

Åke Lernmark  
Diabetes and Celiac Unit  
Visiting address:  
CRC, Hus 91 plan 10, Jan Waldenströms gata 35  
Rm 60:11:015  
Malmö  
Sweden  
Email: ake.lernmark@med.lu.se  
Phone: +4640391901



## Research

The immune genetics of the aetiology and pathogenesis of autoimmune (type 1) diabetes and associated organs-specific autoimmune disorders including celiac disease and narcolepsy are not fully understood. Our research is focused on the role of HLA and non-HLA genes in the etiology and pathogenesis with particular emphasis to uncover the importance of beta cell autoantigens such as GAD65, insulin, IA-2, ZnT8, INS-IGF2 and tetraspanin 7. Humoral and cellular studies are conducted first to detect a trigger that will induce beta cell autoimmunity in children at increased genetic risk. A major effort to identify the trigger of beta cell autoimmunity is carried out in the TEDDY (The Environmental Determinants of Diabetes in the Young) study. A total of 2525 children in Skåne with increased genetic risk for autoimmune (type 1) diabetes were identified at birth (2004-2010) and then followed quarterly until four years of age and thereafter bi-annually until the children turn 15 years of age. TEDDY is supported by the National Institutes of Health (NIH) in the US and is conducted with three clinics in the US, Finland and Germany. In Skåne, we have TEDDY clinics in Malmö, Helsingborg and Kristianstad. Major observations suggest that the association between HLA and autoimmune (type 1) diabetes is secondary to the first appearing autoantibody be it against insulin in children with HLA DR4-DQ8 or GAD65 in children with HLA DR3-DQ2. Studies are also conducted since birth in children born 2000-2004 in the Diabetes Prediction in Skåne (DiPiS) study. Research involves identification of and development of new assays for autoantibodies against novel autoantigens and autoantigen candidates. Studies are conducted in patients with narcolepsy and their controls to identify autoantigens and explain the development of narcolepsy and vaccination with Pandemrix®. Studies on primary prevention is conducted in the GPPAD (Global Platform for the Prevention of Autoimmune Diabetes) consortium and on secondary prevention in TrialNet for which we are the Swedish TrialNet Center. Clinical trials such as the TEDDY Family (TEFA) study is conducted with support from the Juvenile Diabetes Research Foundation (JDRF).

The BB rat is investigated to clarify monogenic type 1 diabetes due to a frameshift mutation in the Gimap5 gene, which is coding for an anti-apoptotic protein. Overall the research aim at the prediction and prevention primarily of autoimmune (type 1) diabetes by combining screening for HLA and non-HLA genes to identify subjects at risk and to measure and develop tests for beta cell autoimmunity and to carry out primary and secondary prevention trials eventually to prevent and thereby cure autoimmune (type 1) diabetes.

## Employment

### Principal investigator

Celiac Disease and Diabetes Unit  
Lund University  
Malmö, Sweden  
2015 Sept 21 → present

### Principal investigator

EXODIAB: Excellence of Diabetes Research in Sweden  
Lund University  
Lund, Sweden  
2010 Jan 1 → present

### Emeritus Professor in Medicine

University of Washington, Seattle  
Seattle, United States  
2009 Jan 1 → present

### Adjunct Professor

Lund University  
Lund, Sweden  
2006 Jan 1 → 2008 Jan 1

**Adjunct Professor**

Lund University  
Lund, Sweden  
1998 Jan 1 → 2005 Jan 1

**Member of the Graduate Faculty**

University of Washington, Seattle  
Seattle, United States  
1997 Jan 1 → 2008 Jan 1

**Robert H. Williams Professor in Medicine**

University of Washington, Seattle  
Seattle, United States  
1995 Jan 1 → 2008 Dec 31

**Adjunct Professor**

Karolinska Institute  
Stockholm, Sweden  
1995 Jan 1 → 2001 Jan 1

**Adjunct Professor**

University of Washington, Seattle  
Seattle, United States  
1995 Jan 1 → 2007 Jan 1

**Professor of Experimental Endocrinology**

Karolinska Institute  
Stockholm, Sweden  
1993 Jan 1 → 1994 Dec 31

**Affiliate Professor**

University of Washington, Seattle  
Seattle, United States  
1993 Jan 1 → 1994 Jan 1

