

Detoxification Diets: Three Pilot Studies

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Abstract

Background: Detoxification diets (detox) have become popular in recent years, with health benefit claims of weight loss and improved energy. Conventionally, *detox* refers to removing toxins from the body, as in the cases of drug and alcohol abuse. In the alternative health field, however, detoxes aim to improve sleep, energy, and weight management. Research is needed to understand the mechanisms, safety, indications, and contraindications of detox.

Pilot Study Objective: Three pilot observational studies were completed to examine the symptoms and side effects of detox diets.

Methods/Design/Setting/Participants: The first pilot study surveyed 390 participants at the National College of Natural Medicine (NCNM). Participants reported the type, duration, and motivation for up to five detoxes. In the second study, 15 adults, who had completed various detoxes (3–40 days in length), were interviewed regarding their motivations, symptoms, and side effects. In a third study, 11 NCNM students were asked to report their symptoms and side effects of a 7-day detox. For all three studies, there was 100% completion among the participants. Adverse events were considered as part of the results of the study.

Intervention: All three pilot studies were observational and researchers did not implement an intervention. Two of the surveys were administered retrospectively, and one was administered prospectively.

Results: In all 3 studies we observed tremendous variability in the motivation and experiences of people who undergo detox diets, including protocols followed, length implemented, as well as symptoms, side effects, and perceived results.

Conclusions: People who undergo detoxes experience both positive and negative side effects. Further investigation of safety and symptoms induced by detoxes is warranted. Efforts should be made to examine physiological effects of detox and which markers can track biochemical changes. Results of further investigations will contribute to clinical use of detoxes.

Introduction

All cells produce waste that must then be eliminated. Toxins, either endogenous or exogenous, are sent to the liver, where they are filtered and processed by means of detoxification. These processed wastes are then sent to the primary emunctories for elimination: the digestive tract eliminates solid wastes; the kidneys eliminate liquid waste; the lungs eliminate gaseous waste; and the skin eliminates waste in the form of sweat.¹

Many chemical toxins are removed by the liver, which detoxifies via oxidation, reduction and hydrolysis (phase 1) and conjugation (phase 2) of functional groups of toxins. Phase 1, also known as the cytochrome P450 monooxygenase system, involves a group of isoenzymes, most commonly the cytochrome P450 enzymes. Phase 1 is the beginning stage of detoxification. In most cases, the chemical compound must go to phase 2 conjugation before it can be removed from the body. The primary function of phase 2 is to chemically modify functional groups to make compounds more polar and less toxic. The hallmark of phase 2 is the conjugation of an endogenous substrate to the new functional group created in phase 1.

Defects in (or inhibitors of) the phase 1 and phase 2 detoxification pathways lead to clinical symptoms including fatigue, PMS, headaches, gastrointestinal distress, acne, weight gain, and poor memory. When liver detox mechanisms are overwhelmed or not working properly, toxins accumulate. Exogenous methods of detoxification can aid the process. This is where detoxification diets have a possible role.

Diets involve modifying nutrient intake and can be selected for a variety of purposes. Most often diets are prescribed for weight loss. However, diets may also be recommended to lower cholesterol or affect other body systems.² Diets that are designed to remove environmental toxins from different organs are gaining popularity. These detoxification diets (hereafter referred to as detox) vary in scope and method, but share the common purpose of reducing intake and increasing elimination of toxins, thus restoring health.

Historically, naturopathic physicians and other alternative practitioners have used detoxes to remove environmental toxins, identify food intolerances, address inflammation, and prevent chronic, degenerative conditions.³ Naturopathic physicians design detoxes to stimulate different organ systems, including the body's natural emunctories which naturally carry waste out of the body.¹



Detoxification Diets

In a conventional sense, *detox* is referred to as cleansing the body from exogenous toxic substances, such as drugs and alcohol. There are thousands of detox centers around the country aimed at the treatment of drug and alcohol abuse. In this regard, detoxes involve pharmacologic intervention along with psychological support. Detox diets are not a typical treatment at these centers.

