DELIVERABLE 1.4

Data Management Plan
(Final Version)

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The GEMSTONE Project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement no. 1010789881

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1. EXECUTIVE SUMMARY

This report describes approaches for dataset preservation, metadata use, data formats, and ethical considerations adopted during the implementation of the GEMSTONE Project. Compliance with Horizon Europe ethical standards and national data protection regulations is a key requirement, especially when personal data are collected or processed.

In line with programme requirements, GEMSTONE maintained a structured and regularly updated Data Management Plan. The plan supports data quality and alignment with the FAIR principles – findability, accessibility, interoperability, and reusability – while also addressing data security, resource planning, and ethical issues.

The report presents the project's approach to data management, software use, and collaboration. Research data are handled through a systematic process in which data from different software tools are cleaned, classified, monitored, and securely stored. Classified data are kept on dedicated project computers, with regular backups on external storage and the servers of the coordinator, Acıbadem Mehmet Ali Aydınlar University, to reduce data loss risks. Advanced software tools support data analysis, collaboration, and visualisation, while real-time data sharing enables effective cooperation within the consortium, particularly with the Lund University team.

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2. INTRODUCTION

The GEMSTONE Project implemented a comprehensive Data Management Plan (DMP) covering both research and administrative data generated throughout the project. In particular, activities carried out under Work Package 2 (WP2) established a structured framework for the generation and management of primary research data derived from laboratory-based and experimental studies. This framework supported both original data production and the effective use and exchange of advanced experimental and theoretical methods, strengthening the project's scientific outputs.

As a Horizon Europe action, the project applied strict procedures for the lawful and responsible processing of personal data. All data management activities complied with the ethical requirements of Horizon Europe, including the European Union (EU) Directive 2010/63/EU[1], and with the General Data Protection Regulation (GDPR, EU Regulation 2016/679)[2]. In addition, national data protection legislation, including Turkey's Personal Data Protection Law (KVKK)[3], was fully respected. Personal data collected during project activities were processed solely for defined purposes, based on informed consent, supported by appropriate security measures, and in line with data subjects' rights.

Project data were classified into two main categories: primary research data and administrative data. Administrative data included financial records, personnel information, dissemination-related data, and documentation from meetings and promotional activities, each managed through dedicated procedures to ensure security and regulatory compliance.

An additional objective of the project was to support data reusability, particularly for capacity-building outputs generated under Work Packages 3, 4, and 5 (WP3, WP4, and WP5). These data were structured and documented to enable use beyond the project's duration, including through openly accessible outputs, which consolidated relevant methodologies and metadata.

2.1. Data Management Strategies

Throughout the GEMSTONE Project, a structured and systematic data management approach was applied across all data categories, including research outputs and administrative records. Clear separation and controlled handling of different data types were implemented to preserve data integrity and ensure compliance with applicable data protection regulations, including the GDPR.

Administrative data were organised into defined categories such as financial, personnel, and event-related records. Each category was managed under dedicated protocols. Financial documentation was treated as highly confidential and stored in secure physical archives and protected digital systems. Personnel data were processed in line with privacy regulations, ensuring restricted access and secure storage.

[1] EU Directive 2010/63/EU, https://eur-lex.europa.eu/eli/dir/2010/63/oj
[2] General Data Protection Regulation (GDPR, EU Regulation 2016/679), https://eur-lex.europa.eu/eli/reg/2016/679/oj
[3] Turkish Personal Data Protection Law (KVKK), https://www.kvkk.gov.tr/Icerik/6649/Personal-Data-ProtectionLaw#:~:text=ARTICLE%201%20%E2%80%93%20(1)%20The,persons%20who%20process%20personal%20data

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Data generated during project events were documented using audio-visual materials and attendance records. Informed consent procedures were applied to ensure lawful and transparent data collection. These practices supported the traceability and reliability of event-related data.

Both digital and physical data security were prioritised throughout the project. Digital datasets were regularly backed up using external storage devices under project management control, while physical records were stored in restricted-access locations and digitised to reduce risks of loss or degradation.

To promote accessibility and reuse, selected datasets[4] were deposited in the Acıbadem Mehmet Ali Aydınlar University's (ACU) DSpace-based open access repository[5] and the GEMSTONE Project's Zenodo community[6]. The use of persistent identifiers, together with comprehensive metadata and methodological documentation, facilitated data discoverability, citation, and reuse by the wider research community.