**Adjunct Professor**

University of Washington, Seattle  
Seattle, United States  
1991 Jan 1 → 1993 Jan 1

**Visiting Professor**

Université Libre de Bruxelles (ULB)  
Brussels, Belgium  
1990 Jan 1 → 2000 Jan 1

**Professor in Diabetes Research**

Lund University  
Lund, Sweden  
1989 Jan 1 → 1991 Jan 1

**Robert H. Williams Professor in Medicine**

University of Washington, Seattle  
Seattle, United States  
1988 Jan 1 → 1992 Dec 31

### **Adjunct Professor of Medical Cell Biology**

Lund University  
Lund, Sweden  
1984 Jan 1 → 1989 Jan 1

### **Director of Research**

Hagedorn Research Institute  
Gentofte, Denmark  
1979 Jan 1 → 1987 Dec 31

### **Assistant professor**

University of Chicago  
Chicago, United States  
1977 Jan 1 → 1978 Dec 31

### **Associate professor**

Umeå University  
Umeå, Sweden  
1973 Jan 1 → 1979 Dec 31

### **Research Associate**

Umeå University  
Umeå, Sweden  
1970 Jan 1 → 1973 Dec 31

### **Instructor**

Umeå University  
Umeå, Sweden  
1968 Aug 1 → 1970 Dec 31

## **Research output**

### **Looking back at the TEDDY study: lessons and future directions**

Lernmark, Å., Agardh, D., Akolkar, B., Gesualdo, P., Hagopian, W. A., Haller, M. J., Hyöty, H., Johnson, S. B., Larsson, H. E., Liu, E., Lynch, K. F., McKinney, E. F., McIndoe, R., Melin, J., Norris, J. M., Rewers, M., Rich, S. S., Toppari, J., Triplett, E. & Vehik, K. & 4 others, Virtanen, S. M., Ziegler, A.-G., Schatz, D. A. & Krischer, J., 2024 Nov 4, (E-pub ahead of print) In: Nature Reviews Endocrinology.

### **Joint modeling of multistate and nonparametric multivariate longitudinal data**

You, L., Salami, F., Törn, C., Lernmark, Å. & Tamura, R., 2024 Sept 1, In: Annals of Applied Statistics. 18, 3, p. 2444-2461

### **Type 1 diabetes, celiac disease, and autoimmune thyroiditis autoantibodies in population-based type 2 diabetes patients**

Lind, A., Cheng-ting, T., Åke, L. & Johan, J., 2024 Sept, In: Journal of Clinical and Translational Endocrinology. 37, 100367.

### **Early appearance of thyroid autoimmunity in children followed from birth for type 1 diabetes risk**

Jonsdottir, B., Clasen, J. L., Vehik, K., Lernmark, Å., Lundgren, M., Bonifacio, E., Schatz, D., Ziegler, A.-G., Hagopian, W., Rewers, M., McIndoe, R., Toppari, J., Krischer, J., Akolkar, B., Steck, A., Veijola, R., Haller, M. J., Elding Larsson, H. & TEDDY Study Group, 2024 Jul 12, (E-pub ahead of print) In: The Journal of clinical endocrinology and metabolism. dgae478.

### **Consensus Guidance for Monitoring Individuals With Islet Autoantibody-Positive Pre-Stage 3 Type 1 Diabetes**

Phillip, M., Achenbach, P., Addala, A., Albanese-O'Neill, A., Battelino, T., Bell, K. J., Besser, R. E. J., Bonifacio, E., Colhoun, H. M., Couper, J. J., Craig, M. E., Danne, T., de Beaufort, C., Dovc, K., Driscoll, K. A., Dutta, S., Ebekozi, O.,