In the mainstream media, the concept of detoxification has become trendy and provided a means for marketing schemes to widely promote detox and claim amazing health benefits, most notably weight loss. Since detoxes typically involve diet modification and often calorie restriction, weight loss is a typical result. Detoxes involving water fasts, juice fasts, and limited diets can be referred to as a very low calorie diet (VLCD), defined as a diet less than 800 kcal/day. VLCDs have been shown to result in rapid, substantial weight loss. However, maintaining these diets is very challenging, and weight loss is not maintained. Subsequent weight gain is typical. The sustainability of the weight loss from detoxes is questionable.⁴ Another commercially promoted detox is the "Master Cleanse," which consists of a 10-day diet of spicy lemonade.

Current scientific literature is lacking regarding the mechanisms involved in detoxification diets. In addition, there is little research establishing safety, efficacy, indications, and contraindications for detoxes. This article reports on three pilot studies of detoxes: (1) a survey of naturopathic medical student detox experiences; (2) a symptom survey of people currently undergoing a detox; and (3) a phone survey of general public who have used detox.

Methods

NCNM Student Survey

The research team reviewed popular literature, commercial products, and common cultural beliefs surrounding the term *detox*. From this literature, a 60-question survey was developed to obtain a broad overview of the perceptions and experiences with detoxes. Following IRB approval, the survey was administered to naturopathic medical students at the National College of Natural Medicine (NCNM). The electronic survey was easily accessible to NCNM students and allowed us to ensure that each student completed only one survey. The

survey was administered anonymously. It was distributed in three ways. First, a schoolwide e-mail detailed the purpose of the study and provided a link to the electronic survey. Second, the team set up computers outside classrooms. Finally, the research team provided a link to the survey on the desktop of library computers. The survey was available to NCNM students for one month.

Nature Cure Class Symptom Survey

As part of the annual Nature Cure class at NCNM, students are required to complete a detox of their choice. Protocols ranged in length from 1 to 7 days. The research team compiled a symptom survey that was distributed by the course instructor, prospective to the detox activity. Students completed one or more questionnaires according to the duration of their detox. Participation in completion of the questionnaire was optional. Names of participants were not obtained. Questionnaires were collected at the end of the week by the research team.

Phone Survey of the Community

Members of the research team conducted phone interviews with people who had experienced at least one detox within the last three years. Members of the research team surveyed acquaintances and members of their community via word of mouth. A questionnaire was given to participants. Answers to the survey were audio recorded and transcribed.

Survey Data Analysis

The quantitative data from each surveyed group were analyzed in a spreadsheet application. 390 students completed the NCNM Student Survey, 13 completed the Nature Cures Symptom Survey, and 13 phone interviews were conducted. The qualitative survey data were compiled into general categories, which were coded to cluster similar experiences under specific headings. For example, types of detoxes were organized to fit in the categories of Kit/Supplement, Juice/Tea, Fast, Dietary changes, and Other. Symptoms elicited by the detoxes were similarly categorized. If the survey was collected while someone was completing a detox, the participant was asked to rate severity of their symptoms. These ratings were not collected for past detoxes.

Results

NCNM Survey

The first pilot study collected people's experience with detoxes. Students at NCNM provided a convenient population who had completed a large number of detoxes, making data readily available. Data were collected from 88% of the NCNM student body, which included 390 male and female students varying in age, with the largest number of students between the ages of 21 and 29 (51%). Characteristics of the respondents were representative of the NCNM population, with 76% female and 83% white (Table 1).

Table 1:
Characteristics of Respondents
of NCNM Survey

Survey Response	N=390 %
Female	76
Age 21–29	51
Age 30+	44
Ethnicity	
Caucasian	83
Hispanic/Latin	3
African American	1
Other	11
Vegetarians	15
Consume >5 servings/day of fruits and vegetables	35
Consume Alcohol	60
Nonsmokers	82
Overweight	15

Survey questions covered knowledge and use of detoxes. Many students had completed more than one detox. Students were asked to report the type, duration, and motivation for up to five detoxes. Participants were also asked to recall symptoms that they experienced during specific types of detoxes.

Several types of detoxes were used frequently among NCNM students. Tea/Juice (28%), Dietary changes (25%), and Kit/Supplements (23%) were used most frequently. Fasting was also popular, with 18% of respondents reporting that they had completed a fast. The remaining 6% of respondents reported use of other unspecified types (Figure 1).

