APPENDIX 1: ALLOCATION OF THE SPECIAL STATUTORY FUNDS FOR TYPE 1 DIABETES RESEARCH

The complete budget allocation of the *Special Statutory Funding Program for Type 1 Diabetes Research* from FY 1998 through FY 2005 is provided in this Appendix. It is important to note that the six overarching goals of type 1 diabetes research are interdependent. For example, "Attracting New Talent and Applying New Technologies" (Goal VI) is important for every area of type 1 diabetes research. Furthermore, the scientific aims of many of the initiatives coincide with multiple Goals. However, to facilitate management of this program, most initiatives have been assigned to a single, specific Goal.

BUDGET OF THE *SPECIAL FUNDING PROGRAM*

The expenditure of funds from the *Special Statutory Funding Program for Type 1 Diabetes Research* is detailed in Table A1. Budget figures for FY 1998 through FY 2005 represent actual spending levels. Some of the projects have received additional support from funds provided to the National Institutes of Health (NIH) or the Centers for Disease Control and Prevention (CDC) through the regular appropriations process or through non-governmental sources. Scientific descriptions of each funded or planned initiative are located in the main text and this Appendix.

Table A1: Detailed Budget by Goal of the *Special Statutory Funding Program for Type 1 Diabetes Research* (FY 1998-2005)

	1998	1999	2000	2001	2002	2003	2004	2005
GOAL I: IDENTIFY THE GENETIC AND ENVIRONMENTAL CAUSES OF TYPE 1 DIABETES								
Type 1 Diabetes Genetics Consortium (T1DGC) (NIDDK, NIAID, NHGRI, JDRF, Diabetes UK)	0	0	0	1,536,000	5,047,330	8,958,898	13,000,000	17,541,724
Repository Services for T1DGC (NIDDK)	0	0	0	0	0	0	0	1,000,000
13th International Histocompatibilty Working Group (NIAID, NIDDK, NCI, NHGRI, JDRF)	0	0	0	3,000,000	1,000,000	0	0	0
Search for Diabetes in Youth (SEARCH) (CDC, NIDDK)	0	0	0	4,200,000	3,000,000	3,000,000	4,000,000	2,000,000
The Environmental Determinants of Diabetes in the Young (TEDDY) (RFA DK02-029) (NIDDK, NIAID, NICHD, NIEHS, CDC, JDRF, ADA)	0	0	0	0	5,000,000	7,568,300	17,500,000	24,542,679
Type 1 Diabetes Mouse Repository (NCRR, NIDDK)	0	0	0	4,000,000	0	0	0	0
Bioinformatics Integration Support Contract (RFP AI-DAIT02-16) (NIAID)	0	0	0	0	1,000,000	0	0	0
Mammalian Gene Collection (NCI, NIDDK)	0	0	0	500,000	0	0	0	0
Sequence the NOD Mouse for Immune System Genes for Type 1 Diabetes (NIAID)	0	0	0	4,500,000	0	0	0	0
Biotechnology Resource Centers (RFA DK00-002) (NIDDK)	0	0	454,575	693,750	502,250	0	0	0
Functional Genomics of the Developing Endocrine Pancreas (RFA DK99-007) (NIDDK)	0	1,500,000	3,241,602	3,081,250	0	0	0	0
Public Health Pilot Programs in Newborn Screening (CDC)	246,718	301,544	548,261	804,826	609,652	0	0	0
Proficiency Testing for Laboratory Assays of Dried Blood Spots (CDC)	0	0	0	0	0	190,256	0	0
High-Throughput, High-Sensitivity Methods for Measuring Markers of Type 1 Diabetes (CDC)	246,718	268,648	219,305	219,305	219,305	0	0	0
Cadaveric Pancreata of Autoantibody Positive Individuals (NIDDK)	0	0	0	0	0	0	308,000	0
Total—Goal I[1]	**493,436**	**2,070,192**	**4,463,743**	**22,535,131**	**16,378,537**	**19,717,454**	**34,808,000**	**45,084,403**

Table A1: continued

	1998	1999	2000	2001	2002	2003	2004	2005
GOAL II: PREVENT OR REVERSE TYPE 1 DIABETES								
Type 1 Diabetes TrialNet (RFA DK01-004) (NIDDK, NIAID, NICHD, JDRF, ADA) and Immune Tolerance Network (RFP-AI-99-30) (NIAID, NIDDK, JDRF)[2]	0	0	0	17,320,000	15,489,174	12,920,894	11,242,933	7,350,382
Recruitment for Clinical Research Studies (Matthews Media)	0	0	0	0	0	0	943,215	716,010
Type 1 Diabetes–Rapid Access to Intervention Development (T1D-RAID) (Prevention Projects) (NIDDK, NCI)	0	0	0	0	0	0	105,000	1,575,503
Cooperative Study Group for Autoimmune Diseases Prevention (RFA AI00-016) (NIAID, NICHD, NIDDK, ORWH, JDRF)	0	0	0	2,154,000	2,318,796	2,336,681	2,354,595	2,392,355
Trial To Reduce IDDM in the Genetically-At-Risk (TRIGR) (NICHD, CIHR, EFSD, EU, JDRF, Mead Johnson, NDF)	0	0	0	2,000,000	500,000	500,000	3,000,000	1,799,998
Diabetes Autoantibody Standardization Program (DASP) (CDC, IDS)	816,680	746,014	438,609	778,609	755,199	1,158,101	675,000	566,000
C Peptide Standardization (CDC, NIDDK)	0	0	0	0	0	57,225	64,301	34,854
Data and Biosample Repository (RFP DK02-04) (NIDDK)	0	0	0	0	0	3,000,000	0	0
Gene Therapy Approaches for Diabetes and Its Complications (RFA DK01-006) (NIDDK, NHLBI, NIAID)	0	0	0	993,000	1,112,600	0	0	0
Innovative Grants on Immune Tolerance (RFA AI00-006) (NIAID, NIDDK)	0	0	0	2,443,000	1,658,523	1,658,523	982,665	741,765
Pilot Studies for New Therapies for Type 1 Diabetes and Its Complications (RFA DK99-013) (NIDDK, NIAID)	0	1,146,742	1,170,524	0	0	0	0	0
Immunopathogenesis of Type 1 Diabetes (RFA DK98-010) (NIDDK, NIAID, NICHD)	4,086,215	4,124,050	3,806,447	0	0	0	0	0
Autoantibodies in Type 1 Diabetes (NIDCR)	0	100,000	200,344	200,000	100,000	0	0	0
Diabetes Prevention Trial for Type 1 Diabetes–Supplements (NIDDK, NIAID, NICHD, NCRR)	3,350,000	95,000	0	0	0	0	0	0
One-Year Supplements to Ongoing Projects (NIDDK, NIAID, NCRR)	994,340	0	0	0	0	0	0	0
Total—Goal II[3]	**9,247,235**	**6,211,806**	**5,615,924**	**25,888,609**	**21,934,292**	**21,631,424**	**19,367,709**	**15,176,867**

Table A1: continued

	1998	1999	2000	2001	2002	2003	2004	2005
GOAL III: DEVELOP CELL REPLACEMENT THERAPY								
Beta Cell Biology Consortium (RFA DK01-014) (NIDDK)	0	0	0	7,250,000	7,589,779	6,790,240	6,126,956	583,095
Beta Cell Biology Consortium (RFA DK04-017; RFA DK04-018) (NIDDK)	0	0	0	0	0	0	0	8,308,561
Clinical Islet Transplantation Consortium (RFA DK04-005; RFA DK04-004) (NIDDK, NIAID)	0	0	0	0	0	0	24,569,188	14,977,134
Comprehensive Programs in Beta Cell Biology (RFA DK02-014) (NIDDK)	0	0	0	0	3,154,850	3,055,850	2,393,922	1,942,751
Non-Human Primate Transplantation Tolerance Cooperative Study Group (RFA AI01-006) (NIAID, NIDDK)	0	0	0	518,000	1,822,876	1,772,003	4,979,323	4,156,398
Immune Tolerance Network—Islet Transplantation (RFP AI99-30) (NIAID, NIDDK, JDRF)	0	0	0	3,500,000	0	0	1,417,000	0
Immunobiology of Xenotransplantation Cooperative Research Program (RFA AI04-042) (NIAID, NIDDK)	0	0	0	0	0	0	0	1,929,129
NIDDK Intramural Program (NIDDK)	0	492,458	0	1,370,000	0	0	0	0
Islet Cell Resource Centers (ICR) (RFA RR01-002) (NCRR, NIDDK)	0	0	0	5,000,000	1,999,998	5,000,000	5,000,000	5,000,000
Collaborative Islet Transplant Registry (CITR) (RFP DK00-02) (NIDDK)	0	0	0	3,964,000	0	0	0	336,988
Pilot and Feasibility Program in Human Islet Biology (RFA DK03-021) (NIDDK)	0	0	0	0	0	0	2,010,158	3,830,341
Islet Encapsulation Research (NIDDK)	0	0	0	0	894,471	0	0	0
Gene Transfer Approaches To Enhance Islet Transplantation (RFA DK02-020) (NIDDK, NIAID)	0	0	0	0	1,744,423	1,727,771	0	0
Imaging Pancreatic Beta Cell Mass, Function, Engraftment, or Inflammation (RFA DK02-002) (NIDDK)	0	0	0	0	1,258,302	1,356,106	651,723	651,723
New Strategies for Treatment of Type 1 Diabetes (RFA DK00-001) (NIDDK)	0	0	1,135,749	1,107,681	882,200	0	0	0
Pilot Studies for New Therapies for Type 1 Diabetes and Its Complications (RFA DK99-013) (NIDDK)	0	779,293	783,039	0	0	0	0	0
Cellular and Molecular Approaches to Achieving Euglycemia (RFA DK98-007) (NIDDK, NIAID, NICHD)	4,883,944	4,921,491	3,962,434	0	0	0	0	0
Beta Cell Proteomics (NIDDK, NHGRI)	0	0	0	2,495,000	0	0	0	0
Glucagon-like Peptide as a Differentiation Factor for Pancreatic Beta Cells (NIA)	94,379	99,995	0	0	0	0	0	0
One-Year Supplements to Ongoing Projects (NIDDK, NIAID, NICHD)	1,401,654	0	0	0	0	0	0	0
Total—Goal III		**6,293,237**	**5,881,222**	**25,204,681**	**19,346,899**	**19,701,970**	**47,148,270**	**41,716,120**

Table A1: continued

	1998	1999	2000	2001	2002	2003	2004	2005
GOAL IV: PREVENT OR REDUCE HYPOGLYCEMIA IN TYPE 1 DIABETES								
Diabetes Research in Children Network (DirecNet) (RFA HD01-009) (NICHD, NIDDK)	0	0	0	2,000,000	3,148,071	1,886,158	2,500,000	2,499,994
Standardization Program To Improve the Measurement of Blood Glucose (CDC)	0	148,284	188,931	231,526	101,319	209,282	0	0
Hypoglycemia in Patients with Type 1 Diabetes (RFA DK03-017) (NIDDK, NINDS)	0	0	0	0	0	0	2,475,590	2,532,821
Effects of Hypoglycemia on Neuronal and Glial Cell Function (RFA NS02-008) (NINDS, NIDDK, JDRF)	0	0	0	0	1,454,310	1,438,495	646,480	645,090
Sensor Development and Validation (RFA EB02-002) (NIBIB, NIDDK)	0	0	0	0	2,091,949	2,073,237	1,405,465	641,154
Understanding Hypoglycemia Unawareness in Patients with Diabetes (RFA DK01-031) (NIDDK, NINDS, JDRF)	0	0	0	0	2,055,648	2,036,527	1,362,001	1,361,842
Pilot Studies for New Therapies for Type 1 Diabetes and Its Complications (RFA DK99-013) (NIDDK)	0	141,408	130,216	0	0	0	0	0
Glucose Sensors in the Treatment of Diabetes (RFA DK98-008) (NIDDK, NCRR)	3,298,740	3,239,772	2,117,998	0	0	0	0	0
Developing New Tools for Detecting and Monitoring Low Blood Glucose (CDC)	0	142,548	142,548	142,548	142,548	0	0	0
Development of Surrogate Markers for Clinical Trials: Supplements (NIMH, NIDDK)	0	0	0	300,000	0	0	0	0
One-Year Supplements to Ongoing Projects (NIDDK, NCRR)	172,000	0	0	0	0	0	0	0
Total—Goal IV	**3,470,740**	**3,672,012**	**2,579,693**	**2,674,074**	**8,993,845**	**7,643,699**	**8,389,536**	**7,680,901**
GOAL V: PREVENT OR REDUCE THE COMPLICATIONS OF TYPE 1 DIABETES								
Genetics of Kidneys in Diabetes (GoKinD) Study (CDC, JDRF)	921,792	872,114	974,809	1,315,827	1,315,827	1,247,536	1,500,000	1,019,150
Epidemiology of Diabetes Interventions and Complications (EDIC): Genetics Study and Measurement of Cardiovascular Disease, Uropathy and Autonomic Neuropathy[4]	1,000,000	0	0	7,000,000	3,807,082	290,000	0	2,021,077
Type 1 Diabetes—Rapid Access to Intervention Development (T1D-RAID) (Complications Projects) (NIDDK, NCI)	0	0	0	0	0	0	75,000	344,728
Family Investigation of Nephropathy and Diabetes (FIND) (NIDDK, NEI, NCMHD)	0	0	0	500,000	500,000	500,000	500,000	500,000
Diabetic Retinopathy Clinical Research Network (DRCR.net) (RFA EY01-001) (NEI)	0	0	0	0	2,000,000	2,000,000	2,000,000	1,000,000

Table A1: continued

	1998	1999	2000	2001	2002	2003	2004	2005
Animal Models of Diabetic Complications Consortium (RFA DK01-009 and HL01-010) (NIDDK, NHLBI)	0	0	0	3,982,000	4,135,862	4,055,585	4,252,287	4,296,778
Improving the Clinical Measurement of HbA1c (CDC)	768,092	520,848	487,537	466,649	384,903	534,825	600,000	600,000
Collaborative Studies on Angiogenesis and Diabetic Complications (RFA DK04-022) (NIDDK, NINDS, NHLBI, NEI)	0	0	0	0	0	0	0	1,736,225
Progression of Cardiovascular Disease in Type 1 Diabetes (RFA HL04-013) (NHLBI, NIDDK)	0	0	0	0	0	0	3,258,309	3,470,479
Feasibility Projects To Test Strategies for Preventing or Slowing the Progression of Diabetic Nephropathy (RFA DK02-025) (NIDDK)	0	0	0	0	1,325,273	1,190,190	0	0
Surrogate Markers for Diabetic Microvascular Complications (RFA DK02-016) (NIDDK, NEI, NINDS)	0	0	0	0	3,427,339	3,468,856	2,731,380	2,031,157
Imaging Early Markers of Diabetic Microvascular Complications in Peripheral Tissue (RFA DK02-001) (NIDDK)	0	0	0	0	1,282,371	1,288,444	729,250	729,250
Oral Microbiology/Immunology of Type 1 Diabetes (RFA DE01-001) (NIDCR)	0	0	0	645,000	500,000	0	0	0
Neurobiology of Diabetic Complications (RFA NS00-002) (NINDS, NIDDK, JDRF)[5]	0	0	907,406	895,971	610,916	442,485	712,852	0
Pilot Studies for New Therapies for Type 1 Diabetes and Its Complications (RFA DK99-013) (NIDDK, NHLBI, NEI)	0	1,174,221	1,159,255	0	0	0	0	0
Neurological Complications of Diabetes (RFA NS99-005) (NINDS, NIDDK)	0	2,243,319	2,193,073	2,007,389	1,603,619	0	0	0
Pathogenesis and Therapy of Complications of Diabetes (RFA DK98-009) (NIDDK, NEI, NHLBI, NICHD, NINDS)	6,713,260	6,914,914	5,622,671	440,431	452,086	0	0	0
Development of Clinical Markers for Kidney Disease (NIDDK)	0	0	0	834,000	0	0	0	0
Advanced Glycation Endproducts (CDC)	0	0	0	280,710	57,567	0	0	0
Development of Surrogate Markers for Clinical Trials: Supplement (NIEHS, NIDDK)	0	0	0	318,000	0	0	0	0
One-Year Supplements to Ongoing Projects (NIDDK, NEI, NIDCR, NICHD, NHLBI)	936,150	0	0	0	0	0	0	0
Functional Genomics Approaches to Diabetic" Complications–IHWG SNPs (NHGRI, NIDDK)[6]	0	0	0	750,000	0	0	0	0
Total—Goal V[7]	**10,339,294**	**11,725,416**	**11,344,751**	**19,435,977**	**21,402,845**	**15,017,921**	**16,359,078**	**17,748,844**

Table A1: continued

	1998	1999	2000	2001	2002	2003	2004	2005
GOAL VI: ATTRACT NEW TALENT AND APPLY NEW TECHNOLOGIES TO RESEARCH ON TYPE 1 DIABETES								
Training Programs in Diabetes Research for Pediatric Endocrinologists (RFA DK02-024) (NIDDK, JDRF, ADA)	0	0	0	0	2,571,342	3,472,772	3,274,907	3,169,415
Innovative Partnerships in Type 1 Diabetes Research (RFA DK02-023) (NIDDK, NEI, NIAID)	0	0	0	0	5,778,702	5,620,843	4,337,638	4,258,939
Bench to Bedside Research on Type 1 Diabetes and Its Complications (RFA DK02-022) (NIDDK, NIAID)	0	0	0	0	3,443,507	3,587,082	392,500	1,236,677
Bench to Bedside Research on Type 1 Diabetes and Its Complications (RFA DK03-001) (NIDDK, NIAID, NEI, NHLBI)	0	0	0	0	0	3,449,975	3,415,870	1,629,440
Bench to Bedside Research on Type 1 Diabetes and Its Complications (RFA DK03-019) (NIDDK, NIAID, NEI, NHLBI, NINDS, ODS)	0	0	0	0	0	0	4,376,639	4,184,253
Proteomics and Metabolomics in Type 1 Diabetes and Its Complications (RFA DK03-024) (NIDDK, NIAID, NEI, NHLBI, NINDS, NICHD)	0	0	0	0	0	0	3,789,400	3,410,294
Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) RFA in Type 1 Diabetes and Its Complications (RFA DK03-020) (NIDDK, NEI, NIAID, NHLBI, NINDS, NICHD, NINR) and SBIR: Measurement Tools for Altered Autonomic Function in Spinal Cord Injury and Diabetes (RFA HD04-018) (NICHD, NIDDK)	0	0	0	0	0	0	4,202,727	4,167,000
Phased Innovation Partnerships (NIDDK)	0	0	0	4,049,000	0	0	0	0
Total—Goal VI[8]	**0**	**0**	**0**	**4,049,000**	**11,793,551**	**16,130,672**	**23,789,681**	**22,056,018**
Conferences and Other Expenses	69,318	27,337	114,667	212,528	150,031	156,860	137,726	536,847
TOTALS:	**30,000,000**	**30,000,000**	**30,000,000**	**100,000,000**	**100,000,000**	**100,000,000**	**150,000,000**	**150,000,000**

Footnotes for Table A1: In some instances, the funding levels reported in this table are different from those reported in the April 2003 Report on Progress and Opportunities of the *Special Funding Program* (accessed at: www.niddk.nih.gov/federal/planning/type1_specialfund). The following footnotes explain the differences.

