0.00000	0.00000	0.00000
24	2.30000	0.90000	1.70000	0.40000	0.20000	0.30000	0.00000	0.00000
25	0.55556	0.13889	0.00000	0.00000	0.00000	0.00000	0.13889	0.00000
26	3.51474	1.02041	1.36054	0.45351	0.00000	0.11338	0.00000	0.00000
27	1.27758	0.81301	0.58072	0.23229	0.23229	0.11614	0.00000	0.11614
28	0.90909	0.18182	0.36364	0.36364	0.00000	0.00000	0.00000	0.00000

29	1.38889	0.27778	0.27778	0.00000	0.13889	0.00000	0.00000	0.00000
30	1.25000	0.41667	0.20833	0.10417	0.10417	0.00000	0.00000	0.00000
31	3.10000	1.80000	1.50000	0.40000	0.60000	0.50000	0.30000	0.10000
32	0.86957	0.95652	0.43478	0.34783	0.08696	0.17391	0.08696	0.08696
33	1.36364	0.79545	0.45455	0.45455	0.11364	0.11364	0.00000	0.00000
34	1.70000	1.10000	0.60000	0.70000	0.30000	0.00000	0.10000	0.00000

The MEANS Procedure

Analysis Variable : Percent_DCLK1_ACF Values of Percent_DCLK1_ACF Were Replaced by Ranks

Diet	N Obs	N	Mean	Std Error
basal diet	12	11	15.2727273	2.5516159
Total Western diet	10	10	22.0000000	2.9664794
TWD with wild rice	12	11	12.7272727	2.6010170

The GLM Procedure

Class Level Information

Class	Levels	Values
Diet	3	TWD with wild rice Total Western diet basal diet

Number of Observations Read	34
Number of Observations Used	32

The GLM Procedure

Dependent Variable: Percent_DCLK1_ACF Values of Percent_DCLK1_ACF Were Replaced by Ranks

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	475.636364	237.818182	3.06	0.0622
Error	29	2252.363636	77.667712		
Corrected Total	31	2728.000000			

R-Square	Coeff Var	Root MSE	Percent_DCLK1_ACF Mean
0.174354	53.41169	8.812929	16.50000

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	475.6363636	237.8181818	3.06	0.0622

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	475.6363636	237.8181818	3.06	0.0622

The GLM Procedure

Duncan's Multiple Range Test for Percent_DCLK1_ACF

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	29
Error Mean Square	77.66771
Harmonic Mean of Cell Sizes	10.64516

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	7.813	8.210

Means with the same letter are not significantly different.

Duncan Grouping		Mean	N	Diet
	A	22.000	10	Total Western diet
	A			
B	A	15.273	11	basal diet
B				
B		12.727	11	TWD with wild rice

Obs	Rat_no	Code	Diet	FI1	FI2	FI3	FI4	FI5	FI6	FI7	FI8	FI9	BW1	BW2
1	1	MT	1	14.91	18.0	16.97	18.00	16.9	20.1	14.68	26.2	18.7	107.6	136.4
2	2	TX	1	17.93	21.3	20.63	16.30	19.8	26.3	20.40	30.0	30.7	117.2	150.6
3	3	BE	1	17.04	20.8	19.21	21.20	19.0	21.0	17.60	21.9	20.2	107.4	149.4
4	4	PE	1	21.42	23.6	21.40	19.20	21.1	22.2	22.70	25.8	28.5	129.1	167.3
5	5	CU	1	30.06	23.2	21.08	25.40	27.2	29.4	20.40	128.7	19.0	126.8	165.8
6	6	LE	1	14.37	18.6	17.51	17.70	18.2	15.7	14.30	28.4	12.3	115.5	147.6
7	7	ET	1	17.32	20.7	19.67	18.10	20.7	22.6	17.70	26.2	24.8	118.7	159.7
8	8	BK	1	17.56	18.3	15.51	16.00	10.7	17.3	10.40	19.5	17.5	128.0	162.4
9	9	HG	1	17.44	19.7	18.72	18.80	17.8	20.9	14.70	26.5	17.7	105.6	140.5
10	10	AM	1	22.73	21.8	21.99	21.10	21.2	20.0	21.00	25.8	25.9	102.8	137.8
11	11	ER	1	18.52	22.7	17.26	18.10	21.4	22.5	16.30	24.8	21.3	117.2	153.3
12	12	TJ	1	17.66	19.0	18.63	17.60	20.8	13.0	15.80	27.0	22.1	120.6	156.5
13	13	TY	2	16.35	18.9	17.53	19.50	18.2	18.3	17.50	22.6	18.0	105.3	151.7

