

Final Progress Report for Research Projects Funded by Health Research Grants

Instructions: Please complete all of the items as instructed. Do not delete instructions. Do not leave any items blank; responses must be provided for all items. If your response to an item is “None”, please specify “None” as your response. “Not applicable” is not an acceptable response for any of the items. There is no limit to the length of your response to any question. Responses should be single-spaced, no smaller than 12-point type. The report **must be completed using MS Word**. Submitted reports must be Word documents; they should not be converted to pdf format. Questions? Contact Health Research Program staff at 717-783-2548.

1. **Grantee Institution:** The Trustees of the University of Pennsylvania
2. **Reporting Period (start and end date of grant award period):** 1/1/2009-12/31/2012
3. **Grant Contact Person (First Name, M.I., Last Name, Degrees):** Gearline R. Robinson-Hall, BSF
4. **Grant Contact Person’s Telephone Number:** 215-746-6821
5. **Grant SAP Number:** 4100047654
6. **Project Number and Title of Research Project:** 3 - Effects of Nicotine on Mu Opioid Receptor Binding
7. **Start and End Date of Research Project:** 1/1/2009-12/31/2012
8. **Name of Principal Investigator for the Research Project:** Caryn Lerman, PhD
9. **Research Project Expenses.**

9(A) Please provide the total amount of health research grant funds spent on this project for the entire duration of the grant, including indirect costs and any interest earned that was spent:

\$ 513,140.52

9(B) Provide the last names (include first initial if multiple individuals with the same last name are listed) of **all** persons who worked on this research project and were supported with health research funds. Include position titles (Principal Investigator, Graduate Assistant, Post-doctoral Fellow, etc.), percent of effort on project and total health research funds expended for the position. For multiple year projects, if percent of effort varied from year to year, report in the % of Effort column the effort by year 1, 2, 3, etc. of the project (x% Yr 1; z% Yr 2-3).

Last Name	Position Title	% of Effort on Project	Cost
Baldwin	Director	51 YR1; 2% YR4; 3% YR3	\$8,104.15
Jepson	Director C – Biostatistician	5% YR1; 4% YR4	\$8168.62
Fleming	Manager – Lab	4% YR1; 9% YR3; 19% YR4	\$18,844.68
Ware	Data Base Manager	1% YR1; 24% YR3	\$17,516.61
Ruparel	IT Sr. Project Leader	4% YR2	\$2,796.85
Valdez	Data Analyst	8% YR2	\$4,349.65
Kranzler	Clin. Research Coordinator	25% YR4	\$9,170.49
Pinto	Director, Clinical Trials	20% YR4	\$21,216.00
Sanborn	Clin. Research Coordinator	25% YR4	\$15,174.99
Wallace	Clin. Research Coordinator	10% YR4	\$3,655.52
Daneshvar	Clin. Research Assistant	54% YR3	\$7,752.32
Hopkins	Clin. Research Assistant	100% YR3; 100% YR4	\$12,983.93

9(C) Provide the names of **all** persons who worked on this research project, but who *were not* supported with health research funds. Include position titles (Research Assistant, Administrative Assistant, etc.) and percent of effort on project. For multiple year projects, if percent of effort varied from year to year, report in the % of Effort column the effort by year 1, 2, 3, etc. of the project (x% Yr 1; z% Yr 2-3).

Last Name	Position Title	% of Effort on Project
Lerman	Professor	2%
Newberg	Professor	1%

D) Provide a list of **all** scientific equipment purchased as part of this research grant, a short description of the value (benefit) derived by the institution from this equipment, and the cost of the equipment.

Type of Scientific Equipment	Value Derived	Cost
NONE		

10. Co-funding of Research Project during Health Research Grant Award Period. Did this research project receive funding from any other source during the project period when it was supported by the health research grant?

Yes X No _____

If yes, please indicate the source and amount of other funds:

NIH - NIDA R21DA027066-02 - \$687,992 direct costs

11. Leveraging of Additional Funds

11(A) As a result of the health research funds provided for this research project, were you

able to apply for and/or obtain funding from other sources to continue or expand the research?

Yes _____ No X _____

If yes, please list the applications submitted (column A), the funding agency (National Institutes of Health—NIH, or other source in column B), the month and year when the application was submitted (column C), and the amount of funds requested (column D). If you have received a notice that the grant will be funded, please indicate the amount of funds to be awarded (column E). If the grant was not funded, insert “not funded” in column E.

Do not include funding from your own institution or from CURE (tobacco settlement funds). Do not include grants submitted prior to the start date of the grant as shown in Question 2. If you list grants submitted within 1-6 months of the start date of this grant, add a statement below the table indicating how the data/results from this project were used to secure that grant.