1. The total funding for Goal I in FY01 has decreased because: (1) the EDIC Genetics Study was combined with the other EDIC funding in Goal V; (2) the TrialNet Epidemiology Study was combined with TrialNet funding in Goal II; and (3) Functional Genomics Approaches to Diabetic Complications was recategorized to Goal V because of its relevance to complications. The total funding for Goal I in FY02 has also decreased due to combining of TrialNet Epidemiology Study with TrialNet funding in Goal II.
2. The funding for TrialNet and ITN studies relevant to Goal II has been combined into a single line item. As noted in footnote 1, the TrialNet Epidemiology Study that was previously categorized in Goal I was also combined with TrialNet funding in FY01-02.
3. The total funding for Goal II in FY01-02 has increased because the TrialNet Epidemiology Study that was previously categorized in Goal I was combined with TrialNet funding in Goal II.
4. All EDIC funding has been combined into this line item. This total includes the FY01 funding for the EDIC Genetics Study that was previously categorized in Goal I.
5. The funding levels for FY01-03 were incorrectly reported in the April 2003 "Report on Progress and Opportunities." The adjusted numbers are reported here.
6. This item was previously listed in Goal I.
7. The total funding levels for Goal V are adjusted based on changes described in footnotes 4-6.
8. Prior to FY 2001, Goal VI was addressed by solicitations for research projects that encouraged the participation of new investigators and the submission of applications for pilot and feasibility awards. These early efforts relative to Goal VI are thus embedded in other goals during the FY 1998-2000 period of the program. Starting in FY 2001, specific initiatives were launched relative to Goal VI.

EXTRAMURAL RESEARCH GRANTS

Extramural NIH grants, cooperative agreements, contracts, and supplements, which were awarded through the *Special Statutory Funding Program for Type 1 Diabetes Research* between FY 1998-2005, are listed in Table A2. Some initiatives supported additional awards with regularly appropriated funds; some awards were supported by both *Special Funds* and regularly appropriated funds. Abstracts describing research topics pursued through these grants are available through the NIH CRISP (Computer Retrieval of Information on Scientific Projects) database at http://crisp.cit.nih.gov. Bibliometric analysis of publications resulting from these awards as of January 1, 2006, is found in the Assessment chapter.

Table A2: Research Grants and Contracts Awarded with *Special Program* Funds

	Year*	Project No.	Project Title
GOAL I: IDENTIFY THE GENETIC AND ENVIRONMENTAL CAUSES OF TYPE 1 DIABETES			
Type 1 Diabetes Genetics Consortium (T1DGC)			
Donald Bowden, Wake Forest University†	2001	R01 DK056289	ID of Diabetes Genes on Human Chromosome 20Q12-Q13.1
Patrick Concannon, Virginia Mason Research Center	2001	R01 DK046635	Susceptibility Genes in Type 1 Diabetes
Stephen Rich, Wake Forest University Health Sciences	2002	U01 DK062418	Type 1 Diabetes Genetics Consortium
Johns Hopkins University	2002	N01 HG065403	Center for Inherited Disease Research
Repository Services for T1DGC			
Rutgers University	2005	N01 DK032610	Repository Services for T1DGC
13th International Histocompatibility Working Group			
John Hansen, Fred Hutchinson Cancer Research Center	2001	U24 AI049213	13th International Histocompatibility Working Group
The Environmental Determinants of Diabetes in the Young (RFA DK02-029)			
William Hagopian, Pacific Northwest Research Institute	2002	U01 DK063829	Diabetes Evaluation in Washington (DEW-IT) Clinical Center
Jeffrey Krischer, Moffitt Cancer Center and Research Institute	2002	U01 DK063790	Data Coordinating Center
Ake Lernmark, University of Washington	2002	U01 DK063861	Diabetes Prediction in Skane (DiPiS)
Marian Rewers, University of Colorado Health Sciences Center	2002	U01 DK063821	Environmental Causes of Type 1 Diabetes
Jin-Xiong She, Medical College of Georgia	2002	U01 DK063865	Consortium for Identification of Environmental Triggers
Olli Simell, Turku University Central Hospital	2002	U01 DK063863	Environmental Triggers of Type 1 Diabetes
Anette Ziegler, Diabetes Research Institute	2002	U01 DK063836	Type 1 Diabetes Triggers: Diet Modification in Neonates

*The first year that the project received support from the *Special Funds*.
† Institutional affiliations at the time of the grant award are listed. Some Principal Investigators (PIs) have moved to new institutions.

Table A2: continued	Year	Project No.	Project Title
Uniform Population-based Approach to Case Ascertainment, Typology, Surveillance and Research on Childhood Diabetes: SEARCH for Diabetes in Youth Study (PA 00097)			
Lawrence Dolan, Children's Hospital Medical Center, Cincinnati	2001	U48 CCU919219	Search for Diabetes in Youth
Richard Hamman, University of Colorado Health Sciences Center	2001	U48 CCU81924	Search for Diabetes in Youth
Elizabeth Mayer-Davis, University of South Carolina	2001	U48 CCU419249	Search for Diabetes in Youth
Diana Pettiti, Kaiser Permanente Southern California	2001	U48 CCU919219	Search for Diabetes in Youth
Catherine Pihoker, Children's Hospital and Regional Medical Center, Seattle	2001	U58 CCU019235	Search for Diabetes in Youth
Beatriz Rodriguez, Pacific Health Research Institute	2001	U58 CCU019235	Search for Diabetes in Youth
Incidence, Natural History, and Quality of Life of Diabetes in Youth (SEARCH for Diabetes in Youth Study) (RFA DP05-069)			
Ronny Bell, Wake Forest University Health Sciences	2005	U01 DP000250	SEARCH for Diabetes in Youth Coordinating Center
Dana Dabelea, University of Colorado at Denver Health Sciences Center	2005	U01 DP000247	SEARCH for Diabetes in Youth 2: Colorado Center
Lawrence Dolan, Children's Hospital Medical Center, Cincinnati	2005	U01 DP000248	SEARCH for Diabetes in Youth 2: Ohio Center
Jean Lawrence, Kaiser Permanente Southern California	2005	U01 DP000246	SEARCH for Diabetes in Youth 2: California Center
Elizabeth Mayer-Davis, University of South Carolina	2005	U01 DP000254	SEARCH for Diabetes in Youth 2: South Carolina Center
Catherine Pihoker, Children's Hospital and Regional Medical Center, Seattle	2005	U01 DP000244	SEARCH for Diabetes in Youth 2: Washington Site
Beatriz Rodriguez, Pacific Health Research Institute	2005	U01 DP000245	Search for Diabetes in Youth 2: Hawaii Center
Type 1 Diabetes Mouse Repository			
Muriel Davisson, The Jackson Laboratory	2001	P40 RR009781	Transgenic and Targeted Mutant Preservation
Cadaveric Pancreas of Autoantibody Positive Individuals			
John Hutton, Barbara Davis Center for Childhood Diabetes	2004	P30 DK057516	UCHSC Diabetes and Endocrinology Research Center
Bioinformatics Integration Support Contract (RFP NIAID-DAIT-02-016)			
Northrop Grumman	2002	N01 AI025487	Bioinformatics Integration Support Contract
Research Triangle Institute	2002	N01 AI025486	Bioinformatics Integration Support Contract
Mammalian Gene Collection			
Science Applications International Corporation	2001	N01 CO012400	Mammalian Gene Collection
Sequence the NOD Mouse for Immune System Genes f or Type 1 Diabetes			
University of California, San Francisco	2001	N01 AI015416	Collaborative Network for Clinical Research on Immune Tolerance
Biotechnology Resource Centers (RFA DK00-002)			
Jin-Xiong She, University of Florida	2000	U24 DK058778	NIDDK Biotechnology Center at the University of Florida
Functional Genomics of the Developing Endocrine Pancreas (RFA DK99-007)			
Klaus Kaestner, University of Pennsylvania	1999	R24 DK056947	Functional Genomics of the Developing Endocrine Pancreas
Marshall Permutt, Washington University	1999	R24 DK056954	Functional Genomics of the Developing Endocrine Pancreas

Table A2: continued	Year	Project No.	Project Title
GOAL II: PREVENT OR REVERSE TYPE 1 DIABETES			
Type 1 Diabetes TrialNet (RFA DK01-004)			
John Lachin, George Washington University	2001	U01 DK061055	Type 1 Diabetes TrialNet: Operations Coordinating Center
Jay Skyler, University of Miami	2002	U01 DK061041	Type 1 Diabetes TrialNet
Type 1 Diabetes TrialNet: Clinical Centers (RFA DK01-003)			
Dorothy Becker, Children's Hospital of Pittsburgh	2005	U01 DK061058	Prediction and Prevention of Type 1 Diabetes
Jennifer Marks, University of Miami	2005	U01 DK061037	Diabetes TrialNet
Antoinette Moran, University of Minnesota	2005	U01 DK061036	Type 1 Diabetes—A Proposal for Prevention & Intervention
Tihamer Orban, Joslin Diabetes Center	2005	U01 DK061040	Type 1 Diabetes TrialNet: Clinical Centers
Henry Rodriguez, Indiana University School of Medicine	2005	U01 DK061038	Type 1 Diabetes TrialNet Indiana University Clinical Center
Darrell Wilson, Stanford University	2005	U01 DK061042	Type 1 Diabetes TrialNet at Stanford
Immune Tolerance Network - Immunomodulation (RFP NIAID-99-30)			
University of California, San Francisco	2001	N01 AI015416	Collaborative Network for Clinical Research on Immune Tolerance
Recruitment for Clinical Research Studies			
Matthews Media	2004	N02 DK032625	
Matthews Media	2004	N02 DK042680	
Type 1 Diabetes—Rapid Access to Intervention Development Projects Relevant to Prevention)			
Jeffrey Bluestone, Tolerance Therapeutics, Inc.	2005	N01 CO12400	GMP Manufacturing of hOKT3gamma1 (Ala-Ala) Monoclonal
Jerry Nadler, DiaKine Therapeutics, LLC	2005	N02 CM27005/ N02 CM37005	Purification of Lisofylline Drug Substance and Manufacture of Lisofylline Drug Product
Terry Strom, Beth Israel Deaconess Medical Center	2005	N01 CO12400	IL-2/Fc-IL15/Fc Fusion Proteins Components of the "Power Mix" Immune Modulator
Cooperative Study Group for Autoimmune Disease Prevention (RFA AI00-016)			
Teodor-Doru Brumeanu, Mount Sinai School of Medicine	2001	R01 DK061927	Prevention of Type 1 Diabetes by Soluble, MHC-II Peptide
George Eisenbarth, University of Colorado Health Sciences Center	2001	U19 AI050864	Virginia Mason/UCHSC Autoimmune Prevention Center
C.G. Fathman, Stanford University	2001	U19 DK061934	Strategies for Prevention of Autoimmunity
C.G. Fathman, Stanford University	2001	U01 DK061925	CD25+ Regulator CD4+ T Cells
David Hafler, Brigham and Women's Hospital	2001	U01 DK061926	Role of Regulatory CD4+/CD25+ T Cells in Diabetes
Matthias Von Herrath, La Jolla Institute for Allergy/Immunology	2001	U19 AI051973	How Does Blockade of CD40/CD40L Prevent Autoimmunity?
Trial To Reduce the Incidence of Type 1 Diabetes in the Genetically-At-Risk (TRIGR)			
Hans Akerblom, University of Helsinki	2001	U01 HD040364	Trial To Reduce IDDM in the Genetically At-Risk Study
Dorothy Becker, Children's Hospital (Pittsburgh)	2001	U01 HD042444	Nutritional Primary Prevention of Type 1 Diabetes
Gene Therapy Approaches for Diabetes and Its Complications (RFA DK01-006)			
George Christ, Yeshiva University	2001	R21 DK060204	Gene Therapy for Bladder Hyperactivity in Diabetic Rats
Chih-Pin Liu, Beckman Research Institute	2001	R21 DK060190	Regulation of Type 1 Diabetes Using Ribozymes
William Osborne, University of Washington	2001	R21 AI051637	Autoantigen Delivery to Induce Tolerance in Diabetes
Manikkam Suthanthiran, Weill Medical College	2001	R21 DK060186	Gene Therapy for Islet Transplantation
Jide Tian, University of California, Los Angeles	2001	R21 DK060209	Genetic Modification of DCs as Immunotherapy for IDDM
Roland Tisch, University of North Carolina, Chapel Hill	2001	R21 AI051638	The Use of VEE Replicons Encoding GAD65 to Treat IDDM
Keith Webster, University of Miami	2001	R21 HL069812	Therapeutic Angiogenesis To Treat Ischemic Disorders

Table A2: continued	Year	Project No.	Project Title
Innovative Grants in Immune Tolerance (RFA AI00-006)			
Adam Adler, University of Connecticut School of Med/Dnt	2001	R21 AI049813	Comparing Toleragenic Versus Immunogenic APC Function
Lin Chen, University of Colorado	2001	R21 AI049905	Develop Peptide Inhibitors of the NFAT/AP-1 Complex
Mark Crew, University of Arkansas	2001	R21 AI049885	Tolerated Xenografts Using Virus Stealth Technology
Joanna Davies, Scripps Research Institute	2001	R21 DK061334	Transplantation Tolerance Induced by Linked Suppression
Nicholas Gascoigne, Scripps Research Institute	2001	R21 DK061329	Real-Time Molecular Interactions in Tolerance Induction
Irving Goldschneider, University of Connecticut School of Med/Dnt	2001	R21 AI049882	Induction Acquired Thymic Tolerance by Regulatory APCs
Hidehiro Kishimoto, Scripps Research Institute	2001	R21 DK061332	Tolerance in NOD Mice
Mark Poznansky, Massachusetts General Hospital	2001	R21 AI049858	Movement of Recipient T-Cells Away from an Allograft
Haval Shirwan, University of Louisville	2001	R21 DK061333	Apoptosis: A Means of Immune Regulation To Treat Diabetes
Luk Van Parijs, Massachusetts Institute of Technology	2001	R21 AI049897	Specificity and Fate of Autoreactive CD4+ T-cells
Dario Vignali, St. Jude's Children's Research Hospital	2001	R21 DK061330	Tolerance Induction by Targeted Expression of GAD
Innovative Grants in Immune Tolerance (RFA AI03-010)			
Andrea Sant, University of Rochester	2004	R21 AI059898	Selective Presentation of Autoantigens by B Cells
Matthias Von Herrath/ Douglas Green, La Jolla Institute for Allergy & Immunolgy	2004	R21 AI059850	Immune Tolerance Induction By Apoptotic Bodies
Chen Dong, University of Texas, MD Anderson Cancer Center	2004	R21 DK069278	Costimulatory Regulation of CD8 T Cell Tolerance
Pilot Studies for New Therapies for Type 1 Diabetes and Its Complications (RFA DK99-013)			
Steinunn Baekkeskov, University of California, San Francisco	1999	R21 DK055977	Generation of a Non-Human Primate Model of Type 1 Diabetes
Kevin Breuel, East Tennessee State University	1999	R21 DK057115	NF-Kappa B as a Therapeutic Target for IDDM
Alan Escher, Loma Linda University	1999	R21 DK057113	APC-Targeting Vaccine for Prevention of Type 1 Diabetes
Daniel Kaufman, University of California, Los Angeles	1999	R21 AI047773	Rational Design of Antigen-Based Immunotherapeutics
William Langridge, Loma Linda University	1999	R21 DK057206	A Targeted Plant-Based Vaccine for Type 1 Diabetes
Jon Mabley, Inotek Corporation	1999	R21 DK057239	Poly(ADP) Ribose Synthetase and Autoimmune Diabetes
Noel MacLaren, Louisiana State University Medical Center	1999	R21 DK057122	A Vaccine for Immune Mediated Diabetes
James Thomas, Vanderbilt University	1999	R21 AI047763	Selection and Regulation of B Lymphocytes in IDDM
Immunopathogenesis of Type 1 Diabetes Mellitus (RFA DK98-010)			
Cheong-Hee Chang, University of Michigan, Ann Arbor	1998	R21 AI044454	Tolerance and Autoreactivity by Self Antigen
Patrick Concannon, Virginia Mason Research Center	1998	R01 DK055970	Immunological Candidate Genes for IDDM Susceptibility
John Corbett, St. Louis University	1998	R01 AI044458	Mechanisms of Viral-Induced Beta Cell Damage
George Eisenbarth, University of Colorado Health Sciences Center	1998	R01 DK055969	*In Vivo* NOD Evaluation of a Pathogenic Insulin Peptide
Christopher Goodnow, Australian National University	1998	R01 AI044392	Mechanisms Regulating Islet Destruction by CD4 T cells
David Hafler, Brigham and Women's Hospital	1998	R01 AI044447	The Role of Invariant T Cells and IL-4 in Type 1 Diabetes
Kathryn Haskins, University of Colorado Health Sciences Center	1998	R01 AI044482	Immunoregulation in the NOD Mouse
Jonathan Katz, Washington University	1998	R01 AI044416	Role of I-AG7 on Selecting Autoreactive T Cells
William Kwok, Virginia Mason Research Center	1998	R01 AI044443	Structure and Immunobiology of an IDDM-Protective Molecule
Paul Lehmann, Case Western Reserve University	1998	R21 AI044484	Human/Humanized T Cell Response to Islet Cell Antigens
Chih-Pin Liu, Beckman Research Institute	1998	R21 AI044429	Regulatory Mechanisms in Type 1 Diabetes
Ali Naji, University of Pennsylvania	1998	R01 HD037754	Autoimmune Diabetes-Maternal Immunoglobulin
Alberto Pugliese, University of Miami	1998	R01 AI044456	Proinsulin Expression in the Immune System
Eric Simone, University of Colorado Health Sciences Center	1998	R01 AI044466	NOD T Cell Receptors for Specific Islet Autoantigens
Grete Sonderstrup, Stanford University	1999	P01 DK055364	Autoimmune T and B Cell Responses in Type 1 Diabetes
Matthias Von Herrath, Scripps Research Institute	1998	R01 AI044451	Regulation and Immunotherapy of IDDM
Li Wen, Yale University	1998	R01 AI044427	Development of a Novel Humanized Animal Model of IDDM