There were many motivations reported for completing a detox. Respondents were allowed to choose as many options as applied. The most frequent motivation was elimination of toxins (87%). Improving energy (59.4%), enhancing immunity

Figure 1: Data for the various types of detoxes are expressed in percentage of respondents out of 390. "Other" was unspecified. The X-axis represents types of detoxes, while the Y-axis represents percentage of respondents who completed each type.

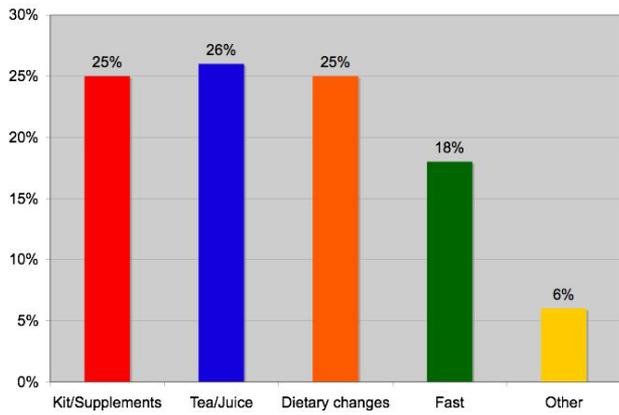


Figure 2: Data for the goals of detox are expressed in percentage of respondents out of 390. "Other" was unspecified. The X-axis represents the various goals for completing a detox, while the Y-axis represents percentage of respondents.

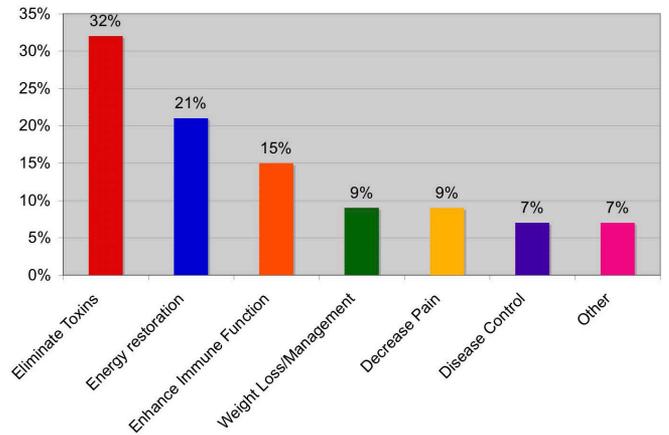


Figure 3: This figure shows the detox goals. Percentage (Y-axis) is the number of respondents out of 13.

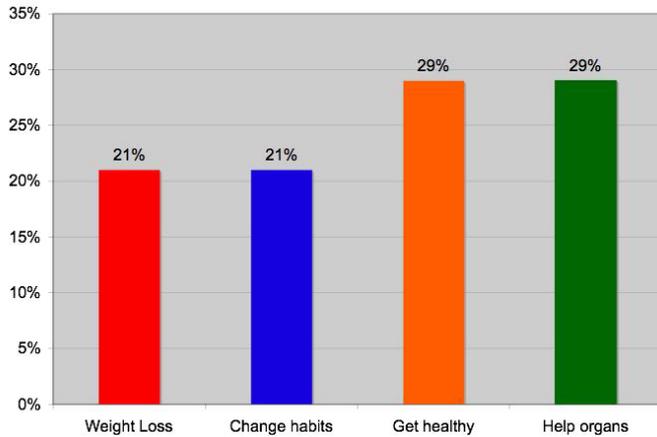


Figure 4: This figure depicts the types of the detoxes completed by participants (n = 13).