A. Title of research project on grant application	B. Funding agency (check those that apply)	C. Month and Year Submitted	D. Amount of funds requested:	E. Amount of funds to be awarded:
None	<input type="checkbox"/> NIH <input type="checkbox"/> Other federal (specify: _____) <input type="checkbox"/> Nonfederal source (specify: _)		\$	\$

11(B) Are you planning to apply for additional funding in the future to continue or expand the research?

Yes X _____ No _____

If yes, please describe your plans:

Planning to submit a follow-up human PET imaging study to elucidate effects of MORs in nicotine withdrawal and to test novel mu opioid receptor antagonist medications that may be effective for smoking cessation.

12. Future of Research Project. What are the future plans for this research project?

Planning to submit a follow-up human PET imaging study to elucidate effects of MORs in nicotine withdrawal.

13. New Investigator Training and Development. Did students participate in project supported internships or graduate or post-graduate training for at least one semester or one

summer?

Yes No

If yes, how many students? Please specify in the tables below:

	Undergraduate	Masters	Pre-doc	Post-doc
Male				1
Female			1	
Unknown				
Total			1	1

	Undergraduate	Masters	Pre-doc	Post-doc
Hispanic				
Non-Hispanic			1	1
Unknown				
Total			1	1

	Undergraduate	Masters	Pre-doc	Post-doc
White			1	
Black				
Asian				1
Other				
Unknown				
Total			1	1

14. Recruitment of Out-of-State Researchers. Did you bring researchers into Pennsylvania to carry out this research project?

Yes No

If yes, please list the name and degree of each researcher and his/her previous affiliation:

15. Impact on Research Capacity and Quality. Did the health research project enhance the quality and/or capacity of research at your institution?

Yes No

If yes, describe how improvements in infrastructure, the addition of new investigators, and other resources have led to more and better research.

This research project was the first to initiate 11C-carfentanil PET imaging in the Department of Radiology/Division of Nuclear Medicine at Penn. There are now several investigators who can build upon this experience for studies of mu opioid receptor imaging in vivo.

16. Collaboration, business and community involvement.

16(A) Did the health research funds lead to collaboration with research partners outside of your institution (e.g., entire university, entire hospital system)?

Yes X No _____

If yes, please describe the collaborations:

New collaboration with Dr. Jon Kar Zubieta at the University of Michigan. Dr. Zubieta provided input on PET imaging protocols and coauthored manuscripts

16(B) Did the research project result in commercial development of any research products?

Yes _____ No X _____

If yes, please describe commercial development activities that resulted from the research project:

16(C) Did the research lead to new involvement with the community?

Yes _____ No X _____

If yes, please describe involvement with community groups that resulted from the research project:

17. Progress in Achieving Research Goals, Objectives and Aims.

List the project goals, objectives and specific aims (as contained in the grant agreement). Summarize the progress made in achieving these goals, objectives and aims for the period that the project was funded (i.e., from project start date through end date). Indicate whether or not each goal/objective/aim was achieved; if something was not achieved, note the reasons why. Describe the methods used. If changes were made to the research goals/objectives/aims, methods, design or timeline since the original grant application was submitted, please describe the changes. Provide detailed results of the project. Include evidence of the data that was generated and analyzed, and provide tables, graphs, and figures of the data. List published abstracts, poster presentations and scientific meeting presentations at the end of the summary of progress; peer-reviewed publications should be listed under item 20.

This response should be a DETAILED report of the methods and findings. It is not sufficient to state that the work was completed. Insufficient information may result in an unfavorable performance review, which may jeopardize future funding. If research findings are pending publication you must still include enough detail for the expert peer reviewers to evaluate the

progress during the course of the project.

Health research grants funded under the Tobacco Settlement Act will be evaluated via a performance review by an expert panel of researchers and clinicians who will assess project work using this Final Progress Report, all project Annual Reports and the project's strategic plan. After the final performance review of each project is complete, approximately 12-16 months after the end of the grant, this Final Progress Report, as well as the Final Performance Review Report containing the comments of the expert review panel, and the grantee's written response to the Final Performance Review Report, will be posted on the CURE Web site.

There is no limit to the length of your response. Responses must be single-spaced below, no smaller than 12-point type. If you cut and paste text from a publication, be sure symbols print properly, e.g., the Greek symbol for alpha (α) and beta (β) should not print as boxes (\square) and include the appropriate citation(s). DO NOT DELETE THESE INSTRUCTIONS.

Broad Research Objective: To characterize the brain mechanisms that explain the association of the mu opioid receptor (*OPRM1*) gene Asn40Asp polymorphism association with nicotine dependence.

Specific Aim and Hypotheses: To examine the effects of IV nicotine (vs. placebo) on mu opioid receptor binding potential (MOR BP) in smokers stratified by *OPRM1* genotype.

Hypothesis 1: Compared to smokers homozygous for the Asn40 allele (high risk), those carrying the Asp40 allele (low risk) will exhibit attenuated effects of nicotine on MOR BP in ventral striatum. Specifically, in the placebo session, the Asn40 group will have higher MOR BP (increased availability of MORs) than the Asp40 group; in the nicotine session, MOR BP should decrease more in the Asn40 group than the Asp40 group (due to greater endogenous MOR neurotransmission).

