

An Introduction to Grant Writing



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GRANTSPERSONSHIP

Preface: This brief instruction manual is the result of a series of workshops that we have provided at the University of Pittsburgh and elsewhere on the subject of how to obtain funding for research and training. It is, in fact, our notes and thus written in a telegraphic form; we hope it will nonetheless be intelligible.

The manual is designed to be generic, that is, to be relevant to most grant and fellowship proposals, although it sometimes uses examples of language that are most relevant to applications to the U.S. National Institutes of Health. We have divided the task of obtaining funding into 16 steps, providing you with our best advice on how to deal with each step in turn:

Sixteen Steps to Funding

| | |
|--|--|
| <p style="text-align: center;"><u>Preparing</u></p> <ol style="list-style-type: none">1. establish frame of mind2. develop concept3. identify funding source4. inform those involved5. refine concept | <p style="text-align: center;"><u>Submitting</u></p> <ol style="list-style-type: none">9. get approvals10. request assignment11. submit application12. provide add'l material13. ensure receipt |
| <p style="text-align: center;"><u>Writing</u></p> <ol style="list-style-type: none">6. outline, write, edit7. think like a reviewer8. get feedback & revise | <p style="text-align: center;"><u>Responding</u></p> <ol style="list-style-type: none">14. await review15. study report16. respond to report |

The "fine print:" Please keep in mind that this manual represents only one set of opinions on the subject of how best to obtaining funding; seek additional perspectives, as well. Also, remember that each funding agency is slightly different and that many of them frequently modify their objectives and/or mode of operation. Thus, be sure to obtain the most current information before embarking on the preparation of your application. Finally, we invite you to help us improve this document by offering your comments. We can be reached at survival@pitt.edu.

BAF and MJZ

Phase I: Preparation

1. **Establish the correct frame of mind** *Grant writing is an opportunity, not a painful chore!*
 - A. Start here: no amount of grantspersonship will overcome a weak idea.
 - B. Many individuals begin the task with a negative mindset – this cannot help
 - C. Preparing a grant application
 - 1) allows time to focus without interruption on your plans for the next few years
 - 2) offers you a chance to get in depth feedback from colleagues while you write and from reviewers after you submit the proposal
 - D. Some of the application text may be useful when publishing research articles or as a review

2. **Develop a strong concept that FITS**
 - A. **F**ills a gap in knowledge
 - B. **I**mportant
 - 1) to the field (and the reviewers)
 - 2) to funding agency
 - 3) to you (or you will not do your best job)
 - C. **T**ests a hypothesis (rather than being descriptive)
 - D. **S**hort-term investment by agency that will lead to long-term gain for field

3. **Identify funding source**
 - A. Explore choices and then select the funding agency to which you will apply. Sources of information on the different funding programs available include the following:
 - 1) your colleagues
 - 2) websites, including those of individual funding agencies and meta sites, (e.g., Community of Science, Foundations Center -- see bibliography)
 - 3) professional societies and their journals
 - 4) funding agency booths set up at conferences
 - 5) acknowledgments in research articles
 - 6) your local “office of research” or “sponsored programs”
 - B. Match your objectives with those of the funding agency in order to improve your odds of being funded. Issues to consider include:
 - 1) support for a particular type of research (e.g., basic versus clinical, specific diseases, etc.)
 - 2) personal characteristics (MDs conducting research, re-entry into science, etc.)
 - 3) geographic location (local area of the foundation, developing nation, etc.)

- C. Read the instructions – carefully, noting:
- 1) stated objective/mission of agency
 - 2) deadline for application
 - 3) need for a letter of intent (see step #4 below)
 - 4) required organization and page length of proposal
- D. Communicate with program staff from the funding agency
- 1) Staff members work to find best possible proposals for their agency and then fund them. Thus, they wish to help you determine if your concept is relevant to them and, if so, to help make the application as strong as possible
 - 2) Contact staff members in their offices and/or at professional meetings early on
 - 3) Find out from the agency:
 - a) Is my concept relevant to your agency or division? And if not, would you recommend
 - a modification of the proposal?
 - another source of funding?
 - b) Do I have the all of the most up-to-date instructions for submission of a grant application to your funding agency?
 - c) What are the criteria that will be used in evaluating my proposal?
 - d) Who will review my application? (try to find out as much about the reviewers as is legitimately possible – their names are almost always public information. You want to tailor your proposal to the reviewers (see step # 7) and citing their papers is always a good idea!
 - e) What percentage of the proposals that you receive do you fund? What is the level (amount, years) of funding?
 - f) What is a reasonable amount of money to request given my history and my concept?
 - g) What are the common strengths and weaknesses of the proposals submitted?
 - h) Can I submit supplementary materials in addition to the main text of my application?
 - i) Can you review an initial draft and provide me with feedback. If so, when would I need to get the document to you?
 - 4) Ask for help from others, too. Ask your colleagues and individuals who have previously reviewed grants for the funding agency to provide you with help, but it is *unethical* to talk about your application with individuals who *currently* serve as reviewers for the funding agency.