Table A2: continued	Year	Project No.	Project Title
Diabetes Prevention Trial for Type 1 Diabetes - Supplements			
Nathaniel Clark, University of Vermont	1998	M01 RR000109	General Clinical Research Center: Diabetes Prevention Trial
George Eisenbarth, University of Colorado Health Sciences Center	1998	R01 AI039213	Antibodies to Recombinant Autoantigens- Prediction/ Immunogenetics
Richard Jackson, Joslin Diabetes Center	1998	U01 DK046601	Diabetes Prevention Trial -Type 1
Noel MacLaren, Children's Hospital (New Orleans)	1998	U01 DK046636	Diabetes Prevention Trial -Type 1
Alvin Powers, Vanderbilt University	1998	M01 RR000095	General Clinical Research Center: Diabetes Prevention Trial
Susan Ratzan, University of Connecticut Health Center	1998	M01 RR006192	General Clinical Research Center: Diabetes Prevention Trial
David Schade, University of New Mexico	1998	M01 RR000997	General Clinical Research Center: Diabetes Prevention Trial
Desmond Schatz, University of Florida	1998	M01 RR000082	General Clinical Research Center: Diabetes Prevention Trial
Stuart Weinzimer, Children's Hospital (Philadelphia)	1998	M01 RR000240	General Clinical Research Center: Diabetes Prevention Trial
One-Year Supplements to Ongoing Projects			
Mark Atkinson, University of Florida	1998	P01 AI042288	Immune Function and Low Risk Genotypes in IDD
Mark Atkinson, University of Florida	1998	R01 AI039250	Mechanisms of Immunotherapy in IDD Prevention Trials
William Hagopian, Pacific Northwest Research Institute	1998	P51 RR000166	Controlled Transfer Model for Autoimmune Diabetes
Laurence Turka, University of Pennsylvania	1998	P01 AI041521	Costimulation and Cytokines in Tolerance
Don Wiley, Children's Hospital (Boston)	1998	P01 AI039619	MHC Linked Susceptibility to Autoimmunity - Structure and Biology
GOAL III: DEVELOP CELL REPLACEMENT THERAPY			
Beta Cell Biology Consortium (RFA DK01-014)			
Michael German, University of California, San Francisco	2001	U19 DK061245	Molecular Control of Pancreatic Islet Development
Joel Habener, Massachusetts General Hospital	2001	U19 DK061251	Restoration of Endocrine Pancreas Function
John Hutton, University of Colorado Health Sciences Center	2001	U19 DK061248	Development and Regeneration of the Endocrine Pancreas
Mark Magnuson, Vanderbilt University	2001	U19 DK042502	Genes of Pancreas Function and Development
Catherine Verfaillie, University of Minnesota	2001	U19 DK061244	Characterization of Beta Cell Stem Cells
Beta Cell Biology Consortium (U19) (RFA DK04-017)			
Mark Magnuson, Vanderbilt University	2005	U19 DK042502	Mechanisms of Pancreas Development
Palle Serup, Hagedorn Research Institute	2005	U19 DK072495	Pancreatic Endocrine Development and Regeneration
Beta Cell Biology Consortium (U01) (RFA DK04-018)			
Markus Grompe, Oregon Health Sciences University	2005	U01 DK072477	Novel Reagents for Beta Cell Biology
Pedro Herrera, University of Geneva	2005	U01 DK072522	Transgenic Model of Inducible Diabetes
Gordon Keller, Mount Sinai School of Medicine	2005	U01 DK072513	Endoderm Induction and Pancreatic Specification from ES Cells
Douglas Melton, Harvard University	2005	U01 DK072505	Mechanisms of Pancreatic Beta Cell Regeneration
Lori Sussel, University of Colorado Health Sciences Center	2005	U01 DK072504	Defining the Roles of Nkx2.2 and NeuroD in Regulating Islet Cell Fate
Kenneth Zaret, Institute for Cancer Research, Fox Chase Cancer Center	2005	U01 DK072503	Gene Regulatory Signals for Beta Cell Development
Beta Cell Biology Consortium (Coordinating Center) (RFA DK04-501)			
Mark Magnuson, Vanderbilt University	2005	U01 DK072473	Coordinating Center for Beta Cell Biology Consortium
Cooperative Clinical Islet Transplantation Consortium (Data Coordinating Center) (RFA DK04-004)			
William Clarke, University of Iowa	2004	U01 DK070431	Clinical Islet Transplantation: Data Coordinating Center

Table A2: continued	Year	Project No.	Project Title
Cooperative Clinical Islet Transplantation Consortium (Clinical Centers) (RFA DK04-005)			
Bernhard Hering, University of Minnesota	2004	U01 AI065193	Advancing Islet Transplants for Type 1 Diabetes Care
Olle Korsgren, Uppsala University	2004	U01 AI065192	Innate Immunity in Clinical Islet Transplantation
Ali Naji, University of Pennsylvania	2004	U01 DK070430	B-Lymphocyte Immunotherapy in Islet Transplantation
Camillo Ricordi, University of Miami	2004	U01 DK070460	Strategies To Improve Long Term Islet Graft Survival
Andrew Shapiro, University of Alberta	2004	U01 AI065191	Islet Transplant - Costimulatory Blockade with LEA29Y
Pilot and Feasibility Program in Human Islet Biology (RFA DK03-021)			
John Corbett, St. Louis University	2004	R21 DK068839	Unfolded Protein Response as a Regulator of Human Beta-Cell Viability
Peter Drain, University of Pittsburgh	2004	R21 DK068833	Human Beta Cell Parameters for Islet Engraftment Success
Adolfo Garcia-Ocana, University of Pittsburgh	2004	R21 DK068836	Protein Kinase B/Akt in the Human Islet
Regina Kuliawat, Albert Einstein College of Medicine	2004	R21 DK068843	Beta-Cell Granule Protein Profile by Split Reporter Assay
Alvin Powers, Vanderbilt University	2004	R21 DK068854	Pdx-1 and Maf Proteins in Human Islets
Michael Roe, University of Chicago	2004	R21 DK068822	Real-Time Analyses of Apoptosis in Human Beta Cells
Rupangi Vasavada, University of Pittsburgh	2004	R21 DK068831	Parathyroid Hormone Related Protein in the Human Islet
Juan Contreras, University of Alabama-Birmingham	2005	R21 DK071300	Effects of Brain-Death on Islet Recovery and Functionality
Luis Fernandez, University of Wisconsin	2005	R21 DK071218	Donation After Cardiac Death for Isolated Pancreatic Islet Transplantation: Biology and Predicting Factors for Success
Klaus Kaestner, University of Pennsylvania	2005	R21 DK071216	Expression Profiling of Human Islets
Charles King, University of California, San Diego	2005	R21 DK071228	Proteomic Analysis of PI 3-Kinase Signaling in Islet
Brad Marsh, University of Queensland	2005	R21 DK071236	3D Structural Biology of the Human Islet
Anna Moore, Massachusetts General Hospital	2005	R21 DK071225	Labeling Human Pancreatic Islets for Multi-Modal Imaging
Comprehensive Programs in Beta Cell Biology (RFA DK02-014)			
Vincenzino Cirulli, University of California, San Diego	2002	R01 DK063443	Role of Connexins in Beta Cell Development and Function
Roger Davis, University of Massachusetts Medical School	2002	R01 DK063368	Functional Analysis of the Beta Cell
Peter Dempsey, Pacific Northwest Research Institute	2002	R01 DK063363	Endogenous Betacellulin Signaling in Beta Cell Biology
Kathleen Dunlap, New England Medical Center Hospitals	2002	R01 DK063344	GABA-B Receptors as Regulators of Islet Biology
Claudia Kappen, University of Nebraska Medical Center	2002	R01 DK063336	Genome-Wide Discovery of Beta Cell Gene Control ElementsJeffrey Pessin, University of Iowa
Fredric Wondisford, University of Chicago	2002	R01 DK063349	Control of Beta Cell Function by Co-Activators
Non-Human Primate Transplantation Tolerance Cooperative Study Group (RFA AI01-006)			
Hugh Auchincloss, Massachusetts General Hospital	2001	U01 AI051706	Tolerance Induction for Primate Islet Transplantation
Bernhard Hering, University of Minnesota	2001	U01 DK062932	Mixed Chimerism in Haploidentical Non-Human Primates
Christian Larsen, Emory University	2001	U19 AI051731	Transplant Tolerance
Judith Thomas, University of Alabama, Birmingham	2001	U19 DK057958	Preclinical Models of Organ and Cell Transplantation Tolerance
Greg Westergaard, Alpha Genesis	2004	U01 AI049916	Specific Pathogen Free Rhesus Macaque Breeding Program
Immune Tolerance Network - Islet Transplantation (RFP-NIAID-99-30)			
University of California, San Francisco	2001	N01 AI015416	Collaborative Network for Clinical Research on Immune Tolerance

Table A2: continued	Year	Project No.	Project Title
Islet Cell Resource Centers (RFA RR01-002)			
A. Osama Gaber, University of Tennessee Health Sciences Center	2001	U42 RR016602	Standardization and Procedure on Islet Isolation
Ronald Gill, University of Colorado Health Sciences Center	2001	U42 RR016599	Islet Cell Resources Facility at the University of Colorado
Mark Hardy, Columbia University of Health Sciences	2001	U42 RR016629	New York Regional Islet Isolation Facility
Bernhard Hering, University of Minnesota	2001	U42 RR016598	Human Pancreatic Islet Cell Resources (ICRs)
Thalachallour Mohanakumar, Washington University	2001	U42 RR016597	Human Islet Isolation Program at Washington University
Ali Naji, University of Pennsylvania	2001	U42 RR016600	Isolation/Distribution of Human Pancreatic Islets
Jo Reems, Puget Sound Blood Center	2001	U42 RR016604	Human Islet Isolations in Seattle
Camillo Ricordi, University of Miami	2001	U42 RR016603	Islet Cell Resources for Diabetes Research and Treatment
Arthur Riggs, Beckman Research Institute	2001	U42 RR016607	Islet Cell Resources of Southern California
Gordon Weir, Joslin Diabetes Center	2001	U42 RR016606	Human Pancreatic Islet Cell Resource
Islet Cell Resource Centers: Administrative and Bioinformatics Coordinating Center (RFA RR02-002)			
Joyce Niland, City of Hope National Medical Center	2002	U42 RR017673	National Islet Cell Consortium Coordinating Center
Collaborative Islet Transplant Registry (RFP NIDDK-00-002)			
EMMES Corporation	2001	N01DK012472	Islet/Beta Cell Transplant Registr
Immunobiology of Xenotransplantation (RFA AI04-042)			
Judith Thomas, University of Alabama, Birmingham	2005	U19 AI067151	Pig to Non-Human Primate Islet Xenografts
Simon Robson, Beth Israel Deaconess Medical Center	2005	U01 AI066331	Thromboregulatory Strategies to Prolong Xenografts
Islet Encapsulation Research - Pilot and Feasibility Supplements to Existing Centers			
John Hutton, University of Colorado Health Sciences Center	2002	P30 DK057516	Diabetes Endocrinology Research Center
Jerry Palmer, University of Washington	2002	P30 DK017047	Diabetes Endocrinology Research Center
Robert Sherwin, Yale University	2002	P30 DK045735	Diabetes Endocrinology Research Center
Donald Steiner, University of Chicago	2002	P60 DK020595	Diabetes Research and Training Cente
Gene Transfer Approaches To Enhance Islet Transplantation (RFA DK02-020)			
Mark Cattral, Toronto General Hospital	2002	R21 AI055024	Immunomodulation of Pancreatic Islets by Adenoviral Genes
Lieping Chen, Mayo Clinic, Rochester	2002	R21 AI055028	Novel Strategies to Prevent Islet Transplantation Rejection
Christiane Ferran, Beth Israel Deaconess Medical Center	2002	R21 DK062601	Gene Transfer with A20 To Improve Islet Transplantation
Donald Kohn, Children's Hospital (Los Angeles)	2002	R21 DK062649	Gene Expression in Beta Cells by Lentiviral Vectors
Joseph LeDoux, Georgia Institute of Technology	2002	R21 DK062616	Induction of Stem Cells To Adopt an Endocrine Fate
Adrian Morelli, University of Pittsburgh	2002	R21 AI055027	Dendritic Cells with Galectin-1 To Enhance Islet Grafts
Alvin Powers, Vanderbilt University	2002	R21 DK062641	Gene Transfer and Revascularization of Transplanted Islets
Paul Robbins, University of Pittsburgh	2002	R21 AI055026	Inhibition of NF-KB to Facilitate Islet Transplantation
Daniel Salomon, Scripps Research Institute	2002	R21 DK062598	Lentiviral-Transduced Endothelium for Islet Transplants
Sihong Song, University of Florida	2002	R21 DK062652	Anti-Inflammatory Serpin (AAT and Elafin) Gene Transfers
Jide Tian, University of California, Los Angeles	2002	R21 AI055025	Genetic Modification of Mouse Islets for Transplantation
Zandong Yang, University of Virginia, Charlottesville	2002	R21 DK062610	Induction of Suppression for Islet Transplantation
Imaging Pancreatic Beta Cell Mass, Function, Engraftment, or Inflammation (RFA DK02-002)			
Paul Harris, Columbia University Health Sciences	2002	R01 DK063567	Human Islet Antigen Discovery and Imaging
Dixon Kaufman, Northwestern University	2002	R01 DK063565	Bioluminescent Imaging of Pancreatic Islet Transplants
Wen-Hong Li, University of Texas SW Medical Center	2002	R01 DK063525	Image Beta Cell Mass and Function in Implants and Pancreas
Anna Moore, Massachusetts General Hospital	2002	R01 DK063572	*In Vivo* Imaging of Autoimmune Attack in Type 1 Diabetes
Louis Philipson, University of Chicago	2002	R01 DK063493	Imaging Beta Cell Function with Biosensors
Massimo Trucco, Children's Hospital (Pittsburgh)	2002	R01 DK063335	Optical Imaging of Beta Cell Function and Engraftment