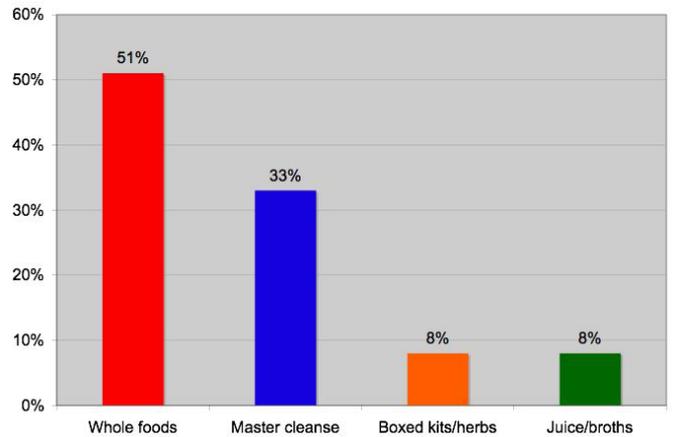


Figure 5: These data depict symptoms during the detox reported by the Nature Cure class. The red diamond line represents energy, the blue square line represents mental clarity, the yellow triangle line represents mood, and the green circle line represents sleep. The X-axis represents the rating scale (1: Poor, 2: Mediocre, 3: Fair, 4: Good, 5: Excellent), and the Y-axis represents the number of days of the detox.

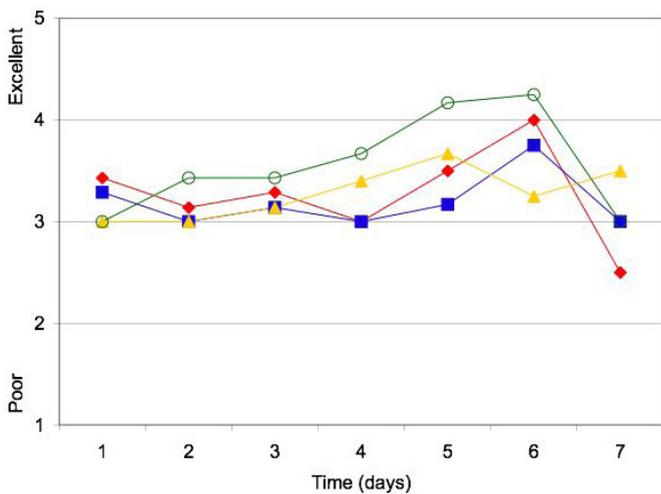
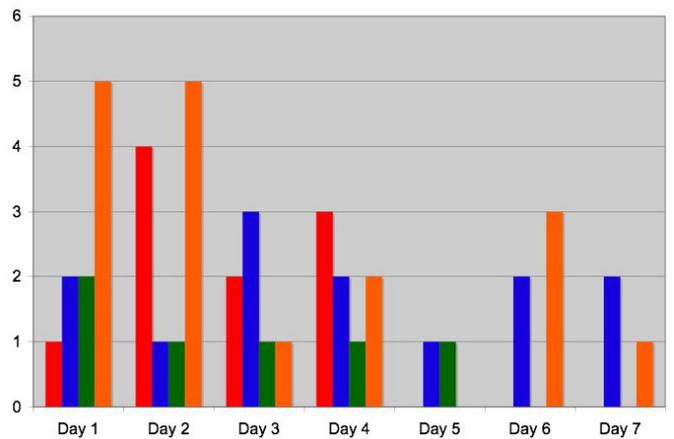


Figure 6: These data depict symptoms during the detox reported by the Nature Cure class. The red column represents headache, the blue column represents muscle aches, the green column represents joint pain, and the orange column represents hunger. The X-axis represents the number of respondents reporting each symptom, and the Y-axis represents the number of days of detox.



Detoxification Diets

(42.1%), weight loss (24.5%), decreasing pain (23.8%), and controlling disease (14.9%) were also common motivations. Many respondents intended to eliminate a specific symptom (such as low energy) with their detox (Figure 2).

Although most participants were motivated to eliminate toxins, toxins were not measured before and after detox. Thus, whether or not the detox was successful was based on symptom self-report. Symptoms experienced during and after detox were collected by the survey. Symptoms reported included information on bowel movements, skin condition, energy, mood, memory, and weight. Table 2A shows the symptom changes during the detox, and Table 2B shows changes after the detox was complete. Detox diets had the greatest impact on energy. During detox, 51% of people reported an increase in energy, and 58% a decrease in weight. After completion of detox, 70% of people reported increased energy. People also reported better moods after detox (60%). Interestingly, during the detox, a nearly equal number of people reported worsening of mood as those who reported improvement.