4. **Inform those involved**

- A. Funding agency: A letter of intent may be required/requested, often several months before the actual application. When a letter of intent is required, failure to submit one may preclude submitting a full application. The letters are often used for
 - 1) screening applications: The agency will invite the submission of full proposals only from individuals whose projects appeal to the agency.
 - 2) administrative planning: Particularly when a new funding mechanism is launched, agencies may not be able to estimate how many individuals will submit an application. A letter of intent allows them to budget the administrative time required to process the full proposals.
- B. Chairperson of your department
- C. The Office of Research (or “sponsored projects”) at your institution
- D. People whose help you need
 - 1) secretarial
 - 2) fiscal
 - 3) scientific (you may need help to collect pilot data or advice in constructing the proposal)

5. **Refine your concept**

- A. do a literature review
- B. talk to colleagues
- C. revise application based on these considerations and your additional hard thinking

Phase II: Preparing the application

6. **Outline, write, and edit**

- A. Develop a thorough outline of your proposal. (The typical sections of an application are outlined in the Appendix.)
- B. Write the entire first draft – *before* you start to edit

*If you try to write and edit at the same time,
you will do neither well.*

Charles H. Sides

- C. Edit, edit, then edit some more: Revise and refine the text of your application

7. **Think like a reviewer**

- A. Format the proposal so that it is easy to
 - 1) find key points (like answers to the review criteria)
 - 2) read & appreciate (see examples at end of this document)
- B. Use an optimal type face and type size
 - 1) select a good typeface:
 - good = Times Roman, Century Schoolbook
 - never = Courier (unattractive) , Arial (hard to read in quantity)
 - 2) typesize ≥ 11 pt (NIH says 10 pt. is ok – it isn't, not if you want happy reviewers.)
 - 3) occasionally use special fonts (**bold**, *italics*)
- C. Write in paragraphs
 - 1) include only one major idea per paragraph
 - 2) make the first sentence in a paragraph a topic sentence
 - 3) use headers frequently
- D. Let your text B-r-e-a-t-h-e
 - 1) indent paragraphs
 - 2) skip line between paragraphs
- E. Be sure to conform to all instructions! (type size, pages, margins, sections, etc.)
You don't want to have the proposal sent back without review because of a formatting error.

8. **Get feedback and revise your proposal**

- A. Establish mentors early
- B. Provide clear instructions as to what type of feedback you are seeking (feedback on science, organization, grammar, formatting, etc.)
- C. Take no for an answer (If someone says they do not have time to comment on your manuscript, find someone else who can assist.)
- D. Gently remind individuals of the deadline
- E. Show appreciation for the feedback you receive

Phase III: Submitting Your Proposal

9. **Get the required approvals** (this usually takes anywhere from a few days to a month)

Often you need several approvals on your proposal before you can submit it. These may include

- A. Use of subjects (humans, animals)

B. Safety (e.g., use of hazardous reagents; environmental impact)

C. Letters and/or signatures from

- 1) collaborators
- 2) consultants
- 3) chair of department
- 4) Office of Research or other officials at your institution

10. Obtain assignment

Obtain the optimal assignment of your application at the funding agency (if there is more than 1 one set of reviewers)

A. Why it might matter

- 1) program relevance
- 2) availability of funds to support research
- 3) sympathetic view to your approach
- 4) competence in evaluating your proposal

B. Ways in which assignment is determined

C. Information in the application

- 1) title
- 2) abstract
- 3) specific aims
- 4) cover letter

D. Input from program staff

11. Submit your application

A. Know deadlines for submission

- 1) *postmarked* or *arrival data*?
- 2) how flexible are these deadlines. Can you submit an application late?