Table A2: continued	Year	Project No.	Project Title
New Strategies for Treatment of Type 1 Diabetes Mellitus (RFA DK00-001)			
Paul Gores, Carolinas Medical Center	2000	R01 DK059070	Islet Transplantation in Non-Uremic Diabetic Patients
Peter Gottlieb, University of Colorado Health Sciences Center	2000	R01 DK059097	Immunotherapy Trial in New-onset Type 1 Diabetes
A. Shapiro, University of Alberta	2000	R01 DK059101	Trial of Anti-TNFalpha in Islet Transplantation
Pilot Studies for New Therapies for Type 1 Diabetes and Its Complications (RFA DK99-013)			
Geoffrey Block, University of Pittsburgh	1999	R21 DK057143	Bioengineered Primary Islets for Transplantation
George Gittes, New York University School of Medicine	1999	R21 DK057224	Mesenchymal Inducers of Beta Cell Differentiation
Lawrence Olson, Michigan State University	1999	R21 DK057173	Pluripotent Human Pancreatic Ductal Cells
Vijayakumar Ramiya, Ixion Biotechnology, Inc.	1999	R21 DK057121	Islets from Islet Progenitor/Stem Cells for Implantation
Raymond Steptoe, Walter and Eliza Hall Institute	1999	R21 DK057228	Proinsulin Gene Transfer Via Bone Marrow To Prevent IDDM
Hei Sul, University of California, Berkeley	1999	R21 DK057217	Pref-1 Function in Islet Growth and Differentiation
Cellular and Molecular Approaches for Achieving Euglycemia (RFA DK98-007)			
Kenneth Brayman, University of Pennsylvania	1998	R21 DK055353	Adenoviral Mediated Islet Gene Transfer
Michael Brownlee, Albert Einstein College of Medicine	1998	R01 DK055299	Genetic Engineering of Beta Cells for Transplantation
Sylvia Christakos, University of Med/Dnt of New Jersey	1998	R21 DK055050	Preservation of Beta Cell Function by Calbindin-D28K
Joanna Davies, Scripps Research Institute	1998	R01 AI045488	Allograft Induced IL-4 in Pancreas Graft Protection
Herbert Gaisano, University of Toronto	1998	R21 DK055160	SNARE Regulation of B-Cell KCA and SUR Potentiates Secretion
Lakshmi Gaur, Puget Sound Blood Center and Program	1998	R01 AI045487	Induction of Tolerance to Islet Allografts in Primates
Ivan Gerling, University of Tennessee	1998	R21 DK055263	Human Leukocyte Response To Human Islets in SCID mice
Marvin Gershengorn, Weill Medical College of Cornell University	1998	R21 DK055087	Dynorphin and Beta Cell Sensitization
Ronald Gill, University of Colorado Health Sciences Center	1998	R01 DK055333	T Cell Mediated Injury to Islet Allografts
Suzanne Ildstad, Allegheny University of Health Sciences	1998	R01 AI045486	Hematopoetic Stem Cell Chimerism To Treat Diabetes
Karen Kover, University of Kansas Medical Center	1998	R21 AI045490	The Effects of Anti-Rat CD40L on Islet Allograft Survival
Fred Levine, University of California, San Diego	1998	R01 DK055065	Inhibition of Apoptosis in Pancreatic Beta Cells
Andreas Martin, Mount Sinai School of Medicine	1998	R21 DK055277	An *In Vivo* Model of Pancreatic Islet Organoids
Albee Messing, University of Wisconsin Madison	1998	R21 DK055309	New Method for Purifying Islets from Transgenic Pancreas
Christopher Newgard, University of Texas SW Medical Center	1998	R01 DK055188	Engineering of Immunoprotection in Beta Cell Lines
Colin Nichols, Washington University	1998	R01 DK055282	Genetic Engineering of Glucose Regulation
Camillo Ricordi, University of Miami	1998	R01 DK055347	Immunomodulation for Islet Transplantation in Diabetes
David Rothstein, Yale University	1998	R01 AI045485	Role of CD45 in Generation of Islet Allograft Tolerance
Thomas Steinberg, Washington University	1998	R01 HD037799	P2 Receptors, Extracellular ATP, and Islet Function
Beta Cell Proteomics (PAR-00-101)			
Joshua LaBaer, Harvard University Medical School	2001	R01 DK061906	Manipulating the Proteome
One-Year Supplements to Ongoing Projects			
Hugh Auchincloss, Massachusetts General Hospital	1998	R01 AI038397	Pathways of Alloreactivity
Jeffrey Bluestone, University of Chicago	1998	P01 AI029531	Immunomodulation of Transplant Rejection
Kenneth Polonsky, University of Chicago	1998	P01 DK044840	Molecular Mechanisms/Beta Cell Dysfunction in Diabetes
Daniel Salomon, Scripps Research Institute	1998	R01 AI042384	Importance of Islet Structure in Islet Transplantation
Nora Sarvetnick, Scripps Research Institute	1998	R01 HD029764	Model of Islet Regeneration and Neogenesis
Ming-Jer Tsai, Baylor College of Medicine	1998	R37 HD017379	*In Vitro* Expression of Hormone-Regulated Genes

Table A2: continued	Year	Project No.	Project Title
GOAL IV: PREVENT OR REDUCE HYPOGLYCEMIA IN TYPE 1 DIABETES			
DirecNet: A Network To Test Glucose Sensors in Children with Type 1 Diabetes (RFA HD01-009)			
Roy Beck, Jaeb Center for Health Research, Inc.	2001	U01 HD041890	Coordinating Center - Glucose Sensors in Type 1 Diabetes
Peter Chase, University of Colorado Health Sciences Center	2001	U10 HD041919	Glucose Sensors in Children with Type 1 Diabetes
William Tamborlane/Stuart Weinzimer, Yale University	2001	U10 HD041906	Yale's Center in the Children's Glucose Sensor Network
Eva Tsalikian, University of Iowa	2001	U10 HD041915	Glucose Sensors and Hypoglycemia in Children with DM
Darrell Wilson/Bruce Buckingham, Stanford University	2001	U10 HD041908	Near-Continuous Glucose Monitoring in Pediatrics
Tim Wysocki, Nemours Children's Hospital	2001	U10 HD041918	Continuous Glucose Sensors in Youth: a Biobehavioural Study
Hypoglycemia in Patients with Type 1 Diabetes (RFA DK03-017)			
Stephen Davis, Vanderbilt University	2004	R01 DK069803	Hypoglycemia Associated Autonomic Failure in Type 1 DM
Rory McCrimmon, Yale University	2004	R01 DK069831	Role of AMPK in Hypoglycemia-Sensing in the VMH
Charles Mobbs, Mount Sinai School of Medicine	2004	R01 DK070057	Adenosine Receptors and Hypoglycemic Responses
Douglas Rothman, Yale University	2004	R01 NS051854	MRS Studies of Brain Metabolic Adaptations in Diabetes
Raymond Swanson, University of California, San Francisco	2004	R01 NS051855	Hypoglycemic Neuronal Death
Cornelis Tack, University Medical Center, St. Radboud	2004	R21 DK069881	Brain Glucose Metabolism and Hypoglycemia Unawareness
Dennis Turner, Duke University Medical Center	2004	R01 NS051856	Lifespan Metabolic Neuroprotection During Hypoglycemia
Effects of Hypoglycemia on Neuronal and Glial Cell Function (RFA NS02-008)			
James Mandell, University of Virginia, Charlottesville	2002	R21 NS045300	Hypoglycemic Signaling Targets in Astrocytes
Jullie Pan, Yeshiva University	2002	R21 DK064565	Cerebral Activation in Hypoglycemia and Hyperketonemia
Scott Rivkees, Yale University	2002	R21 NS045310	The Role of Adenosine in Hypoglycemic Brain Injury
Vanessa Routh, University of Med/Dnt of New Jersey	2002	R01 DK064566	Glucosensing Neurons in Euglycemia, Hypoglycemia, and HAAF
Stephen Salton, Mount Sinai School of Medicine	2002	R01 NS045305	Mechanisms of Neuronal Hypoglycemic Injury
Dennis Turner, Duke University	2002	R21 NS045304	Lifespan Neuronal/Glial Metabolism During Hypoglycemia
Sensor Development and Validation (RFA EB02-002)			
Mark Arnold, University of Iowa	2002	R01 DK064569	Continuous Near Infrared Glucose Sensor
David Gough, University of California, San Diego	2002	R01 DK064570	Validation of Long-Term Glucose Sensor in Tissues
Myra Lipes, Joslin Diabetes Center	2002	R01 DK064568	A Cell-Based Glucose Sensing and Insulin Delivery System
Garry Steil, Medtronic Minimed	2002	R01 DK064567	Long Term Glucose Sensing and Physiologic Insulin Delivery
Understanding Hypoglycemia Unawareness in Patients with Diabetes (RFA DK01-031)			
Casey Donovan, University of Southern California	2002	R01 DK062471	Portal Vein Glucose Sensors in Hypoglycemia
Rolf Gruetter, University of Minnesota	2002	R21 NS045519	NMR Measurements of Human Brain Glycogen Metabolism
Lauren Jacobson, Albany Medical College	2002	R21 DK062442	Role of Glucocorticoids in Hypoglycemia Unawareness
Dianne Lattemann, University of Washington	2002	R21 DK062446	CNS Stress Pathways and the Development of Acute HAAF
Yijun Liu, University of Florida	2002	R21 NS045518	Dynamic FMRI Analyses of Hypoglycemia Unawareness
S. Ritter, Washington State University	2002	R01 NS045520	Hindbrain Mechanisms of Hypoglycemia Unawareness
Elizabeth Seaquist, University of Minnesota	2002	R01 DK062440	Cerebral Responses to Insulin-Induced Hypoglycemia
Harry Shamoon, Yeshiva University	2002	R01 DK062463	Modulation of Hypoglycemic Counterregulatory Responses
Pilot Studies for New Therapies for Type 1 Diabetes and Its Complications (RFA DK99-013)			
David Gough, University of California, San Diego	1999	R21 DK057109	Key Parameters for Artificial Pancreas Controller

Table A2: continued	Year	Project No.	Project Title
Glucose Sensors in the Treatment of Diabetes (RFA DK98-008)			
Mark Arnold, University of Iowa	1998	R21 DK055255	Solid-State Optics for Non-Invasive Glucose Monitors
Sanford Asher, University of Pittsburgh	1998	R01 DK055348	Development of (Non) Invasive Real-Time Glucose Sensors
Katherine Crothall, Animas Corporation	1998	R01 DK055246	An Implantable Near IR Glucose Sensor
Casey Donovan, University of Southern California	1998	R01 DK055257	Portal Glucosensors in Hypoglycemic Detection
Dale Drueckhammer, State University of New York, Stony Brook	1998	R21 DK055234	New Approaches to Fluorescence-Based Glucose Sensors
Johannes Everse, Texas Tech University	1998	R21 RR014174	Enzyme-Thermistors as Glucose Sensors
David Gough, University of California, San Diego	1998	R01 DK055064	Tissue Response to Implanted Glucose Sensor
Joseph Izatt, Case Western Reserve University	1998	R21 RR014172	Pathlength-Resolved Non-Invasive Optical Glucose Sensors
John Mastrototaro, Minimed, Inc.	1998	R01 DK055242	Transdermal Glucose Sensing with Optical Amplification
Francis Moussy, University of Connecticut	1998	R01 RR014171	Control of Sensor/Tissue Interact for Extended Lifetime
Govind Rao, University of Maryland	1998	R01 RR014170	Protein Engineered Glucose Sensor
Kerstin Rebrin, Minimed, Inc.	1998	R01 DK055337	Interstitial Glucose Dynamics Using a Glucose Sensor
Christopher Saudek, Johns Hopkins University	1998	R01 DK055132	Clinical Research Toward Closed-Loop Insulin Delivery
Gary Sayler, University of Tennessee	1998	R21 RR014169	Eukaryotic Bioluminescent Integrated Circuit Sensors
Binghe Wang, North Carolina State University	1998	R21 DK055062	Glucose-Sensitive Artificial Receptors for Insulin
Joseph Wang, New Mexico State University, Las Cruces	1998	R01 RR014173	Oxygen-Independent Interference-Free Glucose Sensors
George Wilson, University of Kansas, Lawrence	1998	R01 DK055297	Evaluation of a Continuous Glucose Monitoring System
Developing New Tools for Detecting and Monitoring Low Blood Glucose for People with Diabetes (CDC PA 99151)			
Robert Langer, Massachusetts Institute of Technology	1999	R08/CCR117792	Ultrasound Mediated Transdermal Glucose Monitoring
Kenneth Ward, National Applied Science	1999	R08/CCR017796	Development of a Continuous Hypoglycemia Monitor
Suzanne Gebhart, SpectRx, Inc.	1999	R08/CCR417812	Continuous Interstitial Fluid Glucose Monitoring
Development of Surrogate Markers for Clinical Trials: Supplements			
University of Iowa	2001	N01 MH120006	Brain Molecular Anatomy Project (BMAP)
One-Year Supplements to Ongoing Projects			
Peter Havel, University of California, Davis	1998	R01 DK050129	ANS Hypoglycemia Induced Glucagon Secretion in Diabetes
Govind Rao, University of Maryland	1998	R01 RR010955	Minimally Invasive Glucose Monitoring
GOAL V: PREVENT OR REDUCE THE COMPLICATIONS OF TYPE 1 DIABETES			
Epidemiology of Diabetes Interventions and Complications: Measurement of Cardiovascular Disease			
William Dahms, Case Western Reserve University	1998	N01 DK062203	Coordinating Center - Diabetes Interventions/Complications
John Lachin, George Washington University	1998	N01 DK062204	Epidemiology of Diabetes Interventions and Complications
Epidemiology of Diabetes Interventions and Complications: Uropathy and Autonomic Neuropathy			
William Dahms, Case Western Reserve University	1998	N01 DK062203	Coordinating Center - Diabetes Interventions/Complications
Epidemiology of Diabetes Interventions and Complications: Genetics Study			
William Dahms, Case Western Reserve University	2001	N01 DK062203	Coordinating Center - Diabetes Interventions/Complications
John Lachin, George Washington University	2001	N01 DK062204	Epidemiology of Diabetes Interventions and Complications

Table A2: continued	Year	Project No.	Project Title
Family Investigation of Nephropathy and Diabetes Study (FIND)			
EMMES Corporation	2001	N01 EY062112	Clinical Trials and Statistical Study Monitoring and Coordination
Hanna Abboud, University of Texas Health Sciences Center	2001	U01 DK057295	Genetics of Diabetic Nephropathy in Mexican Americans
Sharon Adler, Harbor-UCLA Research and Education Institute	2001	U01 DK057249	Identification of Diabetic Nephropathy Risk Genes
Robert Elston, Case Western Reserve University	2004	U01 DK057292	Linkage Consortium for End-Stage Renal Disease
Barry Freedman, Wake Forest University	2001	U01 DK057298	Renal Failure Genes in the Southeastern U.S.
Susanne Nicholas/Mohammed Saad, University of California, Los Angeles	2001	U01 DK057303	Genetics of Diabetic Nephropathy in Hispanics
John Sedor, Case Western Reserve University	2001	U01 DK057329	Genetic Regulation of Renal Disease Progression
Philip Zager, University of New Mexico, Albuquerque	2001	U01 DK057300	Zuni Kidney Project- Family Studies
Diabetic Retinopathy Clinical Research Network (RFA EY01-001)			
Roy Beck, Jaeb Center for Health Research, Inc.	2002	U10 EY014231	Diabetic Macular Edema Clinical Research Network
Animal Models of Diabetic Complications Consortium (RFA DK01-009 and HL01-010)			
Erwin Bottinger, Yeshiva University	2001	U01 DK060995	Mouse Models for Human Diabetic Nephropathy
Matthew Breyer, Vanderbilt University	2004	U01 DK061018	Generating Mouse Mutants with Diabetic Nephropathy
Jan Breslow, Rockefeller University	2001	U01 HL070524	Animal Models of Diabetic Vascular Disease
David Clemmons, University of North Carolina, Chapel Hill	2001	R01 HL069364	Atherosclerosis in Insulin-Resistant, Hyperlipidemic PTS
Thomas Coffman, Duke University	2001	U01 HL070523	Duke-UNC-Stanford AMDC Unit
Willa Hsueh, University of California, Los Angeles	2001	U01 HL070526	Novel Models of Cardiovascular Complications of Diabetes
Donald McClain, University of Utah	2001	U01 HL070525	Animal Models of Diabetic Cardiovascular Complications
Collaborative Studies on Angiogenesis and Diabetic Complications (RFA DK04-022)			
Mathew Breyer, Vanderbilt University	2005	R01 DK074116	Role of Cyclooxygenase Stimulated Neovascularization in
Michael Brownlee, Albert Einstein College of Medicine	2005	R01 DK074153	Progenitor Cell Dysfunction and Impaired Vasculogenesis
Robert Cohen, University of Cincinnati	2005	R01 DK074361	Endothelial Progenitor Cell Biology in Type 1 Diabetes
Timothy Crombleholme, Cincinnati Children's Hospital	2005	R01 DK074055	Endothelial Progenitor Cell Biology in Type 1 Diabetes
Geoffrey Gurtner, New York University School of Medicine	2005	R01 DK074095	Progenitor Cell Dysfunction and Impaired Vasculogenesis
Peter Kaiser, Cleveland Clinic Foundation	2005	R01 EY017528	Vascular Remodeling and Effects of Angiogenic Inhibition in Diabetic Retinopathy
Patricia Parson-Wingerter, NASA Glenn Research Center	2005	R01 EY017529	Vascular Remodeling and Effects of Angiogenic Inhibition in Diabetic Retinopathy
Ambra Pozzi, Vanderbilt University	2005	R01 DK074359	Role of Cyclooxygenase Stimulated Neovascularization in Diabetic Retinopathy
Progression of Cardiovascular Disease in Type 1 Diabetes (RFA HL04-013)			
Zixi Cheng, University of Louisville	2004	R01 HL079636	Cardiac Neuropathy in Type 1 Diabetic and Aging Mice
Barry Goldstein, Thomas Jefferson University	2004	R01 DK071360	Adiponectin Improves Vascular Function In High Glucose
Catherine Hedrick, University of Virginia	2004	R01 HL079621	Sphingolipids and Cardiovascular Disease in Type l Diabetes
George King, Joslin Diabetes Center	2004	R01 DK071359	PKC Activation and Cardiovascular Disease in Diabetes
William Mayhan, University of Nebraska Medical Center	2004	R01 HL079587	Cerebrovascular Disease in Type 1 Diabetes
Trevor Orchard, University of Pittsburgh	2004	R01 DK071487	Progression of Cardiovascular Disease in TID: CADRE/EDC
Marian Rewers, University of Colorado Health Sciences Center	2004	R01 HL079611	Determinants of Accelerated CVD in Type 1 Diabetes
Ming-Hui Zou, University of Oklahoma	2004	R01 HL079584	Reactive Nitrogen Species and Accelerated Atherosclerosis