Phone Survey

Non-NCNM students were interviewed about their past experiences with detox diets. Thirteen people (aged 25–58) were interviewed individually by phone. Roughly half the group was female (Table 3). Participants included adults

who reported completing a detox within the last year. Individuals were interviewed regarding their personal experiences (goals) and recent detoxification protocols (types), as seen in Table 4B. The results of this survey are shown in Figures 3 and 4. The majority of people interviewed used detoxes to either get healthy (29%) or help specific organ systems (29%). Weight loss and changing habits were also common goals for detoxes. The types of detoxes used by non-NCNM students were whole foods (51%), Master Cleanse (33%), Boxed kits/herbs (8%), and Juice/broths (8%).

Several of the phone survey participants commented on food consciousness that resulted from their detox experience. This included a new awareness of food allergies or sensitivities and an appreciation of how food affects weight and mood (Tables 4B, 4C). While 4 participants lost weight, this was not a goal for most people. Most participants wanted to “reset” their bodies or “clean up [their] organs.”

Nature Cure Class

Many physiological factors were assessed in the survey of the Nature Cure class. Quality of sleep improved immediately with the beginning of their detoxification process. Though improvements leveled off on day 2, sleep continued to improve until day 6, when it decreased on the last day of detoxification (Figure 5). Energy was variable at first, but

made a drastic improvement from day 4 to day 6. Like quality of sleep, energy decreased significantly on the last day of detoxification, day 7 (Figure 5).

The mood of the Nature Cure class participants made a slow improvement from day 2 through day 5. Mood on day 6 had a slight decrease, but improved again on day 7. Mental clarity stayed level with a slight decrease the first day. Day 6 was of greatest improvement but returned to baseline on day 7 (Figure 5). Participants were inclined to have headaches days 1 through 5 but no headaches were reported days 5 through 7. The class reported muscle aches to peak on day 3. Joint pain was reported to decrease by day 2, and no joint pain was reported on days 6 and 7 (Figure 6).

Hunger varied dramatically throughout the study, beginning quite high, decreasing dramatically day 3, and slightly increasing day 4. No hunger was reported on day 5. Hunger increased by day 6, and on day 7 there was a slight decrease in hunger (Figure 6).

Table 2A: NCNM Survey: Symptom Reporting During the Detox

	Increased	Decreased	Not sure/No change
Bowel movements (N=258)	45% (117)	28% (72)	27% (69)
Weight change (N=258)	2% (5)	58% (149)	40% (104)
	Improved	Worsened	Not sure/No change/Varied
Skin condition (N=255)	37% (94)	15% (38)	48% (123)
Energy (N=258)	51% (133)	28% (72)	21% (54)
Mood (N=257)	38% (99)	33% (84)	29% (74)
Memory (N=256)	26% (67)	16% (40)	58% (149)

Table 2B: NCNM Survey: Symptom Reporting After the Detox

	Increased	Decreased	Not sure/No change
Bowel movements (N=249)	37% (91)	8% (21)	55% (137)
Weight change (N=251)	9% (23)	35% (88)	56% (140)
	Improved	Worsened	Not sure/No change/Varied
Skin condition (N=246)	44% (109)	3% (6)	53% (131)
Energy (N=249)	70% (174)	5% (12)	25% (63)
Mood (N=250)	60% (149)	3% (8)	37% (93)
Memory (N=251)	34% (86)	2% (4)	64% (161)

Table 3: Phone Survey Demographics

Subject	Age	Sex
1	30	F
2	26	F
3	38	F
4	57	M
5	36	M
6	27	M
7	29	F
8	32	M
9	39	F
10	48	M
11	39	F
12	32	F
13	31	M

Table 4A: Sample Survey Questions

- Have you done a detox; if so, what was the protocol?
- How did you hear about the detox?
- How long was the detox?
- What were the results?
- Did you lose weight?
- What were your successes with the detox and how long did they last?
- Did you experience any adverse reactions?
- Were you under a doctor's care while doing the detox? Did you discuss the detox protocol with your doctor?