Elding Larsson, H., Feiten, D. J. & Frohnert, B. I. & 46 others, Gabbay, R. A., Gallagher, M. P., Greenbaum, C. J., Griffin, K. J., Hagopian, W., Haller, M. J., Hendrieckx, C., Hendriks, E., Holt, R. I. G., Hughes, L., Ismail, H. M., Jacobsen, L. M., Johnson, S. B., Kolb, L. E., Kordonouri, O., Lange, K., Lash, R. W., Lernmark, Å., Libman, I., Lundgren, M., Maahs, D. M., Marcovecchio, M. L., Mathieu, C., Miller, K. M., O'Donnell, H. K., Oron, T., Patil, S. P., Pop-Busui, R., Rewers, M. J., Rich, S. S., Schatz, D. A., Schulman-Rosenbaum, R., Simmons, K. M., Sims, E. K., Skyler, J. S., Smith, L. B., Speake, C., Steck, A. K., Thomas, N. P. B., Tonyushkina, K. N., Veijola, R., Wentworth, J. M., Wherrett, D. K., Wood, J. R., Ziegler, A.-G. & DiMeglio, L. A., 2024 Jun 24, (E-pub ahead of print) In: *Diabetes Care*.

### **The Influence of Pubertal Development on Autoantibody Appearance and Progression to Type 1 Diabetes in the TEDDY Study**

Warncke, K., Tamura, R., Schatz, D. A., Veijola, R., Steck, A. K., Akolkar, B., Hagopian, W., Krischer, J. P., Lernmark, Å., Rewers, M. J., Toppari, J., McIndoe, R., Ziegler, A.-G., Vehik, K., Haller, M. J. & Elding Larsson, H., 2024 May 23, In: *Journal of the Endocrine Society*. 8, 7, bvae103.

### **Anxiety, depression and quality of life in relation to SARS-CoV-2 antibodies in individuals living with diabetes during the second wave of COVID-19**

Lind, A., Yang, C., Hugo, H., Maria, H., Stefan, J., Lernmark, Å., Martin, S., Staffan, T., Cheng-ting, T., Jeanette, W. & Johan, J., 2024 Jan, In: *Diabetes Epidemiology and Management*. 13, 100194.

### **Assisting the implementation of screening for type 1 diabetes by using artificial intelligence on publicly available data**

Teixeira, P. F., Battelino, T., Carlsson, A., Gudbjörnsdottir, S., Hannelius, U., von Herrath, M., Knip, M., Korsgren, O., Elding Larsson, H., Lindqvist, A., Ludvigsson, J., Lundgren, M., Nowak, C., Pettersson, P., Pociot, F., Sundberg, F., Åkesson, K., Lernmark, Å. & Forsander, G., 2024, In: *Diabetologia*. 67, 6, p. 985-994

### **Caesarean section and risk of type 1 diabetes**

Singh, T., Weiss, A., Vehik, K., Krischer, J., Rewers, M., Toppari, J., Lernmark, Å., Hagopian, W., Akolkar, B., Bonifacio, E., Ziegler, A.-G., Winkler, C. & TEDDY Study Group, 2024, In: *Diabetologia*. 67, 8, p. 1582-1587

### **Childhood screening for type 1 diabetes comparing automated multiplex Antibody Detection by Agglutination-PCR (ADAP) with single plex islet autoantibody radiobinding assays**

Lind, A., Freyhult, E., de Jesus Cortez, F., Ramelius, A., Bennet, R., Robinson, P. V., Seftel, D., Gebhart, D., Tandel, D., Maziarz, M., Larsson, H. E., Lundgren, M., Carlsson, A., Nilsson, A.-L., Fex, M., Törn, C., Agardh, D., Tsai, C.-T., Lernmark, Å. & Better Diabetes Diagnosis (BDD) Study Group, 2024, In: *EBioMedicine*. 104, 105144.

### **Consensus guidance for monitoring individuals with islet autoantibody-positive pre-stage 3 type 1 diabetes**

Phillip, M., Achenbach, P., Addala, A., Albanese-O'Neill, A., Battelino, T., Bell, K. J., Besser, R. E. J., Bonifacio, E., Colhoun, H. M., Couper, J. J., Craig, M. E., Danne, T., de Beaufort, C., Dovc, K., Driscoll, K. A., Dutta, S., Ebekozi, O., Larsson, H. E., Feiten, D. J. & Frohnert, B. I. & 46 others, Gabbay, R. A., Gallagher, M. P., Greenbaum, C. J., Griffin, K. J., Hagopian, W., Haller, M. J., Hendrieckx, C., Hendriks, E., Holt, R. I. G., Hughes, L., Ismail, H. M., Jacobsen, L. M., Johnson, S. B., Kolb, L. E., Kordonouri, O., Lange, K., Lash, R. W., Lernmark, Å., Libman, I., Lundgren, M., Maahs, D. M., Marcovecchio, M. L., Mathieu, C., Miller, K. M., O'Donnell, H. K., Oron, T., Patil, S. P., Pop-Busui, R., Rewers, M. J., Rich, S. S., Schatz, D. A., Schulman-Rosenbaum, R., Simmons, K. M., Sims, E. K., Skyler, J. S., Smith, L. B., Speake, C., Steck, A. K., Thomas, N. P. B., Tonyushkina, K. N., Veijola, R., Wentworth, J. M., Wherrett, D. K., Wood, J. R., Ziegler, A.-G. & DiMeglio, L. A., 2024, In: *Diabetologia*. 67, 9, p. 1731-1759