Table A2: continued	Year	Project No.	Project Title
Type 1 Diabetes—Rapid Access to Intervention Development (Projects Relevant to Complications)			
Bo Hedlund, Biomedical Frontiers, Inc.	2005	N01 CO12400/ N02 CM27010	Starch-Deferoxamine (S-DFO) for Diabetic Neuropathy
Feasibility Projects To Test Strategies for Preventing or Slowing the Progression of Diabetic Nephropathy (RFA DK02-025)			
Timothy Meyer, Stanford University	2002	R01 DK063011	Maximizing the Benefit of Ras Blockade in Diabetic Nephropathy
Kumar Sharma, Thomas Jefferson University	2002	R01 DK063017	Pirfenidone: Novel Anti-Scarring Therapy for Diabetic Nephropathy
Robert Toto, University of Texas SW Medical Center	2002	R01 DK063010	Improving Outcomes in Diabetic Nephropathy
Surrogate Endpoints for Diabetic Microvascular Complications (RFA DK02-016)			
Paul Beisswenger, Dartmouth College	2002	R01 DK062995	Enzymatic Controls of Nonenzymatic Glycation
Andrew Boulton, Victoria University of Manchester	2002	R01 NS046259	Non-Invasive Surrogate Markers for Diabetic Neuropathy
Robert Cohen, University of Cincinnati	2002	R01 DK063088	The Glycosylation Gap and Diabetic Complications
Jose Halperin, Harvard University Medical School	2002	R01 DK062994	Complement in the Vascular Complications of Diabetes
George King, Joslin Diabetes Center	2002	R21 DK063000	Monocyte VEGF and PKC, Markers for Diabetic Complications
Oliver Lenz, University of Miami	2002	R21 DK063083	Clonal Selection in Diabetic Nephropathy
Mara Lorenzi, Schepens Eye Research Institute	2002	R01 EY014812	Retinal Blood Flow and Microthrombi in Type 1 Diabetes
Lois Smith, Children's Hospital (Boston)	2002	R21 EY014811	Surrogate Markers for Early Stage Diabetic Retinopathy
Kathryn Thrailkill, Arkansas Children's Hospital	2002	R01 DK062999	Matrix Metalloproteinases and Diabetic Nephropathy
Lance Waller, Emory University	2002	R21 NS046258	Assessing Spatial Patterns of Epidermal Nerve Fibers
Imaging Early Markers of Diabetic Microvascular Complications in Peripheral Tissues (RFA DK02-001)			
Abass Alavi, University of Pennsylvania	2002	R01 DK063579	FDG-PET Imaging in Complicated Diabetic Foot
Randall Barbour, SUNY Downstate Medical Center	2002	R21 DK063692	Functional Imaging of the Vascular Bed
Pierre Carlier, Laboratoire RMN-CEA-AFM	2002	R21 DK063496	NMR of Muscle Perfusion and Oxygenation in Diabetes
George King, Joslin Diabetes Center	2002	R21 DK063511	Retinal Imaging Tests for Microvascular Functions
Jonathan Lindner, University of Virginia, Charlottesville	2002	R01 DK063508	Contrast Ultrasound and Diabetic Microvascular Disease
Ronald Meyer, Michigan State University	2002	R21 DK063497	Functional MRI of Diabetic Peripheral Vascular Disease
Oral Microbiology/Immunology of Type 1 Diabetes (RFA DE01-001)			
Ashraf Fouad, University of Connecticut School of Med/Dnt	2001	R21 DE014476	Endodontic Infections in Type 1 Diabetic Hosts
Evanthia Lalla, Columbia University	2001	R21 DE014490	Periodontal Microbiota, Serum Antibody Response, and IDDM
Paul Moore, University of Pittsburgh	2001	R21 DE014472	Microbiology/Immunology of Periodontal Disease in Type 1 Diabetes
Maria Ryan, State University of New York, Stony Brook	2001	R21 DE014491	Host Modulation/Periodontal Therapy Effects on Diabetes
Thomas Van Dyke, Boston University	2001	R21 DE014478	Periodontal Inflammation in Type 1 Diabetes
Functional Genomics Approaches to Diabetic Complications – IHWG SNPs: Supplements			
Maynard Olson, University of Washington	2001	P50 HG002351	Center for the Study of Natural Genetic Variation
Richard Spielman, University of Pennsylvania	2001	R01 HG002386	Genome-Wide Analysis of Genetic Variation and Expression

Table A2: continued	Year	Project No.	Project Title
Neurobiology of Diabetic Complications (RFA NS00-002)			
Joseph C. Arezzo, Yeshiva University	2000	R01 NS041194	Electrophysiologic Measures in Diabetic Neuropathy
Thomas K. Baumann, Oregon Health Sciences University	2000	R21 NS041157	Dorsal Root Ganglion as Source of Neuropathic Pain
Joseph Beverly, University of Illinois	2000	R01 DK059755	Glucose Mediation of Noradrenergic Activity in VMH
Scott T. Brady, University of Texas SW Medical Center	2000	R01 NS041170	Regulation of Fast Axonal Transport Diabetic Neuropathy
Rick Dobrowsky, University of Kansas Lawrence	2000	R21 DK059749	Role of Caveolin in Schwann Cell Signal Transduction
Charlene Hafer-Macko, University of Maryland Baltimore	2000	R01 DK059758	Endothelial Dysfunction in Human Diabetic Neuropathy
Lynn Heasley, University of Colorado Health Sciences Center	2000	R01 DK059756	MAP Kinases as Mediators of Diabetic Neuropathy
William R. Kennedy, University of Minnesota	2000	R01 NS041163	A Thermal Probe Method for Staging Diabetic Neuropathy
Kathy J. LePard, Midwestern University	2000	R21 NS039768	Synaptic Transmission in Diabetic Enteric Nervous System
Jill Lincoln, University of London	2000	R01 DK058010	Oxidative Stress: Roles in Diabetic Autonomic Neuropathy
Charles V. Mobbs, Mount Sinai School of Medicine	2000	R01 NS041183	Autonomic Diabetic Neuropathy in Mice
Hui-Lin Pan, Pennsylvania State University	2000	R21 NS041178	Spinal Plasticity in Diabetic Neuropathic Pain
Marise B. Parent, Georgia State University Research Foundation	2000	R01 NS041173	Neurochemical and Behavioral Effects of Hyperglycemia
David C. Randall, University of Kentucky Research Foundation	2000	R01 NS039774	Sympathetic Function in Diabetes
Judith A. Richter, Indiana University	2000	R21 NS041162	Hyperglycemia-Induced Neuronal Sensitization
Nancy Tkacs, University of Pennsylvania	2000	R21 DK059754	Counterregulatory Failure and the Arcuate Nucleus
Vickery Trinkaus-Randall, Boston University	2000	R21 DK059753	Role of Growth Factors on Epidermal and Neuronal Injury
Jeffrey Twiss, University of California, Los Angeles	2000	R21 DK059752	Neurotrophic Factor Responsiveness in Diabetic Neuropathy
Pilot Studies for New Therapies for Type 1 Diabetes and Its Complications (RFA DK99-013)			
Maria Alexander-Bridges, Massachusetts General Hospital	1999	R21 DK057200	DAF16 Homologues and Mediating Complications of Diabete
Deborah Ellis, Wayne State University	1999	R21 DK057212	Therapy in IDDM Adolescents in Poor Metabolic Control
Patrizia Marchese, Scripps Research Institute	1999	R21 HL065146	Mechanisms of Thrombus Formation in Type 1 Diabetes
N. Nahman, Ohio State University	1999	R21 DK057223	Alpha-Sense of Therapy of Diabetic Glomerulosclerosis
Csaba Szabo, Inotek Corporation	1999	R21 HL065145	Poly Ribose Synthetase and Endothelial Dysfunction
Benjamin Szwergold, Dartmouth College	1999	R21 DK057146	Nonenzymatic Glycation: Enzymatic Mechanism for Control
Helen Vlassara, Mount Sinai School of Medicine	1999	R21 DK057126	Gene Transfer and Diabetic Complications
Ian Zagon, Pennsylvania State University Hershey Medical Center	1999	R21 EY013086	Regulation of Corneal Wound Healing in Type 1 Diabetes
Neurological Complications of Diabetes (RFA NS99-005)			
Nigel Calcutt, University of California, San Diego	1999	R01 NS038855	Prosaposin and Prosaptides in Diabetic Neuropathy
Nicole Gibran, University of Washington	1999	R01 DK058007	Diabetic Neuropathy: Implications for Wound Repair
Rolf Gruetter, University of Minnesota	1999	R21 DK058004	*In Vivo* Studies of Brain Glycogen in Hypoglycemia
Jean Jew, University of Iowa	1999	R01 NS039771	Diabetic Autonomic Neuropathy and Mitral Valve Dysfunction
Phillip Low, Mayo Clinic Rochester	1999	R01 NS039722	Diabetic Autonomic Neuropathy
Anthony McCall, Oregon Health Sciences University	1999	R01 DK058006	Glucocorticoids, Hypoglycemia, and Brain Glucose Transport
Jose Ochoa, Emanuel Hospital and Health Center	1999	R01 NS039761	New Approaches to C Nociceptors in Diabetic Neuropathy
Kaushik Patel, University of Nebraska Medical Center	1999	R01 NS039751	Altered Nitric Oxide Mechanisms in PVN During Diabetes
Timothy Raabe, St. Mary's University	1999	R21 NS039748	Role of Neuregulin on Axon/Glia Interactions in Diabetes
Mark Yorek, University of Iowa	1999	R01 DK058005	Vascular Disease in Diabetic Neuropathy

Table A2: continued	Year	Project No.	Project Title
Pathogenesis and Therapy of Complications of Diabetes (RFA DK98-009)			
Evan Abel, Beth Israel Deaconess Medical Center	1998	R21 HL062886	The Role of GLUT4 in the Pathogenesis of Diabetic Cardiomyopathy
Lloyd Aiello, Joslin Diabetes Center	1998	R01 EY012603	Systemic VEGF and Diabetic Retinopathy: Clinical Trials
Mark Alliegro, Louisiana State University	1998	R01 EY012602	Control of VEGF-Stimulated Endothelial Proliferation
Karin Bornfeldt, University of Washington	1998	R01 HL062887	Hyperglycemia, Protein Kinases, and Smooth Muscle Growth
Marshall Corson, University of Washington	1998	R21 HL062885	Endothelial-Fibronectin Interactions in Diabetes
Arup Das, University of New Mexico, Albuquerque	1998	R01 EY012604	Extracellular Proteinases in Retinal Neovascularization
Eva Feldman, University of Michigan, Ann Arbor	1998	R01 NS038849	Glucotoxicity Mediates Apoptosis in Diabetic Neuropathy
Martin Friedlander, Scripps Research Institute	1998	R01 EY012599	Cell-Based Ocular Delivery of Anti-Angiogenics for PDR
Kenneth Gabbay, Baylor College of Medicine	1998	R01 DK055137	Species Susceptibility to Diabetic Complications
Gary Gibbons, Brigham and Women's Hospital	1998	R01 HL062884	Diabetic Macrovascular Disease: Role of Apoptosis
Jonathan Glass, Emory University	1998	R01 NS038848	Calpains in the Pathogenesis of Diabetic Neuropathy
Maria Grant, University of Florida	1998	R01 EY012601	Nitric Oxide in the Pathogenesis of Diabetic Retinopathy
Jose Halperin, Harvard University	1998	R01 DK052855	The Role of Complement in the Complications of Diabetes
William Haynes, University of Iowa	1998	R21 NS038846	Sympathetic Neurovascular Function in Diabetes Mellitus
Cinda Helke, Henry M. Jackson Foundation	1998	R01 NS038845	Neurotrophins and Visceral Afferent Neurons in Diabetes
Michael Humphreys-Beher, University of Florida	1998	R01 DE013290	Factor Effects on Oral Complications of Diabetes
Claudia Kappen, Mayo Foundation	1998	R01 HD037804	Molecular Mechanisms in Diabetic Embryopathy
Francis Kappler, Fox Chase Cancer Center	1998	R21 DK055079	Isolation of a Novel Enzymatic Activity
Alexander Ljubimov, Cedars-Sinai Medical Center	1998	R01 EY012605	Growth-Factor Induced Tenascin-C in Diabetic Retinopathy
Jian-Xing Ma, Medical University of South Carolina	1998	R01 EY012600	Retinal Capillaries in Diabetic Retinopathy
Ramesh Nayak, Tufts University	1998	R21 EY012607	Immunogenetic Mechanisms in Diabetic Retinopathy
Ted Reid, Texas Tech University	1998	R21 NS038847	Role of Substance P in Diabetes-Impaired Wound Healing
David Sane, Wake Forest University	1998	R21 HL062891	Role of Vitronectin in the Vascular Complications of Diabetes
Richard Schaeffer, University of Arizona	1998	R01 DK055151	VEGF-Induced Modulation of Endothelial Structure and Function
Gina Schatteman, University of Iowa	1998	R01 DK055965	Adult Angioblasts in Vascular Maintenance and Repair
Richard Spielman, University of Pennsylvania	1998	R01 DK055227	Genetic Studies of Diabetic Nephropathy
James Beach/James Tiedeman, University of Virginia	1998	R01 EY012606	Role of Vascular Autoregulation in Diabetic Retinopathy
Philip Tsao, Stanford University	1998	R01 HL062889	Signaling Mechanisms in Glucose-Induced MCP-1 Expression
Gordon Williams, Brigham and Women's Hospital	1998	R01 HL062888	Mechanisms Underlying Cardiovascular Risks in Diabetes
Douglas Wright, University of Kansas Medical Center	1998	R21 NS038844	GDNF and Nociceptive Primary Sensory Neurons in Diabetes
Development of Clinical Markers for Kidney Disease: Supplements			
Erwin Bottinger, Yeshiva University	2001	U24 DK058768	Albert Einstein Biotechnology Center
Alfred George, Vanderbilt University	2001	U24 DK058749	Vanderbilt NIDDK Biotechnology Center
Steven Gullans, Brigham and Women's Hospital	2001	U24 DK058849	DNA Microarray Biotechnology Center
Raymond Harris, Vanderbilt University	2001	P50 DK039261	Biology of Progressive Destruction
Arthur Matas, University of Minnesota	2001	P01 DK013083	Organ Transplantation in Animals and Man
Richard Quigg, University of Chicago	2001	U24 DK058820	Massively Parallel Gene Expression Analysis
John Sedor, Case Western Reserve University	2001	P50 DK054178	CWRU O'Brien Renal Research Center
Development of Surrogate Markers for Clinical Trials: Supplement			
Christopher Bradfield, University of Wisconsin	2001	R01 ES005703	Characterization of the AH Receptor Signaling Pathway

Table A2: continued	Year	Project No.	Project Title
One-Year Supplements for Ongoing Projects			
Robert Eckel, University of Colorado Health Sciences Center	1998	R01 DK042266	Nutrition, Lipoprotein Lipase, and Body Weight Regulation
Martin Friedlander, Scripps Research Institute	1998	R01 EY011254	Integrins and Ocular Angiogenesis
Anthony Iacopino, Texas A & M Baylor College of Dentistry	1998	R29 DE011553	Impaired Wound Signaling in Diabetic Periodontitis
Timothy Kern, Case Western Reserve University	1998	R01 EY000300	Diabetic Retinopathy
George King, Joslin Diabetes Center	1998	R01 EY005110	Cell Biology Approach to Diabetic Retinopathy
Trevor Orchard, University of Pittsburgh	1998	R01 DK034818	Epidemiology of Diabetic Complications
Ann Schmidt, Columbia University	1998	R01 DE011561	Glycation, Receptors, Cytokines in Periodontal Disease
William Tamborlane, Yale University	1998	R01 HD030671	Effects of Puberty on Metabolism and Body Composition
Russell Tracy, University of Vermont and St. Agric College	1998	R01 HL058329	Epidemiology of Impaired Coagulant Balance in Diabetes
GOAL VI: ATTRACT NEW TALENT AND APPLY NEW TECHNOLOGIES TO RESEARCH ON TYPE 1 DIABETES			
Training Programs in Diabetes Research for Pediatric Endocrinologists (RFA DK02-024)			
Silva Arslanian, Children's Hospital of Pittsburgh	2003	T32 DK063686	Research and Academic Training in Pediatric Diabetes
		K12 DK063704	Academic Career Development in Pediatric Diabetes (K12)
Morey Haymond, Baylor College of Medicine	2002	T32 DK063873	Baylor Pediatric Diabetes Research Training Program
		K12 DK063691	Baylor Mentored Diabetes Investigator Award
Georgeanna Klingensmith, University of Colorado Health Sciences Center	2002	T32 DK063687	Training Program in Diabetes Research
		K12 DK063722	Diabetes Research for Pediatric Endocrinologists
Lori Laffel/Joseph Majzoub, Joslin Diabetes Center	2002	T32 DK063702	Training Grant in Diabetes for Pediatric Endocrinologists
		K12 DK063696	Career Development in Diabetes for Pediatric Endocrinologists
Charles Stanley, Children's Hospital (Philadelphia)	2002	T32 DK063688	Ped Endocrine Fellowship Training in Diabetes Research
		K12 DK063682	Ped Endocrine Career Development in Diabetes Research
William Tamborlane, Yale University	2002	T32 DK063703	Training in Pediatric Endocrinology/Diabetes Research
		K12 DK063709	Pediatric Endocrine/Diabetes Physician Scientists
Neil White, Washington University, St. Louis	2003	T32 DK063706	Fellowship Training in Pediatric Diabetes at WUMS
		K12 DK063683	Career Development in Pediatric Diabetes at WUMS
Innovative Partnerships in Type 1 Diabetes (RFA DK02-023)			
Pamela Carmines, University of Nebraska Medical Center	2002	R21 DK063416	Renal Cortical Oxidative and Nitrosative Stress in IDDM
Alexander Chervonsky, The Jackson Laboratory	2002	R21 DK063452	Role of Innate Immunity in Type 1 Diabetes
Craig Crews, Yale University	2002	R21 DK063404	Pancreatic Stem Cell Induction by Small Molecules
Maria Grant, University of Florida	2002	R21 EY014818	CXCR4/SDF-1 Axis in Proliferation of Diabetic Retinopathy
Wayne Hancock, Children's Hospital (Philadelphia)	2002	R21 DK063591	Modulation of Chemokine-Dependent Islet Injury
William Langridge, Loma Linda University	2002	R21 DK063576	Vaccinia Virus Vaccine for Type 1 Diabetes
Sigurd Lenzen, Hannover Medical School	2002	R21 AI055464	Pathophysiological and Genetic Characterization of IDDM Rats
Diane Mathis, Joslin Diabetes Center	2002	R21 DK063660	Diabetes Susceptibility Genes Through Zebrafish Genetics
Jaime Modiano, AMC Cancer Research Center	2002	R21 DK063410	Role of Negative Regulation in Development of Diabetes
Marcus Peter, University of Chicago	2002	R21 AI055465	Fas Internalization and Beta Cells
Alvin Powers, Vanderbilt University	2002	R21 DK063439	Molecular Determinants of Vascularization in Islets
Marian Rewers, University of Colorado Health Sciences Center	2002	R21 AI055466	Viral Triggers of Type 1 Diabetes
Alexander Rudensky, University of Washington	2002	R21 AI055463	Role of Cathepsins S, L, and B in Type 1 Diabetes
Doris Stoffers, University of Pennsylvania	2002	R21 DK063467	cAMP Signaling in the Pancreatic Beta Cell
Michael Uhler, University of Michigan, Ann Arbor	2002	R21 DK063340	Postgenomic Approaches to Diabetic Complications
Elena Zhukova, University of California, Los Angeles	2002	R21 DK063607	Models of Insulin Production in Enteroendocrine Cells