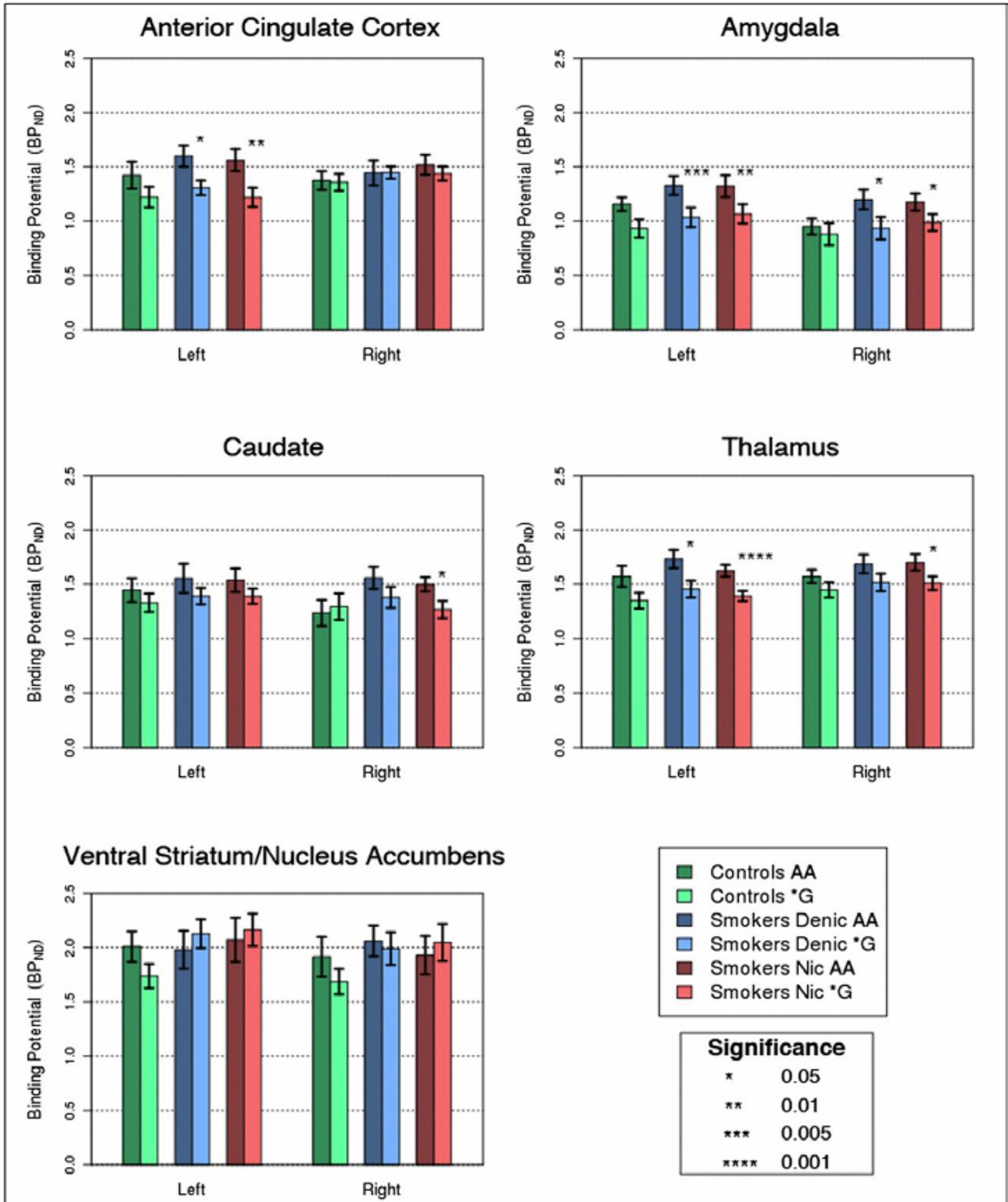
Hypothesis 2: Asp40 carriers will have attenuated subjective responses to IV nicotine (e.g., "drug liking").

Research Design and Methods : This human positron emission tomography study will assess effects of nicotine on mu opioid receptor (MOR) binding potential in 24 chronic smokers stratified by *OPRM1* A118G genotype (12 AA and 12 AG/GG). In the first experiment, smokers will participate in two PET imaging sessions with [¹¹C]Carfentanil after overnight abstinence: (a) after smoking a nicotine containing cigarette, and (b) after smoking a denicotinized cigarette. The primary outcome variable is MOR binding potential (BP) (reflecting receptor availability) in ventral striatum and additional regions of interest (ROIs). In addition, we will complete a single PET imaging session with 20 nonsmoker controls (10 of each genotype). In the second experiment, we will follow the identical procedures, except that nicotine will be administered intravenously: (a) IV nicotine 1.0mg/70kg; and (b) IV placebo (saline) (within-subject, double-blind, counter-balanced order).