### **HLA Class II (DR, DQ, DP) Genes Were Separately Associated With the Progression From Seroconversion to Onset of Type 1 Diabetes Among Participants in Two Diabetes Prevention Trials (DPT-1 and TN07)**

Zhao, L. P., Papadopoulos, G. K., Skyler, J. S., Pugliese, A., Parikh, H. M., Kwok, W. W., Lybrand, T. P., Bondinas, G. P., Moustakas, A. K., Wang, R., Pyo, C.-W., Nelson, W. C., Geraghty, D. E. & Lernmark, Å., 2024, In: *Diabetes Care*. 47, 5, p. 826-834

### **Intake of B vitamins and the risk of developing islet autoimmunity and type 1 diabetes in the TEDDY study**

Hakola, L., Mramba, L. K., Uusitalo, U., Andrén Aronsson, C., Hummel, S., Niinistö, S., Erlund, I., Yang, J., Rewers, M. J., Akolkar, B., McIndoe, R. A., Rich, S. S., Hagopian, W. A., Ziegler, A., Lernmark, Å., Toppari, J., Krischer, J. P., Norris, J. M., Virtanen, S. M. & TEDDY Study Group, 2024, In: *European Journal of Nutrition*. 63, 4, p. 1329-1338

### **Oral Insulin Delay of Stage 3 Type 1 Diabetes Revisited in HLA DR4-DQ8 Participants in the TrialNet Oral Insulin Prevention Trial (TN07)**

Zhao, L. P., Papadopoulos, G. K., Skyler, J. S., Parikh, H. M., Kwok, W. W., Bondinas, G. P., Moustakas, A. K., Wang, R., Pyo, C.-W., Nelson, W. C., Geraghty, D. E. & Lernmark, Å., 2024, In: *Diabetes Care*. 47, 9, p. 1608-1616

**Progression to type 1 diabetes in the DPT-1 and TN07 clinical trials is critically associated with specific residues in HLA-DQA1-B1 heterodimers**

Zhao, L. P., Papadopoulos, G. K., Skyler, J. S., Pugliese, A., Parikh, H. M., Kwok, W. W., Lybrand, T. P., Bondinas, G. P., Moustakas, A. K., Wang, R., Pyo, C.-W., Nelson, W. C., Geraghty, D. E. & Lernmark, Å., 2024, In: *Diabetologia*. 67, 11, p. 2481-2493

**Distinct transcriptomic profiles in children prior to the appearance of type 1 diabetes-linked islet autoantibodies and following enterovirus infection**

Lin, J., Moradi, E., Salenius, K., Lehtipuro, S., Häkkinen, T., Laiho, J. E., Oikarinen, S., Randelin, S., Parikh, H. M., Krischer, J. P., Toppari, J., Lernmark, Å., Petrosino, J. F., Ajami, N. J., She, J.-X., Hagopian, W. A., Rewers, M. J., Lloyd, R. E., Rautajoki, K. J. & Hyöty, H. & 2 others, Nykter, M. & TEDDY Study Group, 2023 Nov 22, In: *Nature Communications*. 14, p. 1-13 7630.

**Executive Summary: Guidelines and Recommendations for Laboratory Analysis in the Diagnosis and Management of Diabetes Mellitus**

Sacks, D. B., Arnold, M., Bakris, G. L., Bruns, D. E., Horvath, A. R., Lernmark, Å., Metzger, B. E., Nathan, D. M. & Kirkman, M. S., 2023 Oct, In: *Diabetes Care*. 46, 10, p. 1740-1746 7 p.