Table A2: continued	Year	Project No.	Project Title
Innovative Partnerships in Type 1 Diabetes (RFA DK03-015)			
Stelios Andreadis, State University of New York at Buffalo	2004	R01 DK068699	Regulated Insulin Delivery from Tissue Engineered Skin for Treatment of Type 1 Diabetes
David Antonetti, Pennsylvania State University	2004	R01 EY016413	Drug Discovery for Diabetic Retinopathy
Anil Bhushan, University of Southern California	2004	R01 DK068763	Cell Cycle Control of Beta-Cell Mass
Jeffery Chalmers, Ohio State University	2004	R01 DK068757	Magnetic Separation of Liberated Islets During Isolation
Gay Crooks, Children's Hospital, Los Angeles	2004	R01 DK068719	Cell Cycle Control of B-Cell Mass
Nika Danial/Stanley Korsmeyer, Dana Farber Cancer Institute	2004	R01 DK068781	Dissecting the Death Pathway in the Islet beta cell
Teresa Dilorenzo, Albert Einstein College of Medicine	2004	R01 AI064422	Prevention of Diabetes with Lipid Immunomodulators
Francis Doyle, University of California, Santa Barbara	2004	R01 DK068706	A Run-to-Run Algorithm for Glucose Regulation
John Gore, Vanderbilt University	2004	R01 DK068751	Pancreatic Islet Imaging and Blood Flow
Kevan Herold, Columbia University	2004	R01 DK068678	Islet Growth in NOD Mice Tolerant to Autoimmune Diabetes
Lois Jovanovic, Sansum Medical Research Institute	2004	R01 DK068663	A Run-to-Run Algorithm for Glucose Regulation
Keith Kirkwood, University of Michigan	2004	R01 DK068673	Regulated Insulin Delivery from Tissue Engineered Skin for Treatment of Type 1 Diabetes
Rohit Kulkarni, Joslin Diabetes Center	2004	R01 DK068721	Dissecting the Death Pathway in Islet Beta Cells
Suzanne Laychock, State University of New York at Buffalo	2004	R01 DK068700	Regulated Insulin Delivery from Tissue Engineered Skin for Type 1 Diabetes
Fred Levine, University of California, San Diego	2004	R01 DK068754	Small Molecular Regulation of Beta-Cell Differentiation
Mark Mercola, Burnham Institute	2004	R01 DK068715	Small Molecule Regulators of Beta-Cell Differentiation
Virginia Papaioannou, Columbia University	2004	R01 DK068661	Islet Growth in NOD Mice Tolerant to Autoimmune Diabetes
Klearchos Papas, University of Minnesota	2004	R01 DK068717	Magnetic Separation of Liberated Islets During Isolation
Steven Porcelli, Albert Einstein College of Medicine	2004	R01 AI064424	Prevention of Diabetes with Lipid Immunomodulators
Alvin Powers, Vanderbilt University	2004	R01 DK068764	Pancreatic Islet Imaging and Blood Flow
Charles Smith, Pennsylvania State University	2004	R01 EY016448	Drug Discovery for Diabetic Retinopathy
Richard Young, Whitehead Institute for Biomedical Research	2004	R01 DK068655	Transcriptional Regulatory Networks in Pancreatic Islets
Bench to Bedside Research on Type 1 Diabetes (RFA DK02-022)			
Christophe Benoist, Joslin Diabetes Center	2002	R21 AI055467	High Sensitivity Detection of Autoimmune T Cells in Type 1 DM
David Bleich, Beckman Research Institute	2002	R21 DK063351	Prevention of Type 1 Diabetes with MMP Inhibitors
Michael Clare-Salzler, University of Florida	2002	R21 DK063422/ R33 DK063422	Dendritic Cells and the Prevention of Type 1 Diabetes
C. Fathman, Stanford University	2002	R21 AI055468/ R33 A1055468	Adoptive Cellular Gene Therapy in Type 1 Diabetes
Peter Gottlieb, University of Colorado Health Sciences Center	2002	R21 DK063518	Human TCR/HLA Transgenic Mice To Prevent Type 1 Diabetes
Zhiguang Guo, University of Minnesota	2002	R21 AI055469	A Strategy to Cure Type 1 Diabetes
Kevin Lemley, Stanford University	2002	R21 DK063456	Urinary Podocyte Excretion Using FACS Methodology
Jerry Nadler, University of Virginia, Charlottesville	2002	R21 DK063521	New Anti-Inflammatory Agents To Prevent Damage to Islets
Gerald Nepom, Virginia Mason Research Center	2002	R21 DK063423	Treatment of Type 1 Diabetes with hGAD65 Altered Peptide Ligand
David Sachs, Massachusetts General Hospital	2002	R21 DK063503	Islet-Kidney Transplants for Treatment of Diabetic ESRD
Massimo Trucco, Children's Hospital (Pittsburgh)	2002	R21 DK063499/ R33 DK063499	Gene-Engineered Dendritic Cell Therapy for Diabetics

Table A2: continued	Year	Project No.	Project Title
Bench to Bedside Research on Type 1 Diabetes (RFA DK03-001)			
Sofia Casares, Mount Sinai School of Medicine	2003	R21 DK066421	HLA Chimeric-Based Interventions in Type 1 Diabetes
Alessio Fasano, University of Maryland	2003	R21 DK066630	Gut Permeability in the Pathogenesis of Type 1 Diabetes
Ronald Gill, University of Colorado Health Sciences Center	2003	R21 AI060349	Correcting Dysregulated Peripheral Tolerance in NOD Mice
Raimund Hirschberg, University of California, Los Angeles	2003	R21 DK063360	Prevention of Diabetic Nephropathy by BMP7
Jian-Xing Ma, University of Oklahoma Health Sciences Center	2003	R21 EY015650/ R33 EY015650	A New Therapy for Diabetic Macular Edema
Alvin Powers, Vanderbilt University	2003	R21 DK066636/ R33 DK066636	GLP-1 to Enhance Islet Transplantation
Bellur Prabhakar, University of Illinois at Chicago	2003	R21 AI060386	Induction of Tolerance to Islet Cell Transplants
Nora Sarvetnik, Scripps Research Institute	2003	R21 DK066511	Engraftment of Pancreatic Progenitors
Andrew Shapiro, University of Alberta	2003	R21 DK066512	ICOS-B7h in Islet Transplant Rejection and Autoimmunity
Andrew Stewart, University of Pittsburgh	2003	R33 DK066127	Islet Allograft Gene Therapy for Primate Diabetes
Bench to Bedside Research on Type 1 Diabetes (RFA DK03-019)			
Sridevi Devaraj, University of California, Davis	2004	R21 DK069801	Cellular Pathways of Inflammation in Type 1 Diabetes
Francis Doyle, University of California, Santa Barbara	2004	R21 DK069833	Model-Based Advanced Control of Insulin in T1DM
Kevan Herold, Columbia University	2004	R21 DK069872	Combination of Anti-CD3 and Ag-Specific Immunotherapy
Daniel Kaufman, University of California, Los Angeles	2004	R21 DK069839	Noninvasive PET Imaging of Islet Grafts
David Kurnit, University of Michigan	2004	R21 DK069877	Detection and Treatment of Nephropathy in DM Type 1
Timothy Lyons, University of Oklahoma Health Sciences Center	2004	R21 HL080921	Apolipoproteins and the Complications of Type 1 Diabetes
Ali Naji, University of Pennsylvania	2004	R33 AI065356	B Cell Immunomodulation in Islet Transplantation
David Sachs, Massachusetts General Hospital	2004	R33 DK069827	Islet-Kidney Transplants for Treatment of Diabetic ESRD
Jin-Xiong She, Medical College of Georgia	2004	R21 DK069878	Development of Microarray-Based Biomarkers for Type 1 Diabetes
Rusung Tan, BC's Children's Hospital	2004	R21 AI065179	Detecting Beta Cell Specific T Cells in Type 1 Diabetes
Ian Zagon, Pennsylvania State University	2004	R21 EY016666	Naltrexone as a Novel Treatment for Diabetic Keratopathy
SBIR and STTR RFA in Type 1 Diabetes and Its Complications (RFA DK03-020)			
William Beschorner, Ximerex, Inc.	2004	R44 DK057986	Islet Transplantation with Chimeric Donor Pigs
John Centanni, Stratatech Corporation	2004	R44 DK069924	Antimicrobial, Angiogenic Skin Substitutes for Diabetic Ulcers
Jenny Freeman, HyperMed, Inc.	2004	R41 DK069871	Hyperspectral Imaging To Predict and Assess Foot Ulcers
Joseph Lucisano, Glysens, Inc.	2004	R44 EB005174	Robust Signal Processing for Tissue Glucose Sensor
Uwe Staerz, Isogenis, Inc.	2004	R43 DK069618	Protecting Pancreatic Islet Grafts from Rejection
Rebecca Tirabassi, Biomedical Research Models, Inc.	2004	R43 DK069733	Neurogenic Compounds for Treating Diabetic Complications
John Wilson, Wilson Wolf Manufacturing Corp.	2004	R43 DK069865	Islet Culture, Shipping, and Infusion Device
Todd Zion, Smartcells, Inc.	2004	R43 DK069870	Glucose-Responsive Self-Regulated Insulin Delivery
SBIR: Measurement Tools For Altered Autonomic Function In Spinal Cord Injury And Diabetes (RFA HD04-018)			
Firouz Daneshgari, Neurotron, Inc.	2005	R41 DK074987	Assessment of Altered Function in Diabetic Bladder

Table A2: continued	Year	Project No.	Project Title
Proteomics and Metabolomics in Type 1 Diabetes and Its Complications (RFA DK03-024)			
M. Amin Arnaout/Darryl Palmer-Toy, Massachusetts General Hospital	2004	R21 DK070212	Metabolomic Analysis of Type 1 Diabetic Nephropathy
Helene Bour-Jordan, University of California, San Francisco	2004	R21 NS052132	Autoimmune Basis of Diabetic Neuropathy
Mark Chance, Albert Einstein College of Medicine	2004	R21 DK070229	Proteomic Approaches to Type l Diabetes Progression
Paul Harris, Columbia University	2004	R21 DK070192	Soluble Protein Markers of T1D Progression
Kathryn Haskins, University of Colorado Health Sciences Center	2004	R21 AI065355	Proteomics Analysis of T Cell Autoantigens in TID2
Michael Mauer, University of Minnesota	2004	R21 DK070210	Proteomics in Type 1 Diabetes and Its Complications
Sreekumaran Nair, Mayo Clinic	2004	R21 DK070179	Plasma Protein Synthesis and Abundance in T1 Diabetes
Mark Nicolls, University of Colorado	2004	R21 DK070203	Viability Assay for Human Islet Transplantation
Jin-Xiong She, Medical College of Georgia	2004	R21 HD050196	Proteomic Changes/Progression of Human Type 1 Diabetes
Richard Smith, Battelle Pacific Northwest National Laboratory	2004	R21 DK070146	Proteomics and Metabolomics Studies of Type 1 Diabetes
Forest White, Massachusetts Institute of Technology	2004	R21 AI065354	Proteomics of Central Tolerance in NOD vs B6 Mice
Phased Innovation Partnerships - Supplements to Centers			
Yaakov Barak, University of Massachusetts Medical School	2001	P30 DK032520	PPAR Gamma KO and Insulin Resistance
Giacomo Basadonna, Yale University	2001	P30 DK045735	Glucose Responsive Transgene
James Callis, University of Washington	2001	P30 DK017047	Islet Purification
Shaoping Deng, University of Pennsylvania	2001	P30 DK019525	Gene Therapy with PDX
Denise Faustman, Massachusetts General Hospital	2001	P30 DK057521	TNF Apoptosis
Eva Feldman, University of Michigan, Ann Arbor	2001	P60 DK020572	Postgenomic Approaches to Complications
Yang-Xin Fu, University of Chicago	2001	P60 DK020595	Lymphotoxin
Mark Geraci, University of Colorado Health Sciences Center	2001	P30 DK057516	RNA Profile of Islet Development
Wouter Hoff, University of Chicago	2001	P60 DK020595	Glucose Sensing Fusion Proteins
Shin-Ichiro Imai, University of Washington	2001	P30 DK017047	Sir2a in Beta Cell Differentiation
Klaus Kaestner, University of Pennsylvania	2001	P30 DK019525	Islet Stem Cells
Myra Lipes, Joslin Diabetes Center	2001	P30 DK036836	Optimize Gene Expression in Surrogate Beta Cells
Diane Mathis, Joslin Diabetes Center	2001	P30 DK036836	Imaging Inflammation
Ruslan Medzhitov, Yale University	2001	P30 DK045735	Innate Immunity in Type 1 Diabetes
Mark Nicolls, University of Colorado Health Sciences Center	2001	P30 DK057516	Proteomics and Transplantation
William Osborne, University of Washington	2001	P30 DK017047	Glucose Regulated Insulin Delivery
Sunhee Park, University of Massachusetts Medical School	2001	P30 DK032530	ART2 Ligands
Alvin Powers, Vanderbilt University	2001	P60 DK020593	*In Vivo* Assessment of Transplanted Islets
Alexander Rudensky, University of Washington	2001	P30 DK017047	Cathespins
Jaromir Ruzicka, University of Washington	2001	P30 DK017047	GAD Assay
Harry Shamoon, Yeshiva University	2001	P60 DK020541	Liver Glycogen Metabolism/Hypoglycemia
Li Wen, Yale University	2001	P30 DK045735	Dendritic Cell Therapy
Burton Wice, University of Washington	2001	P30 DK017047	Gut Stem Cells
John Wiley, University of Michigan, Ann Arbor	2001	P60 DK020572	Neuropathy
Kelvin Yamada, University of Washington	2001	P30 DK017047	Hypoglycemia

DESCRIPTIONS OF RESEARCH EFFORTS SUPPORTED BY THE *SPECIAL FUNDING PROGRAM*

In addition to supporting numerous consortia focused on type 1 diabetes and its complications, presented in the main section of this document, the *Special Funds* were deployed to numerous other initiatives. These initiatives have promoted a broad spectrum of research projects in areas identified as of particular opportunity or challenge to complement the efforts of the consortia. This Appendix includes descriptions of those initiatives, as well as brief descriptions of the consortia that are more fully discussed in the main sections of this Report. The scientific output of these research efforts can be found in the "Assessment" chapter and in the Goal chapters.

For each initiative description in this Appendix, the noted year in which grants were awarded marks the start of the research projects, the majority of which have extended or will extend for multiple years.

Goal I—Identify the Genetic and Environmental Causes of Type 1 Diabetes

Type 1 Diabetes Genetics Consortium (T1DGC)

T1DGC is organizing international efforts to identify genes that determine an individual's risk of developing type 1 diabetes. This Consortium is recruiting 2,800 families who have two or more siblings with type 1 diabetes in order to identify genes that increase susceptibility. Finding these genes will not only increase understanding of the underlying molecular mechanisms of disease development, but also aid in the discovery of novel prevention strategies and identification of patients who could benefit from these approaches.