B. Be prepared for problems (e.g., computer breaks, bad weather, signator from your institution out of the office)

C. Give yourself extra time to print, collate, copy the application: it always takes longer than you think!

D. Keep a receipt showing when you mailed the materials and (if possible) when they were received by the funding agency.

12. Submit supplemental material

A. Find out in advance whether funding agency will accept supplemental material

- B. The agency may
 - 1) not want anything
 - 2) want it at same time that the application is submitted
 - 3) accept material up to the day of the review

- C. Note: reviewers pay the most attention to material they receive along with the application; late-arriving items may not be examined carefully or at all.

13. Ensure receipt of application

- A. Find out if everything has been received

- B. Possible problems
 - 1) proposal does not arrive at funding agency
 - 2) proposal goes to “wrong” review group

- C. If there is a problem, suggest the following solutions
 - 1) different review committee
 - 2) adding to the committee some additional reviewers who have the expertise necessary to adequately review your proposal

Phase IV: Responding

14. Await review of your application: what will be happening

- A. The review process
 - 1) your application is assigned to a group for review
 - 2) your application may be evaluated by
 - a) staff at the funding agency
 - b) your peers in the field
 - c) a visit to your institution (rare)

- B. A report on the evaluation will be prepared. It may
 - 1) not be available to you
 - 2) need to be specially requested from the funding agency
 - 3) take 2-3 months for you to receive a copy
 - 4) be an incomplete record of the review
 - 5) contain contradictions (i.e., reviewer #1 indicates that [x] is necessary, reviewer #2 indicates that [x] is not necessary)

- C. Typical review criteria used to evaluate proposals include
 - 1) significance and originality of proposal
 - 2) adequacy of methodology
 - 3) qualifications of principal investigator and staff
 - 4) availability of resources at institution
 - 5) reasonableness of time and budget
 - 6) relevance to mission of the funding agency
 - 7) compliance with relevant regulations (e.g., human/animal welfare, biohazards)

15. Read the evaluation report

A. The possible results

- 1) your proposal is scored
 - a) high – funding is likely
 - b) “gray area” – funding is uncertain
 - c) low – funding is not likely

- 2) your proposal is rejected, unscored

B. Major reasons *research proposals* are not funded (source: U.S. National Institutes of Health)

- 1) lack of new, original ideas
- 2) diffuse, superficial, unfocused plan
- 3) lack of knowledge of the published literature
- 4) uncertainty concerning future directions
- 5) questionable reasoning in experimental approach
- 6) absence of acceptable scientific rationale
- 7) unrealistically large amount of work
- 8) lack of sufficient experimental detail
- 9) uncritical approach

C. Major reasons why *fellowship* proposals are not funded

- 1) weakness of candidate
 - a) low productivity
 - b) too few papers
 - c) published in low-impact journals
 - d) unfocused
 - e) poor letters of recommendation
 - f) inadequate training to date

- 2) poor mentor
 - a) low quantity/quality of research
 - b) poor funding record
 - c) too little training experience

- 3) inadequate proposal
 - a) research
 - b) training plan

- 4) weak institution
 - a) too little support
 - b) inadequate advisors, colleagues

16. Respond to report

- A. If your project is funded, but with a significantly lower budget than requested
- 1) estimate what can be accomplished with the reduced funds
 - 2) renegotiate
 - a) your objectives
 - b) the experiments you will do for the amount of funding provided
 - 3) save remaining work for a future application
- B. If your score is in “gray zone” (i.e., funding is uncertain)
- 1) talk to program officer at the funding agency
 - 2) consider providing additional material
 - a) rebuttal to reviewer’s comments
 - b) evidence of feasibility of study
- C. If funding is not provided: your options are to
- 1) quit asking for funding – **(we don’t recommend this!)**
 - 2) resubmit the same application with rebuttal
 - 3) revise the application and resubmit
 - a) provide introduction to revised application in which you
 - indicate changes made based on the suggestions from the reviewers
 - indicate any changes the reviewers wanted that you did not make,
AND provide a rationale for why you did not make the changes
 - b) note that you do not need to make all of the changes requested, but you do need to justify those decisions
 - c) be sure to be polite and tactful in your response to the reviews. Criticizing the reviewers is not a good strategy!
 - 4) request different reviewers: This is not usually a good strategy unless you feel something was very wrong with the review. Generally the reviewers respond more favorably to revised applications in which their suggestions were incorporated. With a new review panel, not only will you not benefit from this good will, the new reviewers may find totally different things to criticize in your application.