**Guidelines and Recommendations for Laboratory Analysis in the Diagnosis and Management of Diabetes Mellitus**

Sacks, D. B., Arnold, M., Bakris, G. L., Bruns, D. E., Horvath, A. R., Lernmark, Å., Metzger, B. E., Nathan, D. M. & Kirkman, M. S., 2023 Oct, In: *Diabetes Care*. 46, 10, p. e151-e199

**Polymorphisms in Intron 1 of HLA-DRA Differentially Associate with Type 1 Diabetes and Celiac Disease and Implicate Involvement of Complement System Genes C4A and C4B**

Aydemir, Ö., Bailey, J. A., Agardh, D., Lernmark, A., Noble, J., Andersson Svärd, A., Blankenhorn, E. P., Parikh, H., Ziegler, A. G., Toppari, J., Akolkar, B., Hagopian, W. A., Rewers, M. J., Mordes, J. P. & TEDDY Study Group, 2023 Sept 1, (E-pub ahead of print) In: *eLife*. 22 p.

**SARS-CoV-2 - No Increased Islet Autoimmunity or Type 1 Diabetes in Teens**

Krischer, J. P., Lernmark, Å., Hagopian, W. A., Rewers, M. J., McIndoe, R., Toppari, J., Ziegler, A.-G., Akolkar, B. & TEDDY Study Group, 2023 Aug 3, In: *The New England journal of medicine*. 389, 5, p. 474-475

**Executive Summary: Guidelines and Recommendations for Laboratory Analysis in the Diagnosis and Management of Diabetes Mellitus**

Sacks, D. B., Arnold, M., Bakris, G. L., Bruns, D. E., Horvath, A. R., Lernmark, Å., Metzger, B. E., Nathan, D. M. & Sue Kirkman, M., 2023 Aug, In: *Clinical Chemistry*. 69, 8, p. 777-784 8 p.

**Islet autoantibody screening in at-risk adolescents to predict type 1 diabetes until young adulthood: a prospective cohort study**

Ghalwash, M., Anand, V., Lou, O., Martin, F., Rewers, M., Ziegler, A. G., Toppari, J., Hagopian, W. A., Veijola, R., Achenbach, P. (Contributor), Bonifacio, E. (Contributor), Crouch, C. (Contributor), Dunne, J. (Contributor), Elding Larsson, H. (Contributor), Frohnert, B. I. (Contributor), Hu, J. (Contributor), Hyöty, H. (Contributor), Ilonen, J. (Contributor), Jönsson, J. (Contributor) & Killian, M. (Contributor) & 21 others, Knip, M. (Contributor), Koski, E. (Contributor), Li, Y. (Contributor), Li, Z. (Contributor), Liu, B. (Contributor), Lundgren, M. (Contributor), Malhotra, A. (Contributor), Maziarz, M. (Contributor), Meyer, J. (Contributor), Moore, S. (Contributor), Ng, K. (Contributor), Norris, J. (Contributor), Roy, S. (Contributor), Spiliopoulos, L. (Contributor), Steck, A. (Contributor), Stavropoulos, H. (Contributor), Waugh, K. (Contributor), Winkler, C. (Contributor), Yu, L. (Contributor), Lernmark, Å. (Contributor) & Type 1 Diabetes Intelligence Study Group, 2023 Apr, In: *The Lancet Child and Adolescent Health*. 7, 4, p. 261-268 8 p.

**Epidemiology and Pathogenesis of Type 1 Diabetes**

Stene, L. C. & Lernmark, A., 2023, *Transplantation of the Pancreas*. Gruessner, R. W. G. & Gruessner, A. C. (eds.). 2 ed. p. 13-39

### **Gastrointestinal Infections Modulate the Risk for Insulin Autoantibodies as the First-Appearing Autoantibody in the TEDDY Study**

Lönnrot, M., Lynch, K. F., Rewers, M., Lernmark, Å., Vehik, K., Akolkar, B., Hagopian, W., Krischer, J., McIndoe, R. A., Toppari, J., Ziegler, A.-G., Petrosino, J. F., Lloyd, R., Hyöty, H. & TEDDY Study Group, 2023, In: *Diabetes Care*. 46, 11, p. 1908-1915

### **Guidelines and Recommendations for Laboratory Analysis in the Diagnosis and Management of Diabetes Mellitus**

Sacks, D. B., Arnold, M., Bakris, G. L., Bruns, D. E., Horvath, A. R., Lernmark, Å., Metzger, B. E., Nathan, D. M. & Kirkman, M. S., 2023, In: *Clinical Chemistry*. 69, 8, p. 808-868 61 p.