Obs	BW3	BW4	BW5	BW6	BW7	BW8	BW9	BW10	Body_ Weight_g	Liver_ weight_g	Epididymal_ fat_pad_ weight_g
1	155.1	192.2	227.2	264.3	290.4	308.7	332.6	357.8	362.6	9.8187	3.0639
2	178.0	230.5	277.0	315.3	339.8	348.7	374.9	417.0	411.1	11.7238	4.2967
3	176.2	220.9	263.8	298.6	323.0	345.7	363.2	379.0	393.8	11.2736	4.2604
4	202.1	254.5	296.5	238.4	356.9	382.7	398.5	421.0	421.9	12.2838	4.3387
5	200.2	253.8	303.6	340.8	371.2	401.1	423.8	446.0	448.2	13.6745	6.0860
6	174.9	211.0	235.3	255.0	264.8	291.6	301.8	320.0	322.0	9.7521	1.9190
7	186.7	231.0	269.2	301.9	326.3	353.7	369.9	393.0	402.3	12.6532	4.9141
8	190.7	228.2	257.1	281.4	301.5	320.3	335.4	354.0	363.0	11.1005	4.1013
9	164.0	209.4	248.2	276.8	297.2	316.7	328.3	347.0	367.7	11.8185	3.4110
10	167.4	218.3	260.7	292.3	324.3	350.5	352.3	394.0	404.8	12.3940	3.7150
11	183.3	234.5	270.1	305.5	238.8	352.4	372.1	394.0	401.3	13.0297	3.2654
12	183.2	232.3	265.6	296.0	317.0	339.4	356.1	369.0	372.0	10.3090	3.0040
13	170.1	223.2	259.7	393.8	316.2	346.1	357.6	374.0	384.1	13.4901	4.2810

Obs	Cecal_ pH	Cecal_ Weight_g	Area_cm2	ACF1	ACF2	ACF3	ACF4	ACF5	ACF6	ACF7	ACF8_ plus	Total ACF	Total ACF_A
1	6.60	0.6011	9.00	32	42	30	18	13	8	2	2	34.0	16.3333
2	6.48	0.5201	7.92	11	7	1	6	3	4	2	0	18.5	4.2929
3	6.75	0.6112	9.00	14	2	1	0	0	1	0	0	7.0	2.0000
4	6.51	0.7537	11.00	9	6	5	7	3	1	0	0	13.0	2.8182
5	7.30	0.7072	9.00	39	29	9	5	8	6	2	0	33.0	10.8889
6	6.63	0.5809	9.45	7	4	2	0	0	1	0	0	4.0	1.4815
7	6.62	0.5262	6.58	31	15	3	2	1	0	0	0	27.0	7.9027
8	7.42	0.5622	9.20	9	6	1	1	2	0	0	0	9.0	2.0652
9	6.85	0.7210	10.00	18	19	10	4	1	0	0	0	26.0	5.2000
10	7.05	0.7589	9.60	32	28	16	7	5	0	4	0	32.0	9.5833
11	6.74	0.6367	7.98	13	9	8	3	0	0	0	1	18.5	4.2607
12	7.62	0.7034	10.00	17	14	9	2	2	1	2	3	25.0	5.0000
13	6.74	0.5253	9.00	11	6	2	0	0	0	0	0	7.0	2.1111

Obs	Percent_ DCLK1_ ACF	ACF1_A	ACF2_A	ACF3_A	ACF4_A	ACF5_A	ACF6_A	ACF7_A	ACF8_A
1	5.7400	3.55556	4.66667	3.33333	2.00000	1.44444	0.88889	0.22222	0.22222
2	4.5730	1.38889	0.88384	0.12626	0.75758	0.37879	0.50505	0.25253	0.00000
3	4.4375	1.55556	0.22222	0.11111	0.00000	0.00000	0.11111	0.00000	0.00000
4	.	0.81818	0.54545	0.45455	0.63636	0.27273	0.09091	0.00000	0.00000
5	2.0033	4.33333	3.22222	1.00000	0.55556	0.88889	0.66667	0.22222	0.00000