Results

We completed our primary experiment with human PET imaging to examine MOR binding potential in smokers and non-smokers. Participants included 24 smokers of European ancestry (12 AA and 12 AG/GG, matched for sex) and 20 non-smoker controls of European ancestry (10 AA and 10 AG). The smokers completed two 60-minute [11C]carfentanil PET scans following overnight abstinence from smoking. Prior to each PET scan, they smoked either a nicotine (0.6 mg) cigarette or a denicotinized (0.05 mg) cigarette, using a standardized puffing procedure. Non-smokers completed a single 60-minute [11C]carfentanil PET scan. MOR binding potential (BPND [ND = non-displaceable, specific binding]) was the primary outcome. On the basis of the finding of reduced protein levels of MOR in knock-in mice that carry the G allele, we predicted that *OPRM1* G allele carriers would have reduced MOR binding potential compared with those homozygous for the A allele. Furthermore, we hypothesized that the extent of displacement of the radioligand (i.e., changes in MOR BPND across the two sessions) would be reduced in smokers with the G allele. Regions with high MOR density, which are important in the mesolimbic reward circuits in addiction, were selected as regions of interest (ROIs): anterior cingulate cortex (ACC), amygdala (AMY), caudate (CAU), ventral striatum/nucleus accumbens (VST), and thalamus (THA). Independent of session, smokers homozygous for the wild-type *OPRM1* A allele exhibited significantly higher levels of MOR BPND than smokers carrying the G allele in bilateral amygdala, left thalamus, and left anterior cingulate cortex (Figures 2 and 3). Among G allele carriers, the extent of subjective reward difference (denicotinized versus nicotine cigarette) was associated significantly with MOR BPND difference in right amygdala, caudate, anterior cingulated cortex, and thalamus (*Ray et al., PNAS 2011*). See Figure 1 below.

Figure 1. MOR binding potential values by group and genotype



As reported in the Annual Progress Report: 2008 Formula Grant Reporting Period, July 1, 2010 – June 30, 2011: “We initiated the second experiment which focused on IV nicotine rather than nicotine delivered via cigarette smoking. Between January 1, 2010 and March 31, 2011 we enrolled 6 participants. However, due to problems in the cyclotron facility, the production of carfentanil was unreliable. Several scans had to be cancelled due to insufficient activity. Based on these production issues, it is no longer feasible to pursue the second experiment”.

Given the success of our first experiment using nicotine delivered via cigarette smoking, we decided to focus our efforts on further analysis of these data. Endogenous opioid neurotransmission, and the MOR in particular, plays a role in affective regulation and is modulated by nicotine. In a secondary data analysis, we examined the relationship of MOR BPND in the amygdala to the motivation to smoke for negative affect relief and to the acute effects of smoking on affective responses. Self-reports of smoking motives were collected at baseline using the Reasons for Smoking (RFS) Scale. Measures of positive and negative affect were collected pre- and post-cigarette smoking. Higher MOR availability in the amygdala during the nicotine session was associated with motivation to smoke to relieve negative affect. However, smoking did not alter negative affective responses in either session, and MOR availability was unrelated to changes in negative affect. Increased MOR availability in amygdala may underlie the motivation to smoke for negative affective relief. These results are consistent with prior work suggesting that smokers’ expectations of negative affect relief from smoking are discrepant from what is actually experienced (Falcone et al., *Psychopharmacology* 2012). Please see Figures 2 and 3 below.