Within the project framework, data were classified into two main groups: research data, primarily generated under WP2, and administrative data. Administrative datasets included financial records, personnel information, dissemination and communication data, documentation from short-term visits and meetings, and materials produced for promotional purposes, each managed according to its sensitivity and intended use.

From the outset, the GEMSTONE Project has recognised the critical importance of systematic data management across different categories of data. Key to these efforts has been the segregation and meticulous handling of data to ensure both integrity and compliance with data protection regulations.

[4] 6.74 GB of research data has been stored in open access repositories.
[5] GEMSTONE on ACU Open Access System: https://hdl.handle.net/11443/2897
[6] GEMSTONE on Zenodo: https://www.zenodo.org/communities/gemstonehorizon

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3. DATA CATEGORIES

3.1. Administrative Data

During the GEMSTONE Project, a wide range of administrative and capacity-building data were systematically generated and managed. Administrative data primarily originated from project coordination and management activities and included partner communications, consortium meeting records, and project management reports. In addition, data produced through capacity-building activities under WP3, WP4, and WP5 supported dissemination and exploitation objectives under Work Package 6 (WP6) and were managed as a dedicated administrative data category.

Data from Events and Dissemination Activities

All project events were documented to ensure traceability and transparency. Documentation included audio-visual materials and participant attendance records, which were used for reporting and promotional purposes. Online events were recorded with prior notification to participants, while face-to-face events required signed informed consent forms. Attendance lists containing participant names, affiliations, roles, and handwritten signatures were maintained in physical form.

All event-related data underwent prioritised data-cleaning procedures, with non-relevant information removed prior to classification. Physical documents were archived by the project management in access-restricted facilities and subsequently digitised. Digital files, including consent forms, attendance lists, photographs, and videos, were stored on a computer dedicated to project management. Backups were performed using an external hard disk under exclusive project management control, with additional secure storage provided by servers allocated by the ACU Information Technologies (IT) Department. Cloud-based storage solutions were not used.

Data from Visual Materials

Promotional and dissemination materials were produced digitally in coordination with the ACU Corporate Communications Department using institutionally provided design tools (Canva). These materials were distributed through digital channels and, where required, produced in printed form. Printed materials were archived after use. Both digital and physical promotional data were subject to cleaning, classification, secure storage on project-dedicated hardware.

Data from Financial Records

Financial data generated during the project were handled under strict confidentiality and security requirements. Financial documentation was managed jointly by the project management and the ACU Financial Affairs Department. All invoices were registered in the institutional accounting system, verified through signed hard copies, and archived accordingly. Physical financial records were stored in access-restricted project offices and financial archives, while digitised copies were classified and maintained on a project-dedicated computer.

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Financial monitoring was supported through structured Excel files organised by invoice number and date. Monthly backups were performed using external storage devices assigned exclusively to project management. To ensure data security, financial data were neither stored using cloud services nor transferred via portable USB devices, and all physical and digital financial records were restricted to the ACU campus.

Data from Meetings

Throughout the project, coordination and research meetings were held regularly among consortium partners and project staff. Meetings were organised either online or in person, depending on participant availability. Online meetings were conducted via an institutional Zoom account provided by ACU, and recordings were produced only with participants' consent. For each meeting, an agenda was circulated approximately one week in advance, and decisions and key discussion points were documented.

Draft meeting minutes were shared with participants within seven days, followed by a defined review period to allow verification. Once validated, final records were classified and archived. Digital meeting documentation was stored on a computer dedicated to project management and included in backup procedures using an external hard drive under exclusive project management control. Backed-up data were additionally stored on secure servers allocated by the ACU IT Department. To support internal accessibility, approved digital copies of meeting minutes were also made available through a designated project team account.

For face-to-face meetings, attendance was recorded through signed participant lists containing names, affiliations, roles, and handwritten signatures. These physical records were archived in restricted-access facilities, subsequently digitised, and incorporated into the project's digital archiving and backup system.

Data from Staff Management

Personnel data related to the GEMSTONE Project included employment contracts, timesheets, payrolls, and curricula vitae of project staff. All personnel data were processed and archived in compliance with the national data protection legislation and were not disclosed to unauthorised parties.

Employment contracts and payrolls were managed exclusively by the ACU Human Resources Department in access-restricted facilities. Copies of payrolls and signed timesheets were archived by the project management team in secure locations. In parallel, working time data were recorded monthly in structured Excel files stored on project-dedicated hardware. All personnel-related project data were included in regular backup procedures using external storage devices assigned solely to project management. Cloud-based storage solutions were not used.