6	3.9846	0.74074	0.42328	0.21164	0.00000	0.00000	0.10582	0.00000	0.00000
7	7.2062	4.71125	2.27964	0.45593	0.30395	0.15198	0.00000	0.00000	0.00000
8	5.3762	0.97826	0.65217	0.10870	0.10870	0.21739	0.00000	0.00000	0.00000
9	31.4158	1.80000	1.90000	1.00000	0.40000	0.10000	0.00000	0.00000	0.00000
10	5.6920	3.33333	2.91667	1.66667	0.72917	0.52083	0.00000	0.41667	0.00000
11	3.9582	1.62907	1.12782	1.00251	0.37594	0.00000	0.00000	0.00000	0.12531
12	2.6366	1.70000	1.40000	0.90000	0.20000	0.20000	0.10000	0.20000	0.30000
13	27.5589	1.22222	0.66667	0.22222	0.00000	0.00000	0.00000	0.00000	0.00000

Obs	Rat_no	Code	Diet	FI1	FI2	FI3	FI4	FI5	FI6	FI7	FI8	FI9	BW1	BW2
14	14	NV	2	17.23	16.3	18.01	20.30	16.7	21.6	17.4	27.4	18.0	112.6	150.3
15	16	DJ	2	15.99	17.6	16.57	17.60	17.3	20.0	14.8	27.2	18.0	119.9	152.9
16	18	YE	2	26.76	20.7	18.44	19.10	18.5	21.9	17.0	24.8	16.7	119.1	163.5
17	19	PP	2	17.57	21.2	17.73	19.40	19.7	21.2	16.0	27.0	21.8	124.9	163.6
18	20	VV	2	14.29	15.1	17.45	16.80	15.5	16.5	18.3	26.3	19.9	112.1	151.8
19	21	SK	2	17.81	21.7	18.85	19.65	18.5	47.9	14.0	23.0	22.0	120.8	166.2
20	22	TT	2	19.22	14.0	16.70	13.20	17.3	5.3	17.6	20.7	15.2	117.2	141.2
21	23	YW	2	20.87	16.7	19.04	14.20	16.3	16.2	13.8	23.0	19.0	125.3	159.7
22	24	RA	2	22.81	25.0	22.71	21.80	21.1	25.4	21.1	28.8	40.3	125.6	176.2
23	25	HJ	3	14.99	15.6	14.12	15.50	17.5	17.6	19.0	17.8	19.6	116.8	155.6
24	26	XM	3	17.20	15.5	14.31	16.50	16.8	14.2	17.1	23.1	18.3	116.3	149.7
25	27	UT	3	12.66	16.2	15.81	16.00	14.7	22.2	17.0	23.0	17.0	105.3	135.7
26	28	PS	3	15.23	18.6	18.68	17.70	19.5	22.2	20.1	22.9	21.0	125.7	171.8

Obs	BW3	BW4	BW5	BW6	BW7	BW8	BW9	BW10	Body_ Weight_g	Liver_ weight_g	Epididymal_ fat_pad_ weight_g
14	179.5	231.8	268.4	305.4	326.1	354.1	375.2	399	414.0	14.9671	4.5506
15	179.4	216.5	248.9	277.9	303.0	326.1	336.2	359	370.0	12.8019	3.5899
16	196.4	252.0	292.6	328.8	356.3	381.4	401.0	424	436.0	16.0558	7.7178
17	196.5	246.2	288.7	320.3	346.0	373.1	389.7	404	426.0	15.4274	5.4589
18	183.5	232.0	269.0	302.0	321.5	344.4	365.3	389	403.4	16.6419	5.4446
19	202.3	254.3	297.0	331.5	350.0	375.4	390.0	404	421.9	13.8956	7.1716
20	166.8	216.5	255.4	291.7	315.0	339.6	357.0	379	395.0	13.0304	5.0613
21	191.7	240.1	268.5	300.9	316.5	333.6	352.0	376	388.1	12.9490	6.6912
22	211.0	267.5	310.9	347.9	373.5	402.9	433.0	455	455.0	14.9487	7.0820
23	184.3	233.1	273.3	303.6	330.6	352.9	367.0	376	392.5	15.0056	4.0151
24	174.6	225.8	259.4	296.9	322.0	346.7	365.0	372	388.2	13.5252	4.4652
25	162.2	210.7	245.8	271.2	288.8	307.9	330.0	345	373.8	11.8470	5.0748
26	208.4	264.3	306.3	345.2	366.2	389.6	416.0	446	465.0	13.8180	8.9989