Figure 2. MOR binding potential masks for each region of interest

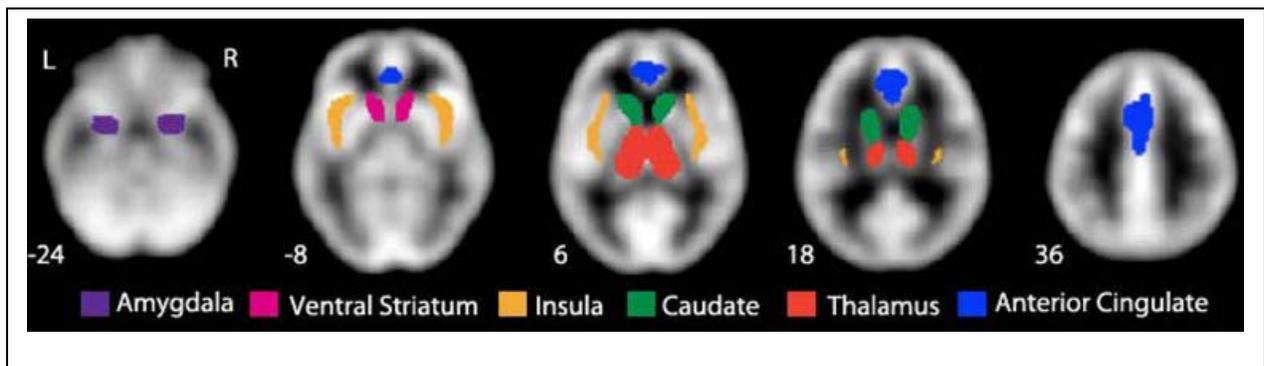
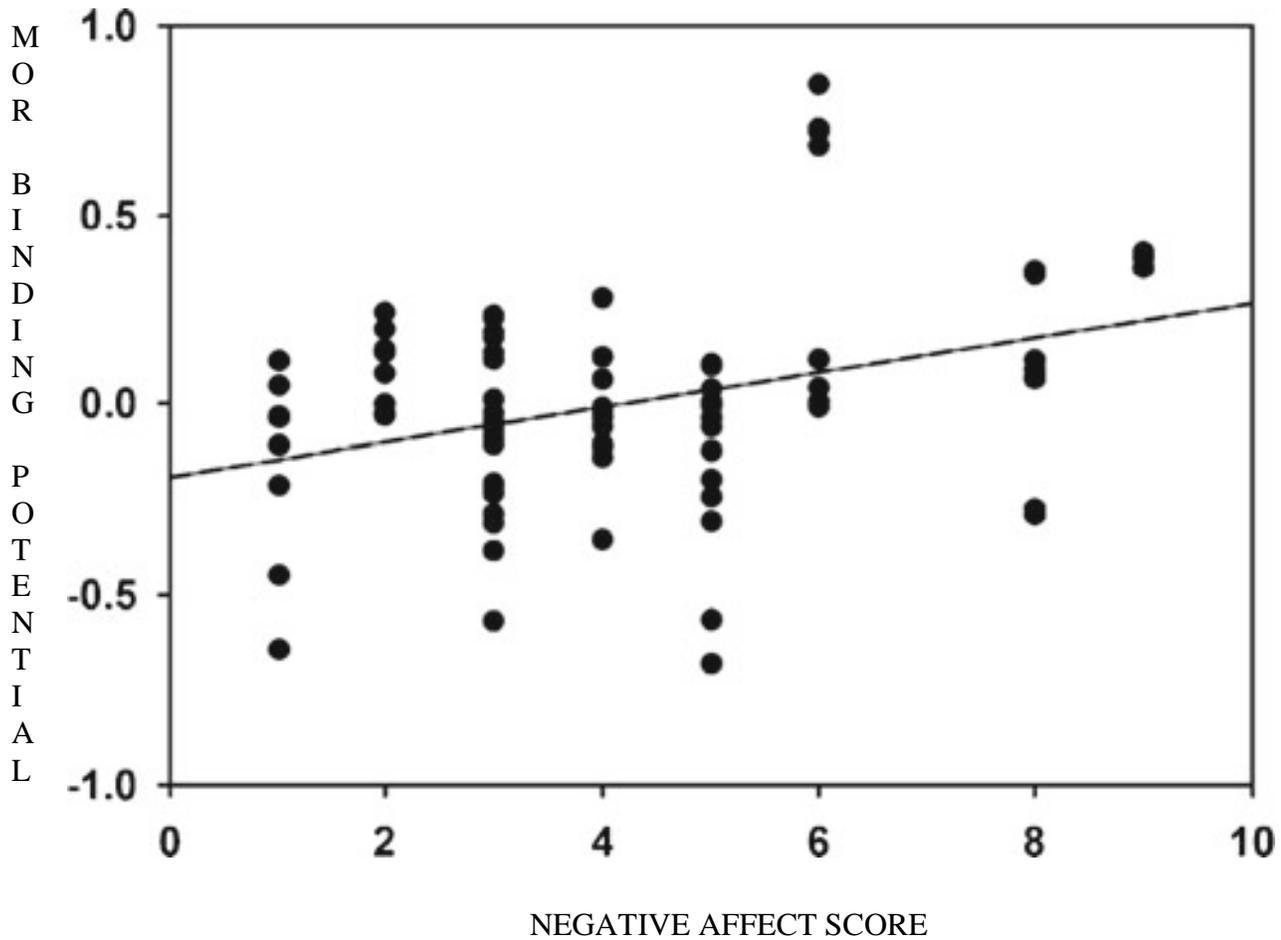


Figure 3. Association of negative affect score with MOR binding potential in amygdala



18. Extent of Clinical Activities Initiated and Completed. Items 18(A) and 18(B) should be completed for all research projects. If the project was restricted to secondary analysis of clinical data or data analysis of clinical research, then responses to 18(A) and 18(B) should be “No.”

18(A) Did you initiate a study that involved the testing of treatment, prevention or diagnostic procedures on human subjects?

Yes

No

18(B) Did you complete a study that involved the testing of treatment, prevention or diagnostic procedures on human subjects?