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Data from Short-Term Visits

Short-term visit activities conducted under Work Packages 3 and 4 generated structured administrative and capacity-building data. Prior to each visit, participating researchers completed preparatory interviews and questionnaires addressing visit objectives and expectations. Following completion of the visits, follow-up interviews and questionnaires were used to assess outcomes and knowledge gained. Participating researchers prepared scientific and administrative summaries of their activities, signed off by supervisors at host institutions.

All visit-related documentation was reviewed by the WP4 Leader and the Primary Principal Investigator to support evaluation and continuous improvement of the mobility activities. Following assessment, data were digitally classified and archived on a computer dedicated to project management and included in the project's regular backup cycle using an external hard drive under exclusive project management control.

3.2. Research Data

Research data in the GEMSTONE Project were generated under WP2 to investigate neurodevelopmental mechanisms associated with absence epilepsy and Parkinson's disease. The research component employed genetically engineered models (GEMs) and produced two main categories of data: electroencephalography (EEG) recordings and brain imaging datasets. Data collection was conducted using chemogenetic and pharmacological approaches in Drd1a-Cre mice and Genetic Absence Epilepsy Rats from Strasbourg (GAERS). These datasets supported the analysis of neuronal activity and circuitry, with particular emphasis on the functional roles of deep and superficial cortical neurons in absence epilepsy.

WP2 also generated research data through the development of a double transgenic model based on Cre-loxP technology. This work involved targeted deletion of the SNCA gene to examine its contribution to Parkinson's disease, enabling assessment of genetic influences on disease development and progression.

Data from Objective 2.1

Data generated under Objective 2.1 focused on neurodevelopmental changes and chemogenetic modulation of deep and superficial cortical neurons in absence epilepsy. EEG recordings were combined with pharmacological interventions targeting neuropeptide receptors to assess their effects on spontaneous seizure activity. In parallel, imaging data obtained through immunohistochemical methods characterised receptor expression patterns across key developmental stages, including juvenile (P21) and adult phases, in both GAERS and control animals.

Additional datasets were produced using chemogenetic modulation with Designer Receptors Exclusively Activated by Designer Drugs (DREADDs) in Drd1a-Cre mice. These experiments enabled targeted control of neuronal subpopulations and were supported by EEG recordings, multi-electrode electrophysiological measurements, and complementary imaging analyses.

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Data from Objective 2.2

Objective 2.2 generated research data addressing the spatial and temporal distribution of α-synuclein in a conditional SNCA transgenic mouse model. Using a Nestin-driven Cre-loxP strategy, targeted control of SNCA expression was achieved to investigate Parkinson's disease pathophysiology. Multichannel immunofluorescence imaging was employed to identify neuronal populations exhibiting α-synuclein accumulation. In addition, brain tissues collected at defined developmental stages were analysed using molecular and biochemical methods, including RNA and DNA analyses, to support investigation of disease progression mechanisms.

Data Format

Within the GEMSTONE Project, brain tissues from conditional SNCA transgenic mice were collected at defined neurodevelopmental stages, including neonatal, juvenile, and adult phases. These samples were subjected to molecular and biochemical analyses, such as RNA and DNA assessments, to investigate gene expression patterns and molecular alterations associated with neurological disorders. Standard laboratory techniques, including PCR-based methods, protein analysis, and sequencing approaches, were applied to support the evaluation of SNCA-related disease mechanisms.

Electroencephalography (EEG) data consisted of high-resolution numerical recordings of electrical brain activity acquired with millisecond temporal precision across multiple channels. EEG datasets were stored in the LabChart Data File format, enabling compatibility with common analysis platforms and conversion to MATLAB format. In addition, data were exported in European Data Format to preserve raw signal integrity and ensure long-term usability. File structures and headers were systematically organised to include experimental dates, conditions, and subject identifiers.

Imaging data were generated through immunohistochemical and immunofluorescence experiments conducted on brain sections from GAERS and Drd1a-Cre mice. Raw images were stored in high-quality formats such as Tagged Image File Format and CZI (image format from Zeiss microscopy software), to support detailed quantitative and qualitative analysis using specialised microscopy software. Both EEG and imaging datasets followed consistent file-naming conventions and directory structures, facilitating efficient data management, traceability, and reproducibility of research results.