Obs	Cecal_ pH	Cecal_ Weight_g	Area_cm2	ACF1	ACF2	ACF3	ACF4	ACF5	ACF6	ACF7	ACF8_ plus	Total ACF	Total ACF_A
14	6.80	0.6134	7.60	7	3	0	1	0	0	0	0	3.0	1.44737
15	6.60	0.5987	10.00	37	21	1	10	1	0	0	0	30.0	7.00000
16	6.97	0.7043	9.60	16	14	1	4	0	0	0	0	20.5	3.64583
17	6.75	0.6033	8.74	6	1	4	1	3	3	0	0	7.0	2.05950
18	6.94	0.5344	8.00	15	8	5	1	0	1	1	0	17.0	3.87500
19	6.65	0.6441	8.60	19	7	0	0	0	0	0	0	14.0	3.02326
20	7.21	0.7762	10.50	23	13	7	2	1	0	0	0	24.0	4.38095
21	6.88	0.6191	6.65	6	3	0	0	0	0	0	0	2.0	1.35338
22	7.01	0.7459	9.00	9	7	5	10	4	3	1	0	22.0	4.33333
23	6.84	0.6857	8.40	11	8	2	0	0	0	0	0	11.0	2.50000
24	7.55	0.6289	10.00	23	9	17	4	2	3	0	0	29.0	5.80000
25	7.31	0.5948	7.20	4	1	0	0	0	0	1	0	1.0	0.83333
26	6.74	0.6367	8.82	31	9	12	4	0	1	0	0	28.0	6.46259

Obs	Percent_ DCLK1_ ACF	ACF1_A	ACF2_A	ACF3_A	ACF4_A	ACF5_A	ACF6_A	ACF7_A	ACF8_A
14	7.9036	0.92105	0.39474	0.00000	0.13158	0.00000	0.00000	0.00000	0.00000
15	10.9261	3.70000	2.10000	0.10000	1.00000	0.10000	0.00000	0.00000	0.00000
16	2.4032	1.66667	1.45833	0.10417	0.41667	0.00000	0.00000	0.00000	0.00000
17	6.1136	0.68650	0.11442	0.45767	0.11442	0.34325	0.34325	0.00000	0.00000
18	6.8933	1.87500	1.00000	0.62500	0.12500	0.00000	0.12500	0.12500	0.00000

19	2.6949	2.20930	0.81395	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	9.3335	2.19048	1.23810	0.66667	0.19048	0.09524	0.00000	0.00000	0.00000
21	8.4329	0.90226	0.45113	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
22	6.5465	1.00000	0.77778	0.55556	1.11111	0.44444	0.33333	0.11111	0.00000
23	2.9526	1.30952	0.95238	0.23810	0.00000	0.00000	0.00000	0.00000	0.00000
24	3.8092	2.30000	0.90000	1.70000	0.40000	0.20000	0.30000	0.00000	0.00000
25	3.4752	0.55556	0.13889	0.00000	0.00000	0.00000	0.00000	0.13889	0.00000
26	.	3.51474	1.02041	1.36054	0.45351	0.00000	0.11338	0.00000	0.00000

Obs	Rat_no	Code	Diet	FI1	FI2	FI3	FI4	FI5	FI6	FI7	FI8	FI9	BW1	BW2
27	29	TZ	3	15.10	17.2	17.27	18.3	17.4	18.7	13.0	21.0	14.6	113.3	153.3
28	30	LA	3	14.05	18.1	18.79	19.3	17.6	18.1	17.0	23.0	19.1	118.8	150.6
29	31	FV	3	15.06	18.5	8.15	16.0	18.8	20.4	18.0	23.0	17.0	107.3	145.7
30	32	HS	3	17.97	21.7	20.18	20.2	19.1	21.4	21.6	24.0	23.0	123.5	167.4
31	33	HB	3	19.80	18.9	20.73	18.4	21.5	23.6	16.8	26.4	19.5	129.8	176.4
32	34	LX	3	16.12	16.5	17.82	17.9	17.3	19.5	16.0	24.7	18.6	117.3	155.7
33	35	JW	3	17.89	20.0	17.59	17.8	15.8	21.1	15.0	27.2	29.7	108.8	150.5
34	36	PL	3	18.66	21.0	15.70	19.9	19.4	20.2	17.0	26.0	19.8	108.9	151.4