Yes

No

If “Yes” to either 18(A) or 18(B), items 18(C) – (F) must also be completed. (Do NOT complete 18(C-F) if 18(A) and 18(B) are both “No.”)

18(C) How many hospital and health care professionals were involved in the research project?

 3 Number of hospital and health care professionals involved in the research project

18(D) How many subjects were included in the study compared to targeted goals?

 24 Number of subjects originally targeted to be included in the study
 44 Number of subjects enrolled in the study (note: 20 additional nonsmoking controls were included as reported in PNAS paper)

Note: Studies that fall dramatically short on recruitment are encouraged to provide the details of their recruitment efforts in Item 17, Progress in Achieving Research Goals, Objectives and Aims. For example, the number of eligible subjects approached, the number that refused to participate and the reasons for refusal. Without this information it is difficult to discern whether eligibility criteria were too restrictive or the study simply did not appeal to subjects.

18(E) How many subjects were enrolled in the study by gender, ethnicity and race?

Gender:

 41 Males
 18 Females
 Unknown

Note: the number enrolled (59) exceeds the number that completed (44)

Ethnicity:

 Latinos or Hispanics
 Not Latinos or Hispanics
 Unknown

Race:

 American Indian or Alaska Native
 Asian
 Blacks or African American
 Native Hawaiian or Other Pacific Islander
 59 White
 Other, specify: _____
 Unknown

NOTE: all subjects European ancestry as the OPRM1 G allele is found in less than 2% of African Americans

18(F) Where was the research study conducted? (List the county where the research study was conducted. If the treatment, prevention and diagnostic tests were offered in more than one county, list all of the counties where the research study was conducted.)

19. Human Embryonic Stem Cell Research. Item 19(A) should be completed for all research projects. If the research project involved human embryonic stem cells, items 19(B) and 19(C) must also be completed.

19(A) Did this project involve, in any capacity, human embryonic stem cells?

Yes
 No

19(B) Were these stem cell lines NIH-approved lines that were derived outside of Pennsylvania?

Yes
 No

19(C) Please describe how this project involved human embryonic stem cells:

20. Articles Submitted to Peer-Reviewed Publications.

20(A) Identify all publications that resulted from the research performed during the funding period and that have been submitted to peer-reviewed publications. Do not list journal abstracts or presentations at professional meetings; abstract and meeting presentations should be listed at the end of item 17. **Include only those publications that acknowledge the Pennsylvania Department of Health as a funding source** (as required in the grant agreement). List the title of the journal article, the authors, the name of the peer-reviewed publication, the month and year when it was submitted, and the status of publication (submitted for publication, accepted for publication or published.). Submit an electronic copy of each publication or paper submitted for publication, listed in the table, in a PDF version 5.0.5 (or greater) format, 1,200 dpi. Filenames for each publication should include the number of the research project, the last name of the PI, the number of the publication and an abbreviated research project title. For example, if you submit two publications for PI Smith for the “Cognition and MRI in Older Adults” research project (Project 1), and two publications for PI Zhang for the “Lung Cancer” research project (Project 3), the filenames should be:

- Project 1 – Smith – Publication 1 – Cognition and MRI
- Project 1 – Smith – Publication 2 – Cognition and MRI
- Project 3 – Zhang – Publication 1 – Lung Cancer
- Project 3 – Zhang – Publication 2 – Lung Cancer

If the publication is not available electronically, provide 5 paper copies of the publication.

Note: The grant agreement requires that recipients acknowledge the Pennsylvania Department of Health funding in all publications. Please ensure that all publications listed acknowledge the Department of Health funding. If a publication does not acknowledge the funding from the Commonwealth, do not list the publication.

Title of Journal Article:	Authors:	Name of Peer-reviewed Publication:	Month and Year Submitted:	Publication Status (check appropriate box below):
1. Human mu opioid receptor (OPRM1 A118G) polymorphism is associated with brain mu opioid receptor binding potential in smokers	Ray R, Ruparel K, Newberg A, Wileyto E., Loughhead J, Divgi C, Blendy JA, Logan J, Zubieta JK, Lerman C	Proceedings of the National Academy of Sciences (PNAS) 2011 May; 108(22):9268-9273 (PMC3107291).	Dec 2010	<input type="checkbox"/> Submitted <input type="checkbox"/> Accepted <input checked="" type="checkbox"/> Published
2. μ -opioid receptor availability in the amygdala is associated with smoking for negative affect relief.	Falcone M, Gold A, Wileyto EP, Ray R, Ruparel K, Newberg A, Dubroff J, Logan J, Zubieta J-K, Blendy J, Lerman C	Psychopharmacology 2012 Aug; 222 (4):701-8	Oct 2011	<input type="checkbox"/> Submitted <input type="checkbox"/> Accepted <input checked="" type="checkbox"/> Published

20(B) Based on this project, are you planning to submit articles to peer-reviewed publications in the future?