Software Use in Research Data

During the project, specialised software tools were used to support data acquisition, analysis, management, and visualisation. Data generated through these tools were routinely reviewed, cleaned, categorised, and securely stored on project-dedicated computers. Regular backup procedures were implemented, with monthly transfers to external storage devices and additional secure storage on ACU servers to ensure data integrity and continuity.

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Laboratory animal data related to the production and management of transgenic models were handled using Mosaic Vivarium. This software supported the organisation of genetic, breeding, and protocol-related information and enabled structured data exchange between collaborating institutions. Data generated through this system were archived in secure environments and managed in accordance with FAIR principles to support reuse and long-term accessibility.

GraphPad Prism was employed for statistical analysis and graphical representation of experimental data, including EEG, electrophysiological, and imaging results. BioRender was used to generate accurate scientific illustrations for communication and dissemination purposes, while Adobe Photoshop supported the processing and preparation of research images for analysis and publication. EEG data acquisition and preliminary analysis were performed using LabChart, with datasets securely stored and shared with project partners as required. All software-generated data followed consistent data management, security, and backup procedures.

Research Data Processing

During the project, research data were managed through a structured processing workflow designed to ensure data quality, integrity, and security. Following data collection, datasets were systematically cleaned and classified to remove redundant or irrelevant information and to support efficient organisation for analysis.

After cleaning, data were archived in an organised manner and subjected to quality checks carried out by designated supervisors to verify completeness and scientific validity. Verified datasets were stored on laboratory computers dedicated to the project, which served as the primary access point for research activities.

To reduce the risk of data loss, regular backups were performed using external hard drives assigned exclusively to the project. In parallel, research data were stored on secure servers provided by the ACU IT Department, ensuring controlled access, data protection, and long-term preservation.

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4. FAIR DATA

Throughout its implementation, the GEMSTONE Project applied a DMP aligned with the principles to ensure that data generated during the action were findable, accessible, interoperable, and reusable (FAIR). Data management procedures were progressively refined over the project duration to meet established European standards and to support long-term usability of research and administrative datasets.

From the outset, the project adopted structured approaches to data handling, including the use of standardised metadata, consistent version control, and clearly defined file-naming conventions. These practices enhanced data discoverability and facilitated efficient data retrieval. Data were stored in structured repositories and managed in compliance with the related regulations, ensuring lawful access and protection of sensitive information. Collectively, these measures supported the effective reuse and interoperability of project data both during and beyond the project lifecycle.

4.1. Making Data Findable

During the GEMSTONE Project, structured measures were implemented to ensure that all generated data were easily findable in accordance with the FAIR principles. Central to this approach was the systematic use of metadata, incorporating version information, descriptive keywords, and standardised file-naming conventions. These metadata practices supported consistent cataloguing and improved data discoverability within the Zenodo and ACU open access repositories. All datasets deposited in the repositories were assigned persistent identifiers through Digital Object Identifiers and the Handle System, providing stable and unique references for retrieval and citation. Automated repository processes ensured that metadata remained up to date throughout and beyond the project's duration, thereby supporting long-term findability of project outputs. Integration of these repositories with OpenAIRE further enhanced the visibility and dissemination of openly accessible data.

Interoperability and reusability were addressed through the adoption of internationally recognised data formats and standards. Roles and responsibilities for data stewardship were clearly defined among partners, ensuring accountable and sustainable data management practices aligned with the project's grant agreement.

4.2. Making Data Accessible

Data accessibility was a core component of the GEMSTONE Project's data management strategy. Access to project data was primarily provided through the ACU Open Access System and Zenodo, which served as the main entry point for external users. The ACU repository was managed by the ACU IT Department and the ACU Library and Electronic Resources Department and supported by robust security measures and regular backup procedures to ensure data availability and integrity. Both repositories ensure that all data, regardless of its nature, is assigned persistent identifiers, thus facilitating easy access and traceability. Non-sensitive research data were made openly accessible through the abovementioned repositories.

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The project applied strict data protection practices, particularly for personal data. Privacy and confidentiality were safeguarded in line with applicable regulations, including GDPR and KVKK. To support interoperability and collaboration, standard data formats were adopted, and non-restricted data were shared with project partners through secure digital channels. Comprehensive metadata accompanied all datasets and were made openly available under a Creative Commons licence dedication to facilitate discovery and reuse. In addition, supporting documentation on relevant software tools and data access requirements was provided to enable effective interpretation and reuse of the data. Data accessibility practices were continuously reviewed to ensure regulatory compliance, data security, and long-term usability.