International Histocompatibility Working Group (IHWG)

The IHWG works to identify single nucleotide polymorphisms (SNPs) in type 1 diabetes candidate genes. Type 1 diabetes is a polygenic disease caused by differences in multiple genes. Identifying genes and polymorphisms associated with type 1 diabetes will enable accurate prediction, diagnosis, and, ultimately, treatment of this disease. One approach for finding disease-associated genes is to screen affected and unaffected individuals for DNA sequence differences (genetic polymorphisms) in candidate genes.

The Environmental Determinants of Diabetes in the Young (TEDDY)

RFA-DK-02-029

The goal of TEDDY is to identify environmental causes of type 1 diabetes in genetically susceptible individuals. This long-term study is enrolling at-risk newborns and then following them until they are 15 years of age. The study is crucial to helping researchers understand the environmental triggers that play a role in type 1 diabetes disease onset and development.

Search for Diabetes in Youth (SEARCH)

PA 00097, RFA-DP-05-069

SEARCH is defining the prevalence and incidence of diabetes in children and youth less than 20 years of age in six geographically dispersed populations that encompass the ethnic diversity of the United States. This study will help increase understanding of how type 1 diabetes strikes and unfolds.

Type 1 Diabetes Mouse Repository

This research resource, located at The Jackson Laboratory in Maine, was established to collect, preserve, and disseminate approximately 150 mouse strains that are important to research in type 1 diabetes. The repository is enhancing access and ensuring the continued availability of these mouse models to the entire research community.

Bioinformatics Integration Support Contract

RFP-NIH-NIAID-DAIT-02-16

Advanced technologies are profoundly altering the study of immunology and infectious diseases; offering new approaches to understanding immune activation and regulation;

uncovering the genetic causes of disease susceptibility; and developing new diagnostic, treatment, and intervention strategies. These technologies are also generating large amounts of data to be captured, analyzed, and stored. This project provides advanced support in the production, analysis, archiving, and exchange of scientific data for a diverse community of immunology researchers and access to best practices in the management of scientific information for researchers engaged in allergy, immunology, and transplantation research. Contracts were awarded in FY 2002.

Mammalian Gene Collection (MGC)

The MGC is a large, trans-NIH program to compile a complete set of full-length (open reading frame) sequences and cDNA clones of expressed genes for human and mouse. The MGC supports the production of cDNA libraries, clones, and sequences. All resources generated by the MGC are publicly accessible to the biomedical research community (http://mgc.nci.nih.gov).

Sequencing the NOD Mouse for Immune System Genes for Type 1 Diabetes

This is a project to generate a finished sequence of the mouse genome, dovetailing with a number of targeted sequencing programs. Sequencing the regions of the NOD mouse genome relevant to type 1 diabetes is crucial to better understanding the role that genetic susceptibility plays in the pathogenesis of type 1 diabetes. The sequencing of these regions will facilitate identification and characterization of potential immunogenic proteins responsible for initiation and progression of autoimmune destruction of islets and potential targets in therapy.

Biotechnology Resource Centers

RFA-DK-00-002

This initiative established core expertise in microarray performance and analysis at research centers around the United States. Regularly appropriated funds were provided for nine centers in FY 2000 to support a wide range of research within the NIDDK mission. An additional center with relevance to type 1 diabetes was awarded using *Special Funds*.

Functional Genomics of the Developing Endocrine Pancreas

RFA-DK-99-007

This initiative sought to identify all genes expressed in the developing endocrine pancreas and to generate both microarray and bioinformatics tools, which could be used to study development, function, and disease progression in type 1 diabetes. A supplemental objective was added in FY 2001 to screen cDNA libraries for clones that might be useful as markers for beta cell precursors. The NIDDK and JDRF awarded two resource-related grants in FY 1999 to establish an Endocrine Pancreas Consortium. One project provided the Consortium with expertise in diabetes and high throughput sequencing capacity through the Washington University Genome Sequencing Center. The other project brought expertise in mouse genetics and bioinformatics through the University of Pennsylvania Center for Bioinformatics. A third investigator offered expertise in pancreatic development through subcontracts to both sites. One of the projects (University of Pennsylvania) was converted to a cooperative agreement and incorporated into the Beta Cell Biology Consortium (BCBC).

Public Health Pilot Programs in Newborn Screening

The CDC fostered, initiated, and supported pilot programs between type 1 diabetes research centers and state public health newborn screening laboratories. The CDC National Diabetes Laboratory used the *Special Funds* for several projects to enhance screening and identification of newborns at risk for type 1 diabetes. The CDC provided additional support from regularly appropriated funds. The Diabetes Evaluation in Washington State (DEWIT) study, with support from the National Diabetes Laboratory, established a cohort of children for pathogenesis studies by testing newborn blood

spots from about 32,000 children at higher genetic risk for type 1 diabetes. In addition, the CDC established proficiency testing programs in the Newborn Screening Quality Assurance Program for type 1 diabetes genetic markers and autoantibody testing on dried blood spots.

Proficiency Testing for Laboratory Assays To Measure Markers of Innate and Acquired Risk for Type 1 Diabetes in Dried Blood Spots

Various analytical approaches are used to test for genetic and serologic markers that identify higher-risk individuals in long-term, multicenter studies of type 1 diabetes. Genetic tests conducted on newborns usually make use of dried blood spots as the sample matrix. Dried blood spots also allow home collection of samples from children enrolled in these studies for surveillance for the appearance of autoantibodies. The CDC Newborn Screening Quality Assurance Program conducts a proficiency testing program in newborn screening laboratories around the world, ensuring the validity of laboratory data over time and among centers.

Goal II—Prevent or Reverse Type 1 Diabetes

Type 1 Diabetes TrialNet

RFA-DK-01-004

TrialNet is an international network of investigators, clinical centers, and core support facilities. It supports the development and implementation of clinical trials of agents to slow the progression of type 1 diabetes in new-onset patients and to prevent the disease in at-risk patients. TrialNet has launched several studies that are recruiting patients and is currently evaluating several other therapeutic agents to test. This type of collaborative network infrastructure is critical for facilitating clinical trials in type 1 diabetes, as well as for making real improvements in patients' health by identifying new therapeutic agents.

Immune Tolerance Network (ITN)

Immune tolerance is the process by which the immune system accepts a protein or other molecule as "self" and does not attempt to destroy cells or tissues containing that protein. Tolerance induction can block the autoimmune process underlying type 1 diabetes or enable the body to accept transplanted islets without the need to globally suppress the immune system. Research conducted through the ITN is evaluating new treatments to induce tolerance in type 1 diabetes, as well as other disease areas. The ITN is currently conducting and developing several clinical trials related to type 1 diabetes and islet transplantation. Research on tolerance is critical both for developing therapies to slow or reverse type 1 diabetes, as well as for improved approaches to islet transplantation.

Cooperative Study Group for Autoimmune Disease Prevention (Prevention Centers)

RFA-AI-05-026

The mission of the Prevention Centers is to engage in scientific discovery that significantly advances knowledge about the prevention and regulation of autoimmune disease, including type 1 diabetes. Pre-clinical research conducted by the Prevention Centers is key to the development of strategies for modulating the immune system so that they can be tested in human clinical trials.

Standardization Programs

Standardized assessment of key measures for type 1 diabetes research is extremely important to ensure consistency across laboratories and clinical trial networks, so that data can be compared and combined. Efforts are ongoing to improve and standardize the measurement of autoantibodies (used to identify initiation of autoimmunity), C-peptide (a measure of beta cell mass and function), and HbA1c (a measure of long-term blood glucose control).

Trial To Reduce IDDM in the Genetically At Risk (TRIGR)

This multicenter international study is comparing the development of type 1 diabetes in genetically susceptible infants who are weaned onto a hydrolysate of cow's milk formula, in which many of the cow proteins have been broken down, versus standard cow's milk formula. TRIGR could have a major impact on disease prevention if differences are observed between the two types of formulas.

Gene Therapy Approaches for Diabetes and Its Complications

RFA-DK-01-006

Scientists have been developing gene transfer techniques for introducing genes into the body's cells to correct a defect or alter the properties of those cells. Many approaches to blocking the development of type 1 diabetes and treating diabetic complications may be amenable to gene transfer technology. This program facilitated preliminary studies, which began in 2001, on the appropriate use and feasibility of this new technology.

Innovative Grants on Immune Tolerance

RFA-AI-00-006, RFA-AI-03-010, and RFA-AI-05-023

Autoimmune diseases and transplant rejection may one day be treated by the induction of immune tolerance. These initiatives were designed to support innovative, high-impact research on the mechanisms and applications of antigen-specific immune tolerance to promote the development of tolerogenic protocols applicable to immune-mediated diseases, including type 1 diabetes, and transplant rejection. Grants for the first two of these initiatives were awarded in 2001 and 2004; grants in response to the third initiative will be funded in 2006.

Pilot Studies for New Therapies for Type 1 Diabetes and Its Complications

RFA-DK-99-013

Insulin therapy, though life-sustaining for individuals with type 1 diabetes, is not a cure and does not prevent the devastating complications that affect nearly every organ system. In FY 1999-2000, grants were awarded to explore new therapies for type 1 diabetes and its complications, including studies relevant to: preventing or reversing type 1 diabetes (Goal II), cell replacement therapy (Goal III), prevention of hypoglycemia (Goal IV), and prevention or treatment of diabetic complications (Goal V).

Immunopathogenesis of Type 1 Diabetes

RFA-DK-98-010

Grants supporting studies related to the development of improved methods for risk prediction, prevention, and therapy for type 1 diabetes were awarded in FY 1998.

Biomarkers of Autoimmunity in Type 1 Diabetes

RFA-DK-06-002

Patients and those at risk for type 1 diabetes would benefit greatly from intensified research toward improving the prediction and early detection of autoimmune destruction of pancreatic beta cells, and developing biomarkers for ongoing autoimmune disease which could be used to monitor responses in clinical trials. This initiative is intended to facilitate progress in this area by soliciting new applications focused on the detection of the human autoimmune response in type 1 diabetes. Such approaches would have the potential to lead to the development of a test useful in a clinical setting. Grants will be awarded in Fall 2006.

Data and Biosample Repository

RFP-DK-02-004

In FY 2003, the NIDDK established a central repository for data and biologic samples, such as blood, DNA, and cell lines, collected in the course of large, multisite clinical studies. The repository will expand the usefulness of these studies by increasing access to trial-related biosamples and data. When appropriate, researchers seeking to reanalyze samples or data will be able to obtain these materials quickly and efficiently. The repository was established to: (1) gather, store, and distribute samples from completed clinical studies; (2) gather, store, distribute, and facilitate analyses of finished datasets of completed studies; (3) process, analyze, and store samples that are being gathered in ongoing and new studies; and (4) provide support services for genetics studies, including cell line immortalization and DNA extraction. This resource is benefiting multiple type 1 diabetes research consortia and networks, as well as other type 1 diabetes researchers who may further analyze the stored data and samples.

Goal III—Develop Cell Replacement Therapy

Beta Cell Biology Consortium (BCBC)

RFA-DK-01-014, RFA-DK-04-017, and RFA-DK-04-018

The BCBC is an international Consortium of investigators pursuing key challenges of enormous relevance to development of therapies for type 1 diabetes. The mission of the BCBC is to facilitate interdisciplinary approaches that will advance understanding of pancreatic islet cell development and function. The long-term scientific goal is to develop a cell-based therapy to restore normal insulin production and action to diabetic patients. Working toward this goal, the BCBC has created and distributed important reagents that will serve the scientific community at large. Research pursued through the BCBC can ultimately help to overcome a major barrier to islet transplantation—the shortage of islets.

Clinical Islet Transplantation Consortium (CIT)

RFA-DK-04-004 and RFA-DK-04-005

The purpose of this Consortium is to develop and implement a program of single- and/or multicenter clinical studies, accompanied by mechanistic studies, in islet transplantation with or without accompanying kidney transplantation, for the treatment of type 1 diabetes. Research pursued through this Consortium aims to make improvements in the field of islet transplantation and to share the data and results with the broad scientific community.

Pilot and Feasibility Program in Human Islet Biology

RFA-DK-03-021

Much of the understanding of the basic biology of beta cells and islets had previously been generated from studies of mouse and rat cell lines and, to a lesser extent, from monkey islets. This program was thus designed to stimulate research focusing on the biology of human beta cells and human pancreatic islets. Such research augments knowledge of human islets, and findings can be compared with those from rodent models. Grants were awarded in 2004 and 2005. The information gained from these studies of human beta cells and islets should help in the development of new reagents for *in vivo* imaging studies of the human islet, assays for use in predicting human islet transplant success, and cellular therapies for potential use in the treatment of type 1 diabetes.

Comprehensive Programs in Beta Cell Biology

RFA-DK-02-014

Increased understanding of beta cell biology may help researchers improve the viability of islets used for transplantation, lead to the development of new treatments for diabetes (e.g., beta cell replacement), and prevent beta cell destruction through the development of novel therapeutics. This program bolstered investigator-initiated collaborative research aimed at understanding the signaling pathways in the adult pancreatic beta cell, and studying the integration of these signaling

networks among the different cell types of the pancreatic islet. The grants in response to this initiative were awarded, in 2002, to teams of investigators with complementary expertise that came together to tackle important research problems of the beta cell.

Non-Human Primate Transplantation Tolerance Cooperative Study Group (NHPCSG)

RFA-AI-01-006 and RFA-AI-06-018

This multi-institution Study Group was established to evaluate the safety and efficacy of novel therapies to induce immune tolerance in non-human primate models of kidney and islet transplantation. The Group also supports research on immune tolerance. Pre-clinical research conducted by this Group will help scientists move promising therapeutic agents from the laboratory into human clinical trials.

Islet Cell Resource Centers (ICRs)

RFA-RR-01-002 and RFA-RR-05-003

The ICRs serve as regional centers that provide clinical-grade human islets to investigators engaged in islet transplantation protocols throughout the country; optimize the procedures used to obtain such islets; and distribute human pancreatic islets to investigators for use in laboratory-based research studies. This resource provides high-quality islets for use in human islet transplantation research and allows researchers to use human islets in basic research studies.

Collaborative Islet Transplant Registry (CITR)

The mission of the CITR is to expedite progress and promote safety in islet transplantation through the collection, analysis, and communication of comprehensive, current data on all islet transplants performed in North America. The CITR prepares an annual report with data on recipient and donor characteristics, pancreas procurement and islet processing, immunosuppressive medications, function of the donated islets, patients' lab results, and adverse events. This information will help to define the overall risks and benefits of islet transplantation as a treatment option for type 1 diabetes patients.

Immunobiology of Xenotransplantation Cooperative Research Program

RFA-AI-04-042

This multi-institution Program is developing and evaluating pre-clinical porcine to non-human primate models of xenotransplantation (solid organ, tissue, or cell transplantation between species). The Program supports pre-clinical research to address immunological and physiological issues critical to the engraftment, survival, and function of xenografts. The long-term goal is to develop novel and efficacious strategies for broad clinical application of xenotransplantation.

Gene Transfer Approaches To Enhance Islet Transplantation

RFA-DK-02-020

Many scientific and medical issues remain before transplantation can become a routine treatment for type 1 diabetes. A major barrier to widespread use of this technology is the limited supply of transplantable islets. Gene transfer approaches to engineer new beta cells or to enhance islet viability could improve the efficiency and availability of islet transplantation. This initiative promoted innovative projects, funded in 2002, on the application of gene transfer technology to islet transplantation.

Imaging Pancreatic Beta Cell Mass, Function, Engraftment or Inflammation

RFA-DK-02-002

In type 1 diabetes, insulin-producing beta cells are destroyed in an autoimmune process that involves infiltration and subsequent inflammation of the pancreatic islets by immune system T cells. Noninvasive methods to image beta cell mass, function, and inflammation and the engraftment of transplanted islets would enhance the ability to monitor disease

progression and response to therapy in individuals who have or are at risk of developing type 1 diabetes. Grants were awarded in 2002 for research toward developing new techniques or reagents for imaging beta cells *in vivo*. (See also the description of RFA-DK-06-003 in this Appendix.)

New Strategies for the Treatment of Type 1 Diabetes Mellitus

RFA-DK-00-001

This initiative supported research on potential clinical strategies for the prevention, treatment, or cure of type 1 diabetes in human patients. In FY 2000, grants were awarded for clinical trials to improve islet transplantation or to maintain residual beta cell function in new-onset patients.

Cellular and Molecular Approaches to Achieving Euglycemia

RFA-DK-98-007

This program encouraged the development of therapies to achieve normal glucose levels in patients with type 1 diabetes. Grants were awarded in FY 1998 on a range of relevant topics, including islet and beta cell transplantation, engineering of regulated insulin secretion in non-beta cell surrogates, hematopoietic stem cell therapy for the induction of tolerance, and development of technologies to preserve beta cell function and stimulate beta cell regeneration. Particular emphasis was placed on the development of clinically applicable technologies.

Islet Encapsulation Research

The development of pancreatic islet transplantation holds great promise as a treatment for type 1 diabetes. However, to prevent rejection of donated islets, patients must rely on long-term immunosuppression, which presents the risk of multiple adverse effects. An alternative to immunosuppression is to coat or "encapsulate" the islets with a material that would prevent the islets from being recognized as foreign by the patient's immune system, yet allow necessary nutrients to reach the islets. Four pilot and feasibility awards were made with the *Special Funds* in FY 2002.

Toward Imaging the Pancreatic Beta Cell in People

RFA-DK-06-003

The ability to image or otherwise directly monitor beta cells in people would greatly enhance understanding of the causes and progression of diabetes and the life cycle of the islet. Furthermore, it would also improve the ability of clinicians to study the beta cell in human health and disease, as well as to monitor therapy, particularly islet transplantation. This initiative, for which grants will be awarded late in 2006, was designed to provide resources to further research on imaging the pancreatic beta cell, beta cell function, or inflammation *in vivo*, using approaches that would be clinically applicable. It builds on research from previous efforts, including RFA-DK-02-002 (described previously).