APPENDIX

Common Sections of a Grant Application

1. Title

- A. Conform to the agency's guidelines for titles (there may be a limit on length)
- B. Make the title an accurate statement of long-term goals
- C. Include keywords in the title

2. Abstract

- A. Make your abstract
 - 1) simple (the general public and/or policy makers may read it)
 - accurate
 - not provocative to groups that may not understand your research
 - interesting
- B. Include keywords in the abstract

3. Budget & budget justification

- A. Use the budget forms and categories developed by the funding agency
- B. Make your request reasonable
 - for the project
 - for agency (i.e., don't ask for more than the maximum award)
 - for your level of experience
- C. Carefully justify *when requested to do so* (see table below)
 - NIH "modular" budgets require less justification than traditional budgets.
 - If justification is required, carefully define all funds & time spent on project
- D. Explain any appearance of overlap with your other sources of funding
- E. Cost-share when possible
 - funds
 - services
 - equipment
- F. Personnel: If your institution provides personnel (i.e., faculty, students, staff) with "fringe benefits" (e.g., healthcare, retirement plan, etc.), you may need to include this in your budget. This is often assessed as a set percentage of the individual's salary, and the rate may vary with the rank of the individual.
- G. "Direct costs" (DC): this is the money that you need to do the research that you propose. It includes funds for personnel, supplies, equipment, travel, etc.

H. Indirect costs (IDC) or Facilities and Administration (F&A) costs: This is often assessed by the institution on research proposals to cover the costs of providing space, heat, light, janitorial services, etc. to the researcher. The rate is negotiated by the institution with the funding agency, and is assessed based on the total direct costs on the grant, though some items such as equipment, are often not included in this calculation. Note that some agencies limit the IDC rate for certain types of awards. You often need to get special permission from your institution if you are applying for a grant which provides IDC below your institution's normal rate.

| Budget Justifications | | |
|------------------------------|--|--|
| <u>Item</u> | <u>Common issues</u> | <u>Example</u> |
| Personnel | Name of individual (when known) Percent effort on project Role on project Responsibilities | Ben Aster, Ph.D. , 20% effort. Dr. Aster is responsible for program evaluation. He develops evaluation instruments, administers surveys, compiles and analyzes the data, initiates follow-up inquiries, and writes evaluation reports |
| Travel | Purpose of trip Cost of airfare (roundtrip, coach) Ground transport Cost and # nights in hotel Amount & # days of per diem | Travel to conference (\$975 requested): Airfare (roundtrip, coach) = \$400 Ground transport (airport/hotel): \$20 x 2 = \$40 Lodging: 3 nights x \$125/night = \$375 Per diem: 4 days x \$40/day per diem = \$160 |
| Animal subjects | Number of animals to be used Cost per animal to purchase Number of days housed Cost per day of housing | Animals (\$1400 requested): Cost to purchase: 40 rats x \$30/rat = \$1200 Animal care: 40 rats x 10 days x \$0.50/day = \$200 |

| Sample budget calculations | |
|---|------------------|
| Salaries | \$50,000 |
| Fringe benefits (example = 20% rate) | 10,000 |
| Supplies | 25,000 |
| Equipment | <u>15,000</u> |
| Direct Costs (DC) | \$100,000 |
| Indirect Costs (IDC) (example = 50% rate, excluding equipment) | 42,500 |
| TOTAL AWARD | \$142,500 |

4. Biographical sketches

A. Include for critical personnel

- 1) Principal investigator (PI)
- 2) Co-Principal Investigator (Co-PI)
- 3) Co-Investigators
- 4) Collaborators
- 5) Consultants
- 6) Research assistants with special skills

B. Highlight relevant accomplishments

C. Ensure accuracy

- 1) training, experience
- 2) grant support
- 3) publications
 - a) separate peer reviewed articles, reviews/chapters, and abstracts
 - b) place in chronological order with complete info re title, vol., and page numbers
 - c) limit “manuscripts in preparation” to manuscripts you would be willing to send to the committee

5. Research plan

A. Typical components of a research plan (The format and terminology varies from agency to agency. Be sure to follow d their instructions.)