Conclusions

Detoxes are commonly recommended by naturopathic physicians, chiropractors, yoga teachers, and massage therapists. Additionally, detoxes have been popularized by the media. Although many people may be doing detoxes, there are no reported data on the effects or efficacy of detoxes. This multitier study collected preliminary data on a variety of common detoxes.

Two retrospective studies were conducted to collect participant experience of detoxes. The NCMN survey successfully reported symptoms experienced during and after detoxes. A shortcoming of this survey was that it didn't collect symptoms experienced before a detox. Many research studies seek out student populations for survey data not only for convenience but also for reliance of completion, familiarity with subject, and interest. For example, a study out of McGill University in Montreal, Canada, surveyed 172 undergraduate students to correlate perceived loss with depressive symptoms.⁵ Just as many psychology researchers target students for

study populations, we initially surveyed naturopathic students for their personal experience. While it is unusual to have such a high response rate for a survey of this nature, we attribute the high rate to several activities. After the survey was e-mailed to all students, tables were set up in the school hallway with computers. Researchers at the tables offered Master Cleanse lemonade, fruit, and vegetables to people who stopped to fill out the survey. In addition, announcements were made in all of the classes to encourage participation.

The retrospective phone survey was used primarily to collect data from a nonmedical student population. While this survey only involved 13 people, it was useful in our analysis of how the general public approaches detox. The results of the phone survey were comparable to those achieved with the NCMN survey. The NCMN and phone surveys required participants to remember one or more past detoxes. Because this data was self-reported, it is not as accurate as might be seen in a controlled trial.



Table 4C: Symptom/Results: Phone Survey

Participant	1	2	3	4	5	6	7	8	9	10	11	12	13
Weight Loss				X				X		X		X	
Increased Energy	X				X	X		X	X		X		X
Decreased Energy													X
Hunger		X					X						
Increased Food Awareness				X		X					X		X
Mental Clarity	X				X						X		
Skin Changes			X								X		

Table 4B: Participant Responses: Phone Survey

Reasons for doing detox	<ul style="list-style-type: none"> Subject 3 "I wanted to clean up my liver a bit because of the anti-inflammatories I take for my injury and because I eat way too much sugar intermittently." Subject 11 "I did the reset cleanse to even my blood sugar and get rid of toxins in my system." Subject 12 "It felt like a good time to clear my body of toxins and I wanted to give my insides a good healing moment..." Subject 13 "My goal was to have increased energy and less intense headaches."
Protocol	<ul style="list-style-type: none"> Subject 1 "[I ate only] whole and healthy foods, no refined sugar or chemicals." Subject 2 "I drank "smooth move" tea at night, salt water flush in the morning, and drank spicy lemonade drink [master cleanse] throughout the rest of the day and night." Subject 8 "I did the master cleanse, 64 oz. a day, with no food." Subject 10 "I made that cabbage soup mixture and ate nothing but that for seven days."
Weight Loss	<ul style="list-style-type: none"> Subject 8 "I lost twelve pounds." Subject 10 "I lost eleven pounds on cabbage soup diet, and thirteen pounds on the master cleanse diet." Subject 11 "I lost seven to eight pounds in four days." Subject 12 "I lost some weight, which was unexpected and not even a specific goal."
Energy	<ul style="list-style-type: none"> Subject 1 "I had short-acting bouts of energy and clarity of thought, but now I feel like crap again." Subject 9 "I feel so energetic. I feel great." Subject 13 "Initially, when I came off of it, I felt like I had more energy, maybe from eating food again. I had low energy and felt detached from the world throughout the detox week."
Increased Food Awareness	<ul style="list-style-type: none"> Subject 4 "I discovered a sensitivity to shellfish that I now rediscover over and over." Subject 6 "I have an appreciation for food now." Subject 13 "I really appreciate food and eating now."
Lasting Success/Results	<ul style="list-style-type: none"> Subject 2 "I had no real success because I never really completed the detox." Subject 5 "I had a couple of weeks of eating healthier and I haven't had caffeine since. I haven't suffered any caffeine headaches since the detox." Subject 9 "If I continued to eat healthy, which is vegetables, fruit and lean meats, I keep the weight off, but once I add processed foods into my diet, my weight fluctuates quite a bit." Subject 12 "I have kept my weight off more easily ever since and it has been eight months."