4.3. Making Data Interoperable

Data interoperability was a key consideration in the GEMSTONE Project to support effective exchange and reuse of datasets across platforms and institutions. To this end, internationally recognised data formats and standard vocabularies were adopted. In particular, electrophysiological data were stored using the European Data Format, ensuring compatibility with widely used analysis tools and facilitating reuse by the international neuroscience research community. Consistent data organisation practices were applied, including standardised file headers and naming conventions, to enable integration with external datasets and software environments. These measures enhanced the clarity, interpretability, and reusability of project data across different research contexts.

All datasets were deposited in open access repositories, which provided a secure and stable infrastructure for long-term data preservation. Persistent identifiers were assigned to datasets to support reliable referencing, citation, and tracking within the scientific literature. Collectively, these practices ensured that GEMSTONE data remained interoperable and suitable for reuse beyond the project's duration.

4.4. Making Data Reusable

To promote the reuse of data generated during the GEMSTONE Project, structured measures were implemented to ensure that datasets were understandable, accessible, and suitable for further research. Comprehensive documentation accompanied the data, including metadata descriptions and procedures detailing variable definitions and measurement units. These materials were essential for enabling external users to interpret and apply the data correctly.

Where appropriate, datasets were made available under open licences, such as the Creative Commons licence, to encourage wider dissemination and reuse within the scientific community. Data quality was supported through systematic cleaning, validation, and verification procedures applied throughout the data lifecycle, from collection to dissemination. Ethical considerations and data protection requirements were consistently addressed through appropriate security measures and compliance with relevant legislation. To support long-term reuse, project data were preserved in reliable repositories together with their associated documentation and metadata. This approach ensured that GEMSTONE datasets remain accessible beyond the project's duration, contributing to future reuse.

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5. ALLOCATION OF RESOURCES

The final version of the DMP for the GEMSTONE Project reflected the effective allocation of financial and institutional resources in line with Horizon Europe Open Science requirements. Building on the initial and interim DMPs, the project demonstrated full compliance with open access and data management obligations throughout its implementation.

A total of €1,431.88 have been spent on open access publications, covering article processing charges and related publication costs. The allocated resources enabled the publication of peer-reviewed articles under open access conditions, ensuring wide visibility, accessibility, and alignment with Horizon Europe criteria.

Open science practices were consistently supported through institutional resources at ACU. The ACU Library and Electronic Resources Department provided guidance on open access publishing, while targeted seminars and training activities strengthened consortium-wide awareness and implementation of open science standards. In order to raise standards, Selcan Ayça Aydemir Mazlumoğlu, Library and Electronic Resources Manager at ACU, undertook a short-term visit to Lund University Library from 21 to 25 October 2024 under WP4.

Within this scope, the following discussion and training sessions were delivered by internal and external experts:

- "GEMSTONE Seminar: Open Science Management in Horizon Europe" by Selcan Ayça Aydemir Mazlumoğlu (ACU) on 12 January 2023
- "Consultation with Lund University Research Services" by Rickard Eksten, Fariba Vaziri-Sani, and Per Mercke (ULUND) on 9 March 2023
- "Discussion Series on Cross Cutting Issues in Horizon Europe: Open Science" by Ebru Soyuyüce Aydın (TÜBİTAK) and Gültekin Gürdal (Izmir Institute of Technology) on 28 March 2023
- "GEMSTONE Seminar: European Union and Open Access Publication Seminar" by Selcan Ayça Aydemir Mazlumoğlu (ACU) on 12 March 2024
- "GEMSTONE Project Experiences in Research Support: Best Practices from Lund University Library" by Selcan Ayça Aydemir Mazlumoğlu (ACU) on 20 March 2025

5.1. Open Access Publications

Within the scope of the GEMSTONE Project, the following open access publications have been produced in line with Horizon Europe Open Science requirements.