Yes _____ No _____

If yes, please describe your plans:

21. Changes in Outcome, Impact and Effectiveness Attributable to the Research Project.

Describe the outcome, impact, and effectiveness of the research project by summarizing its impact on the incidence of disease, death from disease, stage of disease at time of diagnosis, or other relevant measures of outcome, impact or effectiveness of the research project. If there were no changes, insert "None"; do not use "Not applicable." Responses must be single-spaced below, and no smaller than 12-point type. DO NOT DELETE THESE INSTRUCTIONS. There is no limit to the length of your response.

Not applicable at this stage of basic research. See below.

22. Major Discoveries, New Drugs, and New Approaches for Prevention Diagnosis and Treatment.

Describe major discoveries, new drugs, and new approaches for prevention, diagnosis and treatment that are attributable to the completed research project. If there were no major discoveries, drugs or approaches, insert “None”; do not use “Not applicable.” Responses must be single-spaced below, and no smaller than 12-point type. DO NOT DELETE THESE INSTRUCTIONS. There is no limit to the length of your response.

This research provided the first evidence for a link between a genetic variant, mu opioid receptor binding availability, and smoking reward. With the publication in a high impact journal (PNAS), this work has brought attention to the use of PET imaging and genetics to understand the neurochemical basis of substance abuse. The next generation of studies will examine the effects of novel substance abuse medications on mu opioid receptor binding and behavior. The results of these studies could lead to development and delivery of more effective medications for substance abuse and smoking cessation.

23. Inventions, Patents and Commercial Development Opportunities.

23(A) Were any inventions, which may be patentable or otherwise protectable under Title 35 of the United States Code, conceived or first actually reduced to practice in the performance of work under this health research grant? Yes _____ No X

If “Yes” to 23(A), complete items a – g below for each invention. (Do NOT complete items a - g if 23(A) is “No.”)

- a. Title of Invention:
- b. Name of Inventor(s):
- c. Technical Description of Invention (describe nature, purpose, operation and physical, chemical, biological or electrical characteristics of the invention):
- d. Was a patent filed for the invention conceived or first actually reduced to practice in the performance of work under this health research grant?
Yes _____ No _____

If yes, indicate date patent was filed:

- e. Was a patent issued for the invention conceived or first actually reduced to practice in the performance of work under this health research grant?
Yes _____ No _____

If yes, indicate number of patent, title and date issued:

Patent number:

Title of patent:

Date issued:

f. Were any licenses granted for the patent obtained as a result of work performed under this health research grant? Yes _____ No ____
If yes, how many licenses were granted? _____

g. Were any commercial development activities taken to develop the invention into a commercial product or service for manufacture or sale? Yes ____ No ____

If yes, describe the commercial development activities:

23(B) Based on the results of this project, are you planning to file for any licenses or patents, or undertake any commercial development opportunities in the future?

Yes _____ No X _____

If yes, please describe your plans:

24. Key Investigator Qualifications. Briefly describe the education, research interests and experience and professional commitments of the Principal Investigator and all other key investigators. In place of narrative you may insert the NIH biosketch form here; however, please limit each biosketch to 1-2 pages. *For Nonformula grants only – include information for only those key investigators whose biosketches were not included in the original grant application.*

BIOGRAPHICAL SKETCH

NAME Lerman, Caryn	POSITION TITLE Mary W. Calkins Professor		
eRA COMMONS USER NAME CLERMAN			
EDUCATION/TRAINING <i>(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)</i>			
INSTITUTION AND LOCATION	DEGREE <i>(if applicable)</i>	YEAR(s)	FIELD OF STUDY
Pennsylvania State University, University Park, PA	B.S.	1981	Psychology
University of Southern California, Los Angeles, CA	M.A.	1982	Psychology
University of Southern California, Los Angeles, CA	Ph.D.	1984	Clinical Psychology

A. Personal Statement

Dr. Lerman is the Mary W. Calkins Professor in the Department of Psychiatry and the Deputy Director of the Abramson Cancer Center at the University of Pennsylvania. She is an Elected Member of the Institute of Medicine of the National Academy of Sciences, and has served as a member of the National Cancer Institute Board of Scientific Advisors and the National Human Genome Research Institute Advisory Council. She is a current member of the National Institute on Drug Abuse Advisory Council and past President of the Society for Research on Nicotine and Tobacco. Her research focuses on nicotine addiction medication development and pharmacogenetics.