- Objectives of “Specific Aims”: a short overview of what will do (~ 5%)
- Background: State of the field and need for your work
- Significance: why work is important, what impact will it have (~10-15%)
- Pilot Data (25%)
- Research Plan or “Approach”: the work you plan to do (55-60%)

B. General guidelines

- 1) state objectives clearly
- 2) provide background on the state of the field. Include information about
 - a) general literature (do a thorough but brief review of the literature)
 - b) your previous work related to the topic
 - c) the work of likely reviewers
- 3) be hypotheses-driven
- 4) highlight your strengths in the area of research
 - a) your experience and that of collaborators (including publications)
 - b) methodology and equipment available
 - c) unique approach
 - d) strong, testable hypothesis
- 5) emphasize the practicality of your proposal

- a) methods in hand (in your publications?) or easily learned (how?)
 - b) preliminary data available
 - c) time and skills of staff adequate to conduct studies proposed
 - d) time, resources required as compared to that requested
- 6) discuss expected outcomes and contingencies: *a series of experiments must not rely on finding a specific result in prior experiments*

Example of an organization for a given experiment:

Expt. 1: This title should match one of the specific aims

***Hypothesis:** Stating your hypothesis up front, in italics, and indented will increase the chance of funding.*

1: Rationale: This is why I want to do this experiment.

2: Protocol: This is what I will do, *exactly*. I include such details as the number of animals and methods of data analysis.

3: Comments: This is what I expect to find. Also, here are some alternative outcomes and/or problems I might encounter along with my plans to deal with these contingencies. Finally, if I end up with a little extra time, this is what I will do with it.

6. Subject welfare

- A. Adhere to all relevant guidelines (local institution, funding agency, national and international governments)
- B. Be clear about appropriateness of
 - 1) species
 - 2) numbers of subjects
 - 3) treatments
 - 4) special conditions

7. Letters of recommendation or agreement (if appropriate)

- A. Letters of recommendations
 - 1) may be required (for certain fellowships, etc.)
 - 2) could be optional (may help establish credibility)
- B. Letters of agreement from collaborators and consultants
 - 1) the individual should detail what work they have agreed to do for project
 - 2) help the author make the letter as specific and positive as possible
 - 3) provide a copy of the proposal
 - 4) indicate what you hope the author will include in the letter
 - 5) suggest that they indicate enthusiasm for the proposal and for you

8. Supplementary materials

A. Examples

- 1) color or enlarged figures
- 2) reprints of your published articles
- 3) updated information (new results, accomplishments)
- 4) find out the funding agency will accept supplementary materials (some do not)

B. *Never* use supplementary materials to circumvent page limits on the application



Example

The following two pages are designed to represent two versions of some text from a fictional research grant proposal: a poor version and a much improved version. We suggest that you begin with the first version, examining its overall appearance and the content of the first paragraph. Think of ways that that this version might be improved. Then consider the changes we have made in the second version. (Note: In addition to changing the overall appearance, we also have changed the text of the first paragraph.) Note: THIS SAMPLE USES THE OLD NIH LIST OF SECTIONS, and therefore should not be used in a grant application.

RESEARCH PLAN

1. Objectives

Although the binding of peperoni (Pe) to pizza (Pi) has been well established, the nature of the binding cite (BS) remains elusive, as does the relation between Pe binding and the reward experienced by ingesting food. In this study we sought to explore both of these issues. Our hypothesis is that Pe will bind to Pi and the nature of that binding will affect the reward value of the product. First, will will determine the binding characteristics of Pe and other ligands (LIG) to Pi. We will explore several variable including (a) which Pi surface is exposed, (b) the method of target preparation, and (c) nature, concentration, and size of the ligands. Second, we will use a quantitative structure-activity model and show that there is a strong relation between Pi conformation and reward value. We will use a rodent model to examine how variables explored in our first aim impact on the reward value of the product.

2. Background

Addiction is a serious problem in the United States and around the world. The National Institute on Drug Abuse reported that in 1992 alcohol and drug abuse in the United States resulted in a cost of approximately \$276 billion to society (6). Moreover, drug and alcohol addiction is only one type out of a myriad set of addictions. Other addictions that are present in our society include addictions to food, gambling, sex, danger, and religion. In the United States, research into addiction has focused to a large part on addiction to alcohol and other types of drugs. Little research has been done into mechanisms of other types of addictions. This proposal aims to fill that void by examining carbohydrate addiction. Carbohydrate addiction has been defined as a "compelling hunger, craving, or desire for carbohydrate rich foods; an escalating, recurring need or drive for starches, snack foods, junk food, or sweets" (3). Understanding carbohydrate addiction is important for several reasons. Carbohydrate addiction can lead to obesity, which is a major problem in the United States. It has been estimated that 55% of Americans are overweight (5). Obesity is a one of the major risk factors in a number of diseases including heart disease, stroke, and cancer. It has been estimated that in the United States as of 1988, the health care costs directly attributable to the treatment of obesity totaled \$44.6 billion, which represented 7.8% of the national healthcare costs (2). Thus, understanding the nature of carbohydrate addiction and learning how to treat and prevent it could result in tremendous economic savings as well as quality of life improvement for Americans.