Books

- Oğuzhan Altınkoz, Cem Öztürk, Filiz Onat. "Making It Work: GEMSTONE Project's Better Practices for Horizon Europe Newcomers." Acıbadem Mehmet Ali Aydınlar University Publications, 2025. https://doi.org/10.5281/zenodo.16900756

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Articles

- Nihan Çarçak Yılmaz, Filiz Onat, Evgenia Sitnikova. "Astrocytes as a Target for Therapeutic Strategies in Epilepsy: Current Insights." Frontiers in Molecular Neuroscience, Vol. 16, 2023. https://doi.org/10.3389/fnmol.2023.1183775
- Aylin Toplu, Nursima Mutlu, Elif Tuğçe Erdeve, Özge Sarıyıldız, Musa Çelik, Devrim Öz Arslan, Özlem Akman, Zoltán Molnár, Nihan Çarçak Yılmaz, Filiz Onat. "Involvement of Orexin Type-2 Receptors in Genetic Absence Epilepsy Rats." Frontiers in Neurology, Vol. 14, 2023. https://doi.org/10.3389/fneur.2023.1282494
- Filiz Onat, My Andersson, Nihan Çarçak Yılmaz. "The Role of Glial Cells in the Pathophysiology of Epilepsy." Cells, Vol. 14, 2025. https://doi.org/10.3390/cells14020094
- Pablo M. Casillas-Espinosa, Jennifer C. Wong, Wanda Grabon, Ana Gonzalez-Ramos, Massimo Mantegazza, Nihan Çarçak Yılmaz, Manisha Patel, Kevin Staley, Raman Sankar, Terence J. O'Brien, Özlem Akman, Ganna Balagura, Adam L. Numis, Jeffrey L. Noebels, Stéphanie Baulac, Stéphane Auvin, David C. Henshall, Aristea S. Galanopoulou. "WONOEP Appraisal: Targeted Therapy Development for Early Onset Epilepsies." Epilepsia, Vol. 66, 2025. https://doi.org/10.1111/epi.18187
- Melike Şahiner, Oğuzhan Altınkoz, Eda Tanoğlu, Filiz Onat. "Enhancing Research Support Services Through an EU Project: A Case Study." SSRN, 2025 (Preprint). https://doi.org/10.2139/ssrn.5365646

Reports

- Oğuzhan Altınkoz. "GEMSTONE Newsletter 2022-2023." Zenodo, 2024. https://doi.org/10.5281/zenodo.18086927
- Cem Öztürk. "GEMSTONE Newsletter 2024." Zenodo, 2025. https://doi.org/10.5281/zenodo.18086991
- Cem Öztürk. "GEMSTONE Newsletter 2025." Zenodo, 2025. https://doi.org/10.5281/zenodo.18087037
- Cem Öztürk, Hana Owsianková, Tanja Botić, Emilie Trakalova, Blanka Marušincová, Yasemin Ertan, Burcu Kıran, Viera Pechancová, Serena Cogoni, Filiz Onat. "Twinning for Europe's Competitiveness: Keeping Excellence Connected Across All Regions." Zenodo, 2025. https://doi.org/10.5281/zenodo.17589583
- Emilie Trakalova, Cem Öztürk, Hana Owsianková, Tanja Botić, Blanka Marušincová, Yasemin Ertan, Burcu Kıran, Viera Pechancová, Serena Cogoni, Filiz Onat. "Why Twinning Matters: Factsheets for Policymakers, Research Community, and the Public." Zenodo, 2025. https://doi.org/10.5281/zenodo.17594764

Datasets

- Talat Taygun Turan and Deniz Kırık. "GEMSTONE Research Data: Alpha-Synuclein IHC Images and Protocols." Zenodo, 2025 (Dataset). https://doi.org/10.5281/zenodo.18059337
- Talat Taygun Turan and Özkan Özdemir. "GEMSTONE Research Data: PCR Images and Protocols." Zenodo, 2025 (Dataset). https://doi.org/10.5281/zenodo.18059452