### **HLA Genotype and Probiotics Modify the Association Between Timing of Solid Food Introduction and Islet Autoimmunity in the TEDDY Study**

Uusitalo, U., Mramba, L. K., Aronsson, C., Vehik, K., Yang, J., Hummel, S., Lernmark, Å., Rewers, M., Hagopian, W., McIndoe, R., Toppari, J., Ziegler, A.-G., Akolkar, B., Krischer, J. P., Virtanen, S. M., Norris, J. M. & TEDDY Study Group, 2023, In: *Diabetes Care*. 46, 10, p. 1839-1847

### **Interaction Between Dietary Iron Intake and Genetically Determined Iron Overload: Risk of Islet Autoimmunity and Progression to Type 1 Diabetes in the TEDDY Study**

Thorsen, S. U., Liu, X., Kataria, Y., Mandrup-Poulsen, T., Kaur, S., Uusitalo, U., Virtanen, S. M., Norris, J. M., Rewers, M., Hagopian, W., Yang, J., She, J.-X., Akolkar, B., Rich, S., Aronsson, C. A., Lernmark, Å., Ziegler, A.-G., Toppari, J., Krischer, J. & Parikh, H. M. & 3 others, Ellervik, C., Svensson, J. & Environmental Determinants of Diabetes in the Young (TEDDY) Group, 2023, In: *Diabetes Care*. 46, 5, p. 1014-1018

### **Physical Activity and the Development of Islet Autoimmunity and Type 1 Diabetes in 5-15-Year-Old Children Followed in the TEDDY Study**

Liu, X., Johnson, S. B., Lynch, K. F., Cordan, K., Pate, R., Butterworth, M. D., Lernmark, Å., Hagopian, W. A., Rewers, M. J., McIndoe, R. A., Toppari, J., Ziegler, A.-G., Akolkar, B., Krischer, J. P., Yang, J. & TEDDY Study Group, 2023, In: *Diabetes Care*. 46, 7, p. 1409-1416

### **Plasma protein biomarkers predict the development of persistent autoantibodies and type 1 diabetes 6 months prior to the onset of autoimmunity**

Nakayasu, E. S., Bramer, L. M., Ansong, C., Schepmoes, A. A., Fillmore, T. L., Gritsenko, M. A., Clauss, T. R., Gao, Y., Piehowski, P. D., Stanfill, B. A., Engel, D. W., Orton, D. J., Moore, R. J., Qian, W.-J., Sechi, S., Frohnert, B. I., Toppari, J., Ziegler, A.-G., Lernmark, Å. & Hagopian, W. & 6 others, Akolkar, B., Smith, R. D., Rewers, M. J., Webb-Robertson, B.-J. M., Metz, T. O. & TEDDY Study Group, 2023, In: *Cell Reports Medicine*. 4, 7, 101093.

### **Possible heterogeneity of initial pancreatic islet beta-cell autoimmunity heralding type 1 diabetes**

Lernmark, Å., Akolkar, B., Hagopian, W., Krischer, J., McIndoe, R., Rewers, M., Toppari, J., Vehik, K. & Ziegler, A.-G., 2023, In: *Journal of Internal Medicine*. 294, 2, p. 145-158

### **What is new in type 1 diabetes? [Video file]**

Lernmark, A., 2023

### **Temporal changes in gastrointestinal fungi and the risk of autoimmunity during early childhood: the TEDDY study**

Auchtung, T. A., Stewart, C. J., Smith, D. P., Triplett, E. W., Agardh, D., Hagopian, W. A., Ziegler, A. G., Rewers, M. J., She, J.-X., Toppari, J., Lernmark, Å., Akolkar, B., Krischer, J. P., Vehik, K., Auchtung, J. M., Ajami, N. J. & Petrosino, J. F., 2022 Jun 7, In: *Nature Communications*. 13, 3151.