Obs	BW3	BW4	BW5	BW6	BW7	BW8	BW9	BW10	Body_ Weight_g	Liver_ weight_g	Epididymal_ fat_pad_ weight_g	Cecal_ pH
27	185.1	232.1	266.8	292.1	315.3	327.6	350	364	376.0	12.0360	4.6620	6.84
28	180.1	228.9	273.9	313.2	343.5	376.1	400	416	434.6	13.9068	7.7820	6.69
29	175.0	228.3	268.1	300.2	326.1	345.4	367	390	400.8	14.4296	4.7844	6.72
30	197.8	251.6	302.7	334.1	357.8	374.3	400	430	432.6	14.8564	7.9630	7.62
31	220.8	281.2	324.6	363.2	385.7	412.1	440	454	468.3	14.8761	10.1447	6.95
32	187.1	230.1	262.1	286.9	305.6	326.8	345	356	378.7	11.2838	3.3336	6.96
33	182.1	241.6	290.7	321.9	339.3	360.0	383	400	425.6	13.1649	8.1962	6.90
34	185.9	242.4	280.6	317.2	337.1	362.0	379	399	410.0	13.1148	5.0353	7.08

Obs	Cecal_ Weight_g	Area_cm2	ACF1	ACF2	ACF3	ACF4	ACF5	ACF6	ACF7	ACF8_ plus	Total ACF	Percent_ Total ACF_A	DCLK1_ ACF
27	0.7383	8.61	11	7	5	2	2	1	0	1	15.0	3.36818	11.7831
28	0.5482	11.00	10	2	4	4	0	0	0	0	11.0	1.81818	4.9124
29	0.6955	7.20	10	2	2	0	1	0	0	0	5.0	2.08333	5.9765
30	0.5038	9.60	12	4	2	1	1	0	0	0	11.0	2.08333	3.1229
31	0.7065	10.00	31	18	15	4	6	5	3	1	31.0	8.30000	0.7009
32	0.6385	11.50	10	11	5	4	1	2	1	1	20.5	3.04348	4.6956
33	0.5958	8.80	12	7	4	4	1	1	0	0	16.0	3.29545	2.0880
34	0.5253	10.00	17	11	6	7	3	0	1	0	23.0	4.50000	5.7785

Obs	ACF1_A	ACF2_A	ACF3_A	ACF4_A	ACF5_A	ACF6_A	ACF7_A	ACF8_A
27	1.27758	0.81301	0.58072	0.23229	0.23229	0.11614	0.00000	0.11614
28	0.90909	0.18182	0.36364	0.36364	0.00000	0.00000	0.00000	0.00000
29	1.38889	0.27778	0.27778	0.00000	0.13889	0.00000	0.00000	0.00000
30	1.25000	0.41667	0.20833	0.10417	0.10417	0.00000	0.00000	0.00000
31	3.10000	1.80000	1.50000	0.40000	0.60000	0.50000	0.30000	0.10000
32	0.86957	0.95652	0.43478	0.34783	0.08696	0.17391	0.08696	0.08696
33	1.36364	0.79545	0.45455	0.45455	0.11364	0.11364	0.00000	0.00000
34	1.70000	1.10000	0.60000	0.70000	0.30000	0.00000	0.10000	0.00000

The MEANS Procedure

Analysis Variable : TotalACF Values of TotalACF Were Replaced by Ranks

Diet	N Obs	N	Mean	Std Error
1	12	12	20.5833333	3.0331710
2	10	10	14.6500000	3.0368569
3	12	12	16.7916667	2.7821525

The GLM Procedure

Class Level Information

Class	Levels	Values
Diet	3	1 2 3

Number of Observations Read	34
Number of Observations Used	34

The GLM Procedure

Dependent Variable: TotalACF Values of TotalACF Were Replaced by Ranks

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	201.329167	100.664583	1.02	0.3732
Error	31	3066.170833	98.908737		
Corrected Total	33	3267.500000			

R-Square	Coeff Var	Root MSE	TotalACF Mean
0.061616	56.83021	9.945287	17.50000

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Diet	2	201.3291667	100.6645833	1.02	0.3732

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Diet	2	201.3291667	100.6645833	1.02	0.3732

The GLM Procedure

Duncan's Multiple Range Test for TotalACF

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	31
Error Mean Square	98.90874
Harmonic Mean of Cell Sizes	11.25

NOTE: Cell sizes are not equal.