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- Talat Taygun Turan and Özkan Özdemir. "GEMSTONE Research Data: dPCR Reports." Zenodo, 2025 (Dataset). https://doi.org/10.5281/zenodo.18059485
- Nursima Mutlu and Devrim Öz Arslan. "GEMSTONE Research Data: Investigation of OX1R Protein Levels by Western Blotting." Zenodo, 2025 (Dataset). https://doi.org/10.5281/zenodo.18071811
- Nursima Mutlu, Merve Açıkel Elmas, Talat Taygun Turan, Merve Çavuş, Nihan Çarçak Yılmaz, Filiz Onat. "GEMSTONE Research Data: Investigation of OX1R Distribution by Immunofluorescence." Zenodo, 2025 (Dataset). https://doi.org/10.5281/zenodo.18069331
- Nursima Mutlu, Merve Açıkel Elmas, Neval Sevinç Özdemir, Talat Taygun Turan, Merve Çavuş, Nihan Çarçak Yılmaz, Filiz Onat. "GEMSTONE Research Data: Investigation of OX2R Distribution by Immunofluorescence". Zenodo, 2025 (Dataset). https://doi.org/10.5281/zenodo.18069369
- Nihan Çarçak Yılmaz, Merve Çavuş, Nursima Mutlu, Talat Taygun Turan, Özge Sarıyıldız, Filiz Onat. "GEMSTONE Research Data: Immunofluorescence Images from Chemogenetic Applications." Zenodo, 2025 (Dataset). https://doi.org/10.5281/zenodo.18060615
- Nihan Çarçak Yılmaz, Özge Sarıyıldız, Merve Çavuş, Nursima Mutlu, Talat Taygun Turan, Filiz Onat. "GEMSTONE Research Data: EEG Recordings from Chemogenetic Applications on GAERS." Zenodo, 2025 (Dataset). https://doi.org/10.5281/zenodo.18085460
- Nihan Çarçak Yılmaz, Merve Çavuş, Nursima Mutlu, Filiz Onat. "GEMSTONE Research Data: EEG Recordings from Chemogenetic Applications on Mice." Zenodo, 2025 (Dataset). https://doi.org/10.5281/zenodo.18085697

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6. DATA SECURITY

GEMSTONE's final DMP reflects the progress achieved in establishing and maintaining robust data security practices throughout the project lifecycle. Data generated during project activities – including meetings, seminars, workshops, and research tasks – were collected in multiple formats, such as physical documents, audio-visual materials, and electronic files. As the coordinating institution, ACU stored and managed its data in accordance with institutional regulations, ensuring compliance with national and European data protection requirements.

Personal data were processed exclusively on the basis of informed consent and handled in line with the consortium agreement, Horizon Europe ethical standards, and applicable national and international legislation, including the GDPR. Data protection practices consistently reflected legal and ethical obligations across all participating countries.

Data security was ensured through structured organisational and technical measures. Physical records were systematically archived in access-restricted facilities, while digital data were stored on project-dedicated computers and regularly backed up on secure external storage within ACU's protected network. Access to both physical and digital records was limited to authorised personnel, and data updates were performed under controlled procedures.

Overall, the project not only complied with the requirements set out in the initial and interim DMPs but also strengthened its data security framework in response to operational needs, ensuring secure storage, controlled access, and ethical handling of all project data.

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7. ETHICS

Throughout the GEMSTONE Project, ethical compliance was maintained as a core principle, particularly with regard to research involving animal models. All activities requiring animal use were conducted following the receipt of appropriate ethical approvals from authorised bodies, in line with the procedures defined at the project outset. Continuous ethical oversight was ensured through the appointment of Prof. Janet Mifsud as Ethics Advisor to the Independent Advisory Board, providing expert guidance on ethical standards in clinical pharmacology and related research activities.

Ethical approvals for all relevant research activities were obtained in accordance with applicable national and international regulations, including EU Directive 2010/63/EU. Initial ethical approval was granted by the ACU Ethics Committee (ACU-HADYEK-2022/82), followed by additional approval for chemogenetic modulation and validation activities (ACU-HADYEK-2023/79). Required permissions for the importation of animal models were secured from the Ministry of Agriculture and Forestry of the Republic of Turkey.

The Drd1a-Cre, Nestin-Cre, and SNCA flox mouse lines were imported from partner institutions and established suppliers and were successfully integrated into the ACU animal research facilities. All procedures, including quarantine and breeding, were conducted in full compliance with approved ethical protocols and institutional standards.

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8. OTHER ISSUES

For long-term sustainability, project-related data will be preserved for a minimum of five years following project completion. ACU assumed responsibility for data stewardship, ensuring secure storage and continued accessibility through trusted repositories. Oversight of data management activities was and will be provided by the Primary Principal Investigator in coordination with the ACU Library and Electronic Resources Department, leveraging existing institutional infrastructure to ensure reliable and sustainable data preservation.

No additional national, funder-specific, sectorial, or departmental procedures for data management apply to the GEMSTONE Project beyond those already described in this final DMP. Furthermore, the project does not generate any other research outputs apart from those previously identified and addressed in this document.

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