Beta Cell Regeneration for Diabetes Therapy

RFA-DK-05-007

Regenerative medicine is providing new therapeutic approaches for restoring organ functions lost due to disease or other causes. To enhance tissue and organ regeneration, progenitor cells must be mobilized and provided with an appropriate niche to advance their development. In order to harness the power of regenerative medicine for diabetes therapy, it is important to define further the basic tissue biology and regenerative capacity of the human pancreas, as well as cellular and molecular mechanisms regulating cell turnover, tissue remodeling and regeneration. This initiative aims to support studies that will characterize the regenerative potential of human beta cells or islets *in vivo*, define cellular and molecular factors regulating pancreatic regeneration in normal and diabetic adults, and identify ways to enhance recovery of endogenous beta cell function in diabetic patients.

Goal IV—Prevent or Reduce Hypoglycemia in Type 1 Diabetes

Diabetes Research in Children Network (DirecNet)

RFA-HD-01-009

The focus of DirecNet is to investigate the use of technological advances in the management of type 1 diabetes in children and to develop a better understanding of hypoglycemia. The Network's goals include assessing the accuracy, efficacy, and effectiveness of continuous glucose monitoring in children with type 1 diabetes, and determining the extent to which exercise contributes to the risk of hypoglycemia. Until cell replacement therapy is a viable treatment option for children with type 1 diabetes, research on glucose sensing and insulin delivery is crucial to improving quality of life and decreasing the number of hypoglycemic episodes.

Hypoglycemia in Patients with Type 1 Diabetes

RFA-DK-03-017

Large clinical trials have demonstrated the efficacy of intensified glucose control in the prevention of the long-term vascular complications of diabetes. However, episodes of severe hypoglycemia may complicate intensified treatment and are often a major obstacle to the achievement of euglycemia in many patients. This program supports basic and clinical studies to enhance understanding of how the brain and other critical tissues sense and respond to hypoglycemia; to delineate the effects of hypoglycemia on brain function; and to develop improved methodologies to prevent hypoglycemia based on an understanding of physiological glucose sensing and counterregulation. Grants were awarded in 2004.

Effects of Hypoglycemia on Neuronal and Glial Cell Function

RFA-NS-02-008

Recent therapeutic strategies aimed at closely controlling elevated glucose levels in diabetic individuals put them at risk for experiencing multiple episodes of hypoglycemia. Acute episodes of hypoglycemia can result in alteration of brain function, confusion, abnormal behavior, seizures, or coma. Likewise, recurrent hypoglycemia can potentially harm the cells of the central nervous system or impose long-lasting damage on the brain. This initiative focused on elucidating the effects of acute and recurrent episodes of hypoglycemia on glial and neuronal cells of the developing and mature central nervous system. Funded in 2002, these research projects should enhance understanding of the effects of hypoglycemia on brain function and could lead to new targets for therapy for this serious complication.

Sensor Development and Validation

RFA-EB-02-002

Management of type 1 diabetes has been improved by the availability of continuous, noninvasive glucose monitoring systems and insulin pumps. Nonetheless, this advanced technology does not fully replicate the body's natural ability to link insulin secretion directly and continuously to blood glucose levels. The broad scope of this solicitation encompassed research to further advance the field of novel glucose sensing methods and "closed-loop" insulin delivery systems; grants were awarded in 2002.

Understanding Hypoglycemia Unawareness in Patients with Diabetes

RFA-DK-01-031

Many individuals with diabetes experience a progressive decay in the counter-regulatory response to hypoglycemia over time. Falling blood glucose levels fail to trigger epinephrine secretion, and therefore no neurogenic symptoms occur to warn the patient of a problem. Such "hypoglycemia unawareness" can cause prolonged exposure to hypoglycemia and result in potential brain injury, seizure, or loss of consciousness. The development of hypoglycemia unawareness makes the implementation of intensified blood glucose control more

difficult and puts patients at risk for severe hypoglycemia-related complications. This initiative fostered basic and clinical research on molecular mechanisms underlying hypoglycemia unawareness and novel approaches to prevent or reverse this condition in diabetic patients, with research grants awarded in 2002.

Glucose Sensors in the Treatment of Diabetes
RFA-DK-98-008

Accurate, noninvasive glucose sensors hold great promise for improving glucose control and quality of life for individuals with type 1 diabetes. This initiative, funded in FY 1998, supported research on the development of novel glucose sensors or the creation of a closed-loop system for regulating blood glucose, incorporating advances in chemistry, engineering, cell biology, biochemistry, and endocrinology.

Developing New Tools for Detecting and Monitoring Low Blood Glucose for People with Diabetes
PA 99151 (CDC)

Hypoglycemia is the most common problem limiting diabetes management. This program focused on the development of innovative and minimally invasive technology to alert people with diabetes of an impending hypoglycemic episode, to minimize the morbidity and mortality associated with hypoglycemia, and to aid glycemic control, thus reducing the risk for complications of diabetes. In response to the program announcement, "Innovative Technology Development Grant for the Detection and Monitoring of Diabetic Hypoglycemia by Non- or Minimally-Invasive Techniques," the CDC funded three research grants in 1999.

Standardization Program To Improve the Measurement of Blood Glucose by Portable Monitoring Systems

People with diabetes and their health care providers rely on the results reported by portable blood glucose monitoring systems to make treatment decisions. Improper treatment can result if performance is not comparable among the many different systems that are available. This project was launched by the CDC to evaluate the variability among blood glucose monitoring systems and to develop a standardization program to normalize results among these systems.

Goal V—Prevent or Reduce the Complications of Type 1 Diabetes

Epidemiology of Diabetes Interventions and Complications (EDIC)

The aim of EDIC is to study the clinical course and risk factors associated with the long-term complications of type 1 diabetes, using the cohort of the Diabetes Control and Complications Trial (DCCT). The DCCT/EDIC research group has observed dramatic long-term benefits of intensive glucose control in preventing and delaying complications of the eyes, kidneys, nerves, and heart. These results have had a major impact on the clinical care of diabetes patients.

Family Investigation of Nephropathy and Diabetes (FIND)

The FIND Consortium is carrying out studies to elucidate the genetic susceptibility to kidney disease in patients with diabetes, as well as genetic susceptibility to retinopathy in diabetic patients. A family-based study recruited more than 2,500 affected and discordant pairs of siblings. A separate case control study is completing recruitment of more than 3,000 individuals. These studies will help researchers understand the genetic underpinnings of the kidney and eye complications of diabetes, which can, in turn, inform prevention and treatment strategies.

Genetics of Kidneys in Diabetes Study (GoKinD)

GoKinD was established to study the genetics of kidney disease in type 1 diabetes patients. The study group has collected and is distributing DNA and other biological samples from more than 1,700 adults with type 1 diabetes in the United States and Canada. Scientists will use these samples to identify genes that are important in the development of, or resistance to, diabetic kidney disease.

Diabetic Retinopathy Clinical Research Network (DRCR.net)

RFA-EY-01-001

Type 1 diabetes causes damage to the eyes and may lead to blindness. The DRCR.net conducts multicenter clinical research studies to test promising therapeutic agents for the treatment of two forms of diabetic eye disease—diabetic retinopathy and diabetic macular edema—and associated conditions. Because blindness is such a severe and debilitating disease complication, research pursued through DRCR.net could dramatically improve patients' quality of life.

Animal Models of Diabetic Complications Consortium (AMDCC)

RFA-DK-01-009, RFA-HL-01-010, and RFA-DK-05-011

The AMDCC is an interdisciplinary Consortium designed to develop animal models that closely mimic the human complications of diabetes for the purpose of studying disease pathogenesis, prevention, and treatment. The Consortium has already developed a number of promising models for complications involving the heart, kidneys, and nervous system. Development of animal models is essential for pre-clinical drug development.

Collaborative Studies on Angiogenesis and Diabetic Complications

RFA-DK-04-022

This program supports studies to bolster understanding of the effects of type 1 diabetes on the development of new blood vessels from preexisting vessels (angiogenesis). Funded in 2005, these studies are exploring the mechanisms of abnormal angiogenesis seen in diabetes complications, such as diabetic kidney and eye disease and defects in wound healing. This research should open new avenues for treatment of diabetic complications.

Progression of Cardiovascular Disease in Type 1 Diabetes

RFA-HL-04-013

The causes of the increased incidence and earlier onset of cardiovascular disease in patients with type 1 diabetes are not fully understood. It is not yet clear whether known risk factors for cardiovascular disease are also important in type 1 diabetes patients, or whether other factors are responsible for or contribute to the enhanced cardiovascular complications in these patients. Understanding the mechanisms involved will facilitate the development of improved prevention and treatment approaches tailored to individuals with type 1 diabetes. The objective of this program is to support basic and clinical studies to enhance understanding of the mechanisms involved in the early development and fast progression of cardiovascular disease in type 1 diabetes. Grants were awarded in 2004.

Feasibility Projects To Test Strategies for Preventing or Slowing the Progression of Diabetic Nephropathy

RFA-DK-02-025

Type 1 diabetes increases risk for kidney failure. Because many type 1 diabetes patients develop progressive kidney disease despite adequate management of risk factors, new strategies to prevent disease and slow its progression are needed. This initiative supported clinical research on new therapies to

prevent or treat diabetic kidney disease that might potentially be taken to large interventional trials. Support from this program will help ensure that sufficient preliminary data will be available to plan such trials. Grants were awarded in 2002.

Surrogate Endpoints for Diabetic Microvascular Complications

RFA-DK-02-016

Prevention and treatment of long-term micro- and macrovascular complications remain critical problems in the management of type 1 diabetes. Early identification of patients at risk for the development of diabetic complications and early intervention are essential. By the time disease symptoms are recognized, irreversible organ damage may have already occurred. This program supports research on the development of surrogate endpoints, which are biological markers that can be used to gauge a person's health without having to wait for full-blown disease to develop. Ideally, these biomarkers will predict patients who are at high risk for developing complications and who may benefit from aggressive intervention, aid in early diagnosis of complications, or correlate with disease progression. Such endpoints could be used as diagnostic tools for the individual patient, or as outcome measures for clinical trials of new therapeutic agents. Grants were awarded in 2002.

Imaging Early Markers of Diabetic Microvascular Complications in Peripheral Tissue

RFA-DK-02-001

Impaired perfusion—the ability of oxygen to reach tissues—may be an early event in the development of microvascular complications of diabetes. This program, funded in 2002, supports research on the development of new, clinically useful imaging tools for the study of microvascular disease in the diabetic population. Tools to measure perfusion and tissue oxygenation at the level of the microvasculature, or to identify inflammation associated with diabetic complications, will help define the mechanisms leading to microvascular complications of diabetes in peripheral tissues. Moreover, this research may result in the development of new techniques to detect the early stages of these complications, identify patients likely to benefit from therapeutic interventions, and monitor disease progression and response to therapy.

Oral Microbiology/Immunology of Type 1 Diabetes

RFA-DE-01-001

Diabetes is a significant factor for severe and extensive periodontal (gum) disease. Recent studies indicate that diabetes alters the immune system and connective tissue, making the patient more susceptible to oral tissue destruction and inflammation. Research projects funded through this initiative, beginning in 2001, involved exploratory research to broaden the understanding of the microbiology and immunology of oral complications associated with type 1 diabetes.

Neurobiology of Diabetic Complications

RFA-NS-00-002

Chronically high blood glucose levels result in significant nerve damage in more than half of all diabetic individuals. Diabetic peripheral neuropathy—affecting the hands, arms, feet, and legs—is associated with vascular disease and impaired wound healing, and often results in chronic skin ulcers and limb amputation. The nervous system also controls the body's counter-regulatory response to hypoglycemia. This program was designed to support research on the mechanisms by which diabetes results in painful, disabling peripheral neuropathy, autonomic neuropathy, impaired counter-regulation and hypoglycemia unawareness, and other neurological complications. Because of two initiatives supported by the *Special Funds*, RFA-NS99-005, funded in FY 1999 (see below) and RFA-NS00-002, funded in FY 2000, the number of funded research projects in diabetic neuropathy became far greater than it would have been otherwise.

Neurological Complications of Diabetes

RFA-NS-99-005

Neurological complications are significant problems for diabetic individuals. In many patients, symptoms such as pain, numbness, weakness, or even paralysis are serious enough to interfere with daily activities. Other symptoms of diabetic neuropathy may include heart rate abnormalities, high blood pressure, dizziness, digestive disturbances, and impotence. Autonomic neuropathy can cause sudden cardiac death in persons with diabetes. Prevention and treatment are often ineffective, so new approaches are needed. This program was designed to encourage research on the mechanisms by which diabetes results in painful and disabling neuropathies and other neurological complications, and on the development of interventions to prevent, limit, or reverse these conditions. Grants were funded in FY 1999.

Pathogenesis and Therapy of Complications of Diabetes

RFA-DK-98-009

Central medical issues for patients with type 1 diabetes are prevention and treatment of chronic complications, including blindness, end-stage renal disease, non-traumatic lower leg amputations, and macrovascular complications. With grants awarded in FY 1998, this program encouraged research on the mechanisms by which hyperglycemia causes vascular complications and the application of this information to the development of interventions to prevent or treat diabetic complications.

Administrative Supplements for a Drug Screening Program for Diabetic Complications

NOT-DK-05-017

An important, but elusive, goal for diabetes care has been therapeutics that would prevent or reverse the cellular injury induced by hyperglycemia. Research on hyperglycemic cellular injury has increased knowledge of the pathologic pathways, but translation of this knowledge to clinically useful drugs has been largely unsuccessful. In a new approach to this problem, this program is fostering a collaborative effort to screen a collection of about 1,000 FDA-approved compounds over approximately 6 months in individual laboratories, using assays relevant to diabetic complications. The purposes of this program are to encourage laboratory scientists to participate in translational research; highlight the best assays for diabetic complications; uncover new metabolic or signaling pathways involved in the cellular injury of diabetes; discover new potential drugs for diabetic complications; and piggy-back on the knowledge base of these FDA-approved compounds to hasten clinical trials. Funding was awarded in early 2006.

Goal VI—Attract New Talent and Apply New Technologies to Research on Type 1 Diabetes

Training Programs in Diabetes Research for Pediatric Endocrinologists

RFA-DK-02-024

This program provides support of research training and career development in pediatric diabetes at institutions that have environments, mentors, and programs that will make them particularly effective in enhancing the number of independent investigators contributing to research in pediatric diabetes. The awards, through the T32 (institutional research training) and K12 (clinical scientist career development program) grant mechanisms of the NIH, are intended to provide an opportunity for continuous training from the clinical fellowship years to emergence as a fully trained independent investigator. These integrated programs are designed to prepare pediatricians, selected by the institution, for careers in pediatric endocrinology research related to diabetes.

Innovative Partnerships in Type 1 Diabetes and Its Complications

RFA-DK-02-023 and RFA-DK-03-015

This innovative partnership program promotes collaboration among diabetes researchers and those in areas other than diabetes who have expertise or technology that could advance diabetes research projects. The goal is to encourage diabetes researchers to act as "talent scouts" to identify other researchers who could contribute to research breakthroughs in diabetes.

Bench to Bedside Research on Type 1 Diabetes and Its Complications

RFA-DK-02-022, RFA-DK-03-001, and RFA-DK-03-019

An innovative bench to bedside program in type 1 diabetes supports collaboration between basic research scientists, whose findings have potential direct applicability to the development of new treatments or diagnostic tests, and clinical scientists, who can help translate these basic discoveries into pre-clinical studies or clinical trials.

Type 1 Diabetes—Rapid Access to Intervention Development (T1D-RAID)

The T1D-RAID program provides resources for manufacture and pre-clinical development of drugs, natural products, and biologics that will be tested in type 1 diabetes clinical trials. The goal of T1D-RAID is to facilitate the translation of promising therapeutic agents from bench to bedside in order to more rapidly impact patients' health.

Small Business Innovation Research and Small Business Technology Transfer To Develop New Therapeutics and Monitoring Technologies for Type 1 Diabetes (T1D) and Its Complications (SBIR [R43/R44])

RFA-DK-05-016 and RFA-DK-05-015

These parallel initiatives are intended to support innovative research on type 1 diabetes and its complications in the biotechnology industry. Examples of research areas that would be encompassed by these initiatives include development of novel or improved therapeutics for prevention or treatment, and development of new methods to monitor the initiation, progression, and therapy of type 1 diabetes and its complications. Grants will be awarded in Fall 2006.

Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) RFA in Type 1 Diabetes and Its Complications

RFA-DK-03-020

This initiative was designed to encourage the small business community to apply cutting edge technology to research on developing treatment or prevention approaches for type 1 diabetes and its complications. Grants were awarded in 2004.

Measurement Tools for Altered Autonomic Function in Spinal Cord Injury and Diabetes: SBIR/STTR

RFA-HD-04-018

This initiative solicited small business grant applications to conduct research on measurement tools or devices for altered autonomic functions in persons with spinal cord injury or diabetes mellitus. A grant was awarded in 2005.

Proteomics and Metabolomics in Type 1 Diabetes and Its Complications

RFA-DK-03-024

Proteomic approaches have been successfully used for studying complex biological problems and for the identification of disease markers. However, these technologies had previously been applied to study type 1 diabetes and its complications only in a limited way. This program was designed to support research using proteomics and metabolomics technologies to study type 1 diabetes and its complications, particularly as collaborative efforts between investigators with expertise in these technologies and those with expertise in type 1 diabetes. Grants were awarded in 2004.