Number of Means	2	3
Critical Range	8.552	8.988

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	Diet
A	20.583	12	1
A			
A	16.792	12	3
A			
A	14.650	10	2

The CORR Procedure

1 With Variables: Percent_DCLK1_ACF
1 Variables: TotalACF_A

Simple Statistics

Variable	N	Mean	Std Dev	Median	Minimum	Maximum
Percent_DCLK1_ACF	32	6.72265	6.51162	5.14432	0.70093	31.41583
TotalACF_A	34	4.38660	3.23060	3.50700	0.83333	16.33333

Simple Statistics

Variable	Label
Percent_DCLK1_ACF	
TotalACF_A	Total ACF per cm2

Spearman Correlation Coefficients
Prob > |r| under H0: Rho=0
Number of Observations

	Total ACF_A
Percent_DCLK1_ACF	-0.04088 0.8242 32

Medallion Labs
www.medallionlabs.com 800-245-5615 info@medlabs.com

Final Report

Order Number: **2019-002573**
Completed Date: 28-Mar-2019
Submitted Date: 15-Mar-2019

Submitter: Daniel Gallaher
Company: U of MN - Twin Cities
Company Address: 1334 Eckles Ave
Dept of Food Science and Nutrition
St Paul, MN 55108
Results Email: dgallahe@umn.edu
Invoice Email: dgallahe@umn.edu
Purchase Order: CC

Medallion Labs

www.medallionlabs.com 800-245-5615 info@medlabs.com

Final Report

Order # Sample ID:	2019-002573-01	**Company:**	U of MN - Twin Cities
Customer Sample ID:	Wild Rice		University of Minnesota
Sample Description:	Wild Rice		

Analytical Testing

Method:	Component:	Result:	Test Date:
Ash	Ash	1.281 %	22-Mar-2019
² Calories	Calories	368 Calories/100 g	28-Mar-2019
	Calories, 2020	368 Calories/100 g	28-Mar-2019
	Calories from Fat	11 Calories/100 g	28-Mar-2019
	Calories from Saturated Fat	3 Calories/100 g	28-Mar-2019
² Carbohydrates	Carbohydrates	75.9 %	28-Mar-2019
	Carbohydrates, 2020	75.9 %	28-Mar-2019
	Carbohydrates, Available	75.9 %	28-Mar-2019
Fat (Gas Chromatography)	Total Fat	1.24 %	26-Mar-2019
	Saturated Fat	0.31 %	26-Mar-2019
	Monounsaturated Fat	0.27 %	26-Mar-2019
	cis-cis Polyunsaturated Fat	0.60 %	26-Mar-2019
	trans Fat	<LOQ %	26-Mar-2019
Fat (Gravimetric)	Total Fat	1.3 %	28-Mar-2019
Fiber (AOAC 991.43)	Total Dietary Fiber	2.9 %	26-Mar-2019
Moisture by Forced Air Oven	Moisture	8.186 %	25-Mar-2019
Protein	Protein (6.25)	13.4 %	22-Mar-2019

Results Approved By: Randy Vados
(Authorized Reviewer)

² This test is not considered in-scope of our current A2LA accreditation. For a listing of in-scope tests, please visit www.medallionlabs.com.

Final Report

Analytical Method References:

Method Name	Method Reference
Ash	AOAC: 923.03*
Calories	Please contact for Method Details
Carbohydrates	Please contact for Method Details
Fat (Gas Chromatography)	AOAC: 996.06*
Fat (Gravimetric)	AOAC: 948.15, 922.06, 925.32, 950.54, 922.09*
Fiber (AOAC 991.43)	AOAC: 991.43*
Moisture by Forced Air Oven	AOAC: 926.07, 925.10*, AACC: 44.15A, 44.31*
Protein	AACC 46-30*; AOAC 992.15*

* This method has been modified.