### **Telomere length is not a main factor for the development of islet autoimmunity and type 1 diabetes in the TEDDY study**

Törn, C., Liu, X., Onengut-Gumuscu, S., Counts, K. M., Moreno, J. L., Remedios, C. L., Chen, W.-M., LeFaive, J., Butterworth, M. D., Akolkar, B., Krischer, J. P., Lernmark, Å., Rewers, M., She, J.-X., Toppari, J., Ziegler, A.-G., Ratan, A., Smith, A. V., Hagopian, W. A. & Rich, S. S. & 2 others, Parikh, H. M. & TEDDY Study Group, 2022 Mar 16, In: *Scientific Reports*. 12, 1, p. 4516

### **Heterogeneity of beta-cell function in subjects with multiple islet autoantibodies in the TEDDY family prevention study - TEFA**

The TEDDY Family (TEFA) Study Group, 2022 Jan 5, In: *Clinical diabetes and endocrinology*. 7, 1, 10 p.

**Association of HLA-DQ Heterodimer Residues -18 $\beta$  and  $\beta$ 57 With Progression From Islet Autoimmunity to Diabetes in the Diabetes Prevention Trial-Type 1**

Zhao, L. P., Skyler, J., Papadopoulos, G. K., Pugliese, A., Najera, J. A., Bondinas, G. P., Moustakas, A. K., Wang, R., Pyo, C.-W., Nelson, W. C., Geraghty, D. E. & Lernmark, Å., 2022, In: *Diabetes Care*. 45, 7 , p. 1610-1620

**Enteroviruses and Type 1 Diabetes: Multiple Mechanisms and Factors?**

Lloyd, R. E., Tamhankar, M. & Lernmark, Å., 2022, In: *Annual Review of Medicine*. 73, 1

**HbA1c as a time predictive biomarker for an additional islet autoantibody and type 1 diabetes in seroconverted TEDDY children**

Salami, F., Tamura, R., You, L., Lernmark, Å., Elding Larsson, H., Lundgren, M., Krischer, J., Ziegler, A.-G., Toppari, J., Veijola, R., Rewers, M., Haller, M. J., Hagopian, W., Akolkar, B., Törn, C. & TEDDY Study Group, 2022, In: *Pediatric Diabetes*. 23, 8 , p. 1586-1593

**Islet Autoantibody Levels Differentiate Progression Trajectories in Individuals with Presymptomatic Type 1 Diabetes**

Kwon, B. C., Achenbach, P., Anand, V., Frohnert, B. I., Hagopian, W., Hu, J., Koski, E., Lernmark, Å., Lou, O., Martin, F., Ng, K., Toppari, J., Veijola, R. & T1DI Study Group, 2022, In: *Diabetes*. 71, 12 , p. 2632-2641

**Multiplex agglutination-PCR (ADAP) autoantibody assays compared to radiobinding autoantibodies in type 1 diabetes and celiac disease**

Lind, A., de Jesus Cortez, F., Ramelius, A., Bennet, R., Robinson, P. V., Seftel, D., Gebhart, D., Tandel, D., Maziarz, M., Agardh, D., Larsson, H. E., Lundgren, M., Lernmark, Å. & Tsai, C.-T., 2022, In: *Journal of Immunological Methods*. 506, 113265.

**Possible Relationship between the HLA-DRA1 Intron Haplotype of Three Single-Nucleotide Polymorphisms in Intron 1 of the HLA-DRA1 Gene and Autoantibodies in Children at Increased Genetic Risk for Autoimmune Type 1 Diabetes**

Andersson Svård, A., Benatti, E., Lundgren, M., Lernmark, A., Maziarz, M., Elding Larsson, H. & DiPiS Study Group, 2022 , In: *ImmunoHorizons*. 6, 8, p. 614-629 8.

**Predictors of the Initiation of Islet Autoimmunity and Progression to Multiple Autoantibodies and Clinical Diabetes: The TEDDY Study**

Krischer, J. P., Liu, X., Lernmark, Å., Hagopian, W. A., Rewers, M. J., She, J.-X., Toppari, J., Ziegler, A.-G., Akolkar, B. & TEDDY Study Group, 2022, In: *Diabetes Care*. 45, 10, p. 2271-2281

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