Not only is understanding carbohydrate addiction important for the prevention and treatment of obesity, but it may teach us something about the basic nature of addiction itself, and may provide us with insights into new treatments for the abuse of other addictive substances including alcohol, cocaine, and marijuana. Moreover, understanding carbohydrate addiction is particularly relevant to successful treatment of drug addicts and alcoholics, since it is not uncommon for addicts to simply switch addictions to a different substance or behavior rather than eliminating addictive behavior from their lives. For example, a recovering alcoholic may avoid alcohol but become addicted to overeating. Thus understanding carbohydrate addiction becomes all the more pertinent in the treatment of illicit drug abuse.

RESEARCH PLAN

A. SPECIFIC AIMS

Although the binding of pepperoni (Pe) to pizza (Pi) has been well established, the nature of the binding site remains elusive, as does the relation between Pe binding and the reward experienced by the individual who is ingesting the food. In this study we sought to explore both of these issues.

***Hypothesis:** Pe will bind to Pi at a single site and the affinity of that binding for a given Pi substrate will be inversely related to the reward value of the product, reward being defined in an animal model as the number of level presses an animal will make to obtain a Pe-Pi pellet*

Aim 1: To determine the binding characteristics of Pe and other ligands to Pi. We will explore several variables including (a) which Pi surface is exposed (dorsal versus ventral), (b) the method of target preparation (including baking and boiling), and (c) nature, concentration, and size of the Pe ligands.

Aim 2: To use a quantitative structure-activity model to determine the relation between Pi conformation and reward value. We will use a rodent model to examine how variables explored in Aim 1 impact on the reward value of the product, with reward defined in terms of rate of lever pressing.

B. BACKGROUND AND SIGNIFICANCE

Addiction

Addiction is a serious problem in the United States and around the world. The National Institute on Drug Abuse reported that in 1992 alcohol and drug abuse in the United States resulted in a cost of approximately \$276 billion to society (NIDA, 1998). Moreover, drug and alcohol addiction is only one type out of a myriad set of addictions. Other addictions that are present in our society include addictions to food, gambling, sex, danger, and religion. In the United States, research into addiction has focused to a large part on addiction to alcohol and other types of drugs. Little research has been done into mechanisms of other types of addictions. This proposal aims to fill that void by examining carbohydrate addiction. Carbohydrate addiction has been defined as a “compelling hunger, craving, or desire for carbohydrate rich foods; an escalating, recurring need or drive for starches, snack foods, junk food, or sweets” (Heller & Heller, 1997). Understanding carbohydrate addiction is important for several reasons. Carbohydrate addiction can lead to obesity, which is a major problem in the United States. It has been estimated that 55% of Americans are overweight (NHLBI, 1998). Obesity is a one of the major risk factors in a number of diseases including heart disease, stroke, and cancer. It has been estimated that in the United States as of 1988, the health care costs directly attributable to the treatment of obesity totaled \$44.6 billion, which represented 7.8% of the national healthcare costs (International Obesity Taskforce). Thus, understanding the nature of carbohydrate addiction and learning how to treat and prevent it could result in tremendous economic savings as well as quality of life improvement for Americans.

Not only is understanding carbohydrate addiction important for the prevention and treatment of obesity, but it may teach us something about the basic nature of addiction itself, and may provide us with insights into new treatments for the abuse of other addictive substances including alcohol, cocaine, and marijuana. Moreover, understanding carbohydrate addiction is particularly relevant to successful treatment of drug addicts and alcoholics, since it is not uncommon for addicts to simply switch addictions to a different substance or behavior rather than eliminating addictive behavior from their lives. For example, a recovering alcoholic may avoid alcohol but become addicted to overeating. Thus understanding carbohydrate addiction becomes all the more pertinent in the treatment of illicit drug abuse.