Detoxification Diets

The two retrospective studies were followed by a small prospective study. Data were collected from students who were currently undergoing a detox in the Nature Cures class. Students were allowed to choose their own protocols. Despite the variety in detox protocols, several interesting trends were observed. Both mental clarity and energy dropped on day 4 and then improved, peaking on day 6. Further research is needed to examine what physiologically occurs during detox from day 4 to 6 leading to the increase in both energy and mental clarity. Interestingly, for all participants but one, sleep improved significantly as the detox progressed, also peaking on day 6. During REM sleep, the body facilitates cellular repair and detoxification. Thus further research may be indicated to investigate how detox affects the body's circadian rhythm.

The reported quality of sleep peaked by day 6 of detox. There was a significant decrease in headaches and joint pain by the 6th day as well, suggesting a possible decrease in inflammation. Further studies may be indicated to look at inflammatory markers, such as C-reactive protein (a protein synthesized by the liver in response to inflammation and an important marker for heart disease risk).

There are many questions that arise when considering biological outcomes for detox. For example, if someone undergoes a liver detox, is the test of liver enzymes sensitive enough to see change

in an otherwise healthy individual? How long does a person need to be doing a detox before changes of liver enzymes are observed? When is the best time to measure enzymes or elimination? Also, we might speculate that during a detox, liver function would increase because the liver is processing the toxins. However, after a detox, liver function would decrease because there is less toxic burden. It may also be prudent to focus on non-liver-related outcomes such as inflammation, lipids, and glucose or insulin levels.

Other questions that arise around detoxes concern the individuals who are completing them. A certain degree of health is required, as detox puts the body under stress. There may be individuals for whom a detox is contraindicated. However, the characteristics of those people have not yet been identified. Naturopathic physicians suggest that emunctories should be functioning optimally before someone completes a detox, so that toxins are not trapped in the body.

The combination of these small studies suggest that larger prospective controlled studies are warranted. Types of detoxes could be compared with each other. It could be determined which types of detox are best for certain symptoms or patient profiles. For example, Ayurvedic medicine commonly uses detox as a form of therapy. However, different detoxes are recommended based on dosha (patient constitution). A similar recommendation

may be needed for naturopathic patients. Lab markers should be collected pre, during, and post for additional studies. Finally, future studies should collect long-term effects of detox.

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Notes

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to all the participants
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**We thank you for your
award-winning submissions.**

**We invite the
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community to send
their entries next year
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As a naturopathic doctor, Dr. Sarah Axtell provides holistic health care for the entire family. She works with many different chronic health conditions, such as hormonal imbalances, autoimmune diseases, gastrointestinal disorders, cancer, anxiety, and weight loss. Dr. Axtell graduated with honors from the University of Wisconsin-Madison, where she earned a bachelor of science degree in dietetics and nutrition. She then earned a doctorate in naturopathic medicine from the National College of Natural Medicine (NCNM). She received extensive training in natural therapeutics from some of the leading physicians in the field during her three-year clinical rotations there. While Dr. Axtell was in naturopathic medical school, she was involved in research at the Helfgott Research Institute. During this time, she extensively researched the area of detoxification. She graduated with honors in research from NCNM. She is mother to two daughters, Cecelia and Louisa, who have inspired her and given her a love for children. She believes that establishing a solid foundation of health in childhood will lead to a fulfilling, healthy life.

Heather Zwickey, PhD, dean of research at NCNM, director of Helfgott Research Institute, and professor of immunology, trained at the world-renowned National Jewish Medical and Research Center in Denver. She received a PhD in immunology and microbiology from the University of Colorado Health Sciences Center. Dr. Zwickey went on to complete a postdoctoral fellowship at Yale University. In 2003, Dr. Zwickey launched the Helfgott Research Institute at NCNM. At Helfgott, Dr. Zwickey applies her immunology expertise to natural medicine. She studies the immunological mechanisms involved in nutrition, herbal medicine, acupuncture, and mind-body medicine. She also actively trains students and faculty in how to conduct clinical research in natural medicine, and recently launched a Master of Science of Integrative Medicine Research program at NCNM.