B. Positions and Honors

Positions and Employment

1985-1986	Assistant Professor of Psychiatry, Director of Health Psychology, Medical College of Pennsylvania, Philadelphia, PA
1986-1988	Assistant Professor of Medicine and Psychiatry, Temple University School of Medicine, Philadelphia, PA
1988-1993	Associate Member, Director of Behavioral Oncology Research, Fox Chase Cancer Center, Philadelphia, PA
1993-1998	Associate Professor, Departments of Medicine and Psychiatry, Georgetown University Medical Center (GUMC), Washington, DC
1998-2001	Professor, Departments of Oncology and Medicine, Georgetown University Medical Center (GUMC), Washington, DC
2001-2006	Associate Director, Cancer Control and Population Sciences, Abramson Cancer, University of Pennsylvania, Philadelphia, PA
2001-pres.	Mary W. Calkins Professor, Department of Psychiatry and Annenberg Public Policy Center, University of Pennsylvania, Philadelphia, PA
2006-pres.	Deputy Director, Abramson Cancer Center, University of Pennsylvania, Philadelphia, PA
2010-2011	Interim Director, Abramson Cancer Center, University of Pennsylvania, Philadelphia, PA

Honors

1981	Phi Beta Kappa
1981	Magna Cum Laude, Pennsylvania State University
1989	New Investigator Award, Society of Behavioral Medicine
1991	Preventive Oncology Academic Award, National Cancer Institute/National Institutes of Health

- 1995 Award for Outstanding Contributions to Health Psychology, American Psychological Assn.
- 2004 Joseph Cullen Memorial Award, American Society of Preventive Oncology
- 2007 Alton Ochsner Award Relating Smoking and Health, American College of Chest Physicians
- 2007 American Cancer Society, Cancer Control Award - Southeastern Pennsylvania
- 2008 Arthur Asbury Outstanding Faculty Mentor Award, University of Pennsylvania
- 2009 Elected President of the Society for Research on Nicotine and Tobacco
- 2010 Elected Member, Institute of Medicine of the National Academy of Sciences
- 2011 William Osler Patient-Oriented Research Award, University of Pennsylvania

C. Selected Peer-Reviewed Publications (Out of 318)

- Lerman C**, et al. BRCA1 testing in families with hereditary breast-ovarian cancer. A prospective study of patient decision-making and outcomes. Journal of the American Medical Association, 1996; 275(24):1885-1892.
- Lerman C**, et al. Genetic testing in families with hereditary nonpolyposis colon cancer. Journal of the American Medical Association, 1999; 281(17):1618-1622.
- Lerman C**, et al. Individualizing nicotine replacement therapy for the treatment of tobacco dependence. Annals of Internal Medicine, 2004; 140(6):426-433.
- Lerman C**, et al. Translational research in medication development for nicotine dependence. Nature Reviews Drug Discovery, 2007; 6(9):746-762.
- Wang Z, Faith M, Patterson F, Tang K, Kerrin K, Wileyto EP, Detre JA, **Lerman C**. Neural substrates of abstinence-induced cigarette cravings in chronic smokers. Journal of Neuroscience, 2007; (27):14030-14040.
- Patterson F, Schnoll RA, Wileyto EP, Pinto A, Epstein LH, Shields PG, Hawk LW, Tyndale RF, Benowitz N, **Lerman C**. Toward personalized therapy for smoking cessation: a randomized placebo-controlled trial of bupropion. Clinical Pharmacology & Therapeutics, 2008; 84, 320-325 (PMID18388868; PMC in Progress).
- Loughead J, Wileyto EP, Valdez NJ, Sanborn P, Tang K, Strasser AA, Ruparel K, Ray R, Gur RC, **Lerman C**. Effect of abstinence challenge on brain function and cognition in smokers differs by COMT genotype. Molecular Psychiatry, 2009; 14(8):820-826 (PMID19065145; PMC in Progress).
- Langleben DD, Loughead JW, Ruparel K, Hakun JG, Strasser A, Holloway MX, Cappella JN, **Lerman C**. Reduced prefrontal and temporal processing and recall of high "sensation value" ads. Neuroimage, 2009; 46(1):219-225 (PMID19457412; PMC2896241; NIHMS183449).
- Mague SD, Isiegas C, Huang P, Liu-Chen L-Y, **Lerman C**, Blendy JA. Mouse model of *OPRM1* (A118G) polymorphism has sex-specific effects on drug-mediated behavior. Proceedings of the National Academy of Sciences, USA, 2009; 106(26):10847-10852 (PMID19528658; PMC2705603).
- Schnoll RA, Patterson F, Wileyto EP, Heitjan D, Shields AE, Asch D., **Lerman C**. Effectiveness of extended-duration transdermal nicotine therapy: a randomized trial. Annals of Internal Medicine, 2010; 152(3):144-151 (PMID20124230; PMC in Progress).
- Ray R, Mitra N, Baldwin D, Guo M, Patterson F, Heitjan DJ, Jepsen C, Wileyto EP, Wei J, Payne T, Ma JZ, Li MD, **Lerman C**. Convergent evidence that choline acetyltransferase gene variation is associated with prospective smoking cessation and nicotine dependence. Neuropsychopharmacology, 2010; 35(6):1374-1382 (PMID20147892; PMC2855736).
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