



COST Action CA20135

Working Group Meetings

"Improving biomedical research by automated behaviour monitoring in the animal home-cage"

Hybrid meeting, 6th and 7th October 2022, Prague, Czechia

REPORT

All members of the Action were invited to attend 2 days of working groups meetings. The aim of the meetings was to take forward and discuss the current science tasks within each WG and inform members of other WG of their current tasks, get input from them and determine any synergies where joint work could be done in future. Each of the WG therefore had a session within the agenda where they could design the content and format for presentations, discussion and breakout groups as they wished (see Annex 1 for final agenda). As well as this, there were sessions on ethics and 3Rs, grants available and awarded by the Action and the Action Communication and Dissemination Plan and methods of communication. At the end of the meeting, there was a general management session to get feedback from members on the Action so far and to start planning for GP2 of the Action. These were further discussed by the Management Committee in their MC2 meeting directly after the WG meetings ended on 7th October.

The event was hosted by Institute of Molecular Genetics (IMG) of the Czech Academy of Sciences in Prague, Czechia in their impressive lecture theatre and associated breakout rooms and communal areas for breaks. This was a hybrid meeting: 32 delegates were able to join in-person with a further 30 joining online. There was good geographical spread and inclusiveness for delegates, with 29 countries represented, nearly 50% of which were ITC countries (14/29) who were represented by 18 delegates (30% of all delegates). There equal representation of males and females (52% female) and 31% of the delegates were Young Researchers. This was an excellent opportunity for members to meet and for Young Researchers to contribute to the Action.





WG1: Identifying, Gathering and Coordinating community requirements for HCM

Anna Kiryk, Aleksandra Bartelik, Marthe Schmit

TEATIME Network

One of the key aims of the TEATIME Action is to develop a lasting network of European researchers and industrial partners, that can continue to work together to increase the uptake and impact of this research at a European and global level. We are bringing together a new European-based scientific and technical inter-disciplinary network and facilitate interactions with international networks and provide new collaboration activities from wide geographical locations, including ITC and Young Researchers.

Action members have set up a list of stakeholders that can be contacted to join this network including science societies, academic organisations, organization relating to 3Rs, veterinary and welfare, pharma industry and companies. Individuals have contact these to tell them about TEATIME and suggest individuals can join the TEATIME network. Joining is open to anyone, including members of the public via a pop-up box on the TEATIME website. To date 217 people have joined the network. Their details will be held securely on MailChimp by the Grant Holder. Benefits will include keeping updated of the activities of TEATIME by electronic newsletter, being invited to TEATIME webinars, contributing to the work of the Action.

HCM Survey

The campaign has started at FELASA2022 conference and was announced via TEATIME social media accounts on Twitter and LinkedIn and via our stakeholders' newsletters: EARA, The North American 3Rs Collaborative, and LASA.

All stakeholders identified (above) have been asked and reminded to complete the survey. A flier (Annex 2) has been produced and distributed at meetings, e.g. FELASA and FENS.

To 28.10.2022, we have 274 responders. The survey will close on 31.10.2022.

The survey has questions for 4 main groups of stakeholders of our campaign:

Academics – e.g. in writing grants

Facility Managers – animal welfare & purchasing equipment

Industry – develop of new and existing systems

Funders – benefits of HCM, current and future usage investment in research

A preliminary analysis of the interim results was presented. Breakout groups at the meeting discussed how to forward take the analysis, publication and use of the results, from the perspective of science, welfare and commercial. Points for discussion were:

- The raw results – what is useful from the survey
- How to approach the analysis, including grouping of the replies by categories (e.g. job role of the respondent)
- What format the results and conclusions can be displayed in

- Where they can be published and disseminated, including audience and intended outcome
- How any result can inform the future work in TEATIME

Recommendation from these groups will be taken into account when moving forward with the survey analysis and reporting.

The WG has been very active throughout the Grant Period with 9 online meetings, a face-to-face meeting/hybrid at MRC Harwell. WG1 members have participated in and promoted the work of the Action in a number of conferences: MB2022, MNS2022, FENS2022, FELASA2022, PoLLASA and the International Digital Vivarium Forum.

WG2: Current status of HCM

Ewelina Knapska, Silvia Mandillo

WG2 has started its activity with a kick-off meeting call on November 15, 2021 with 24 participants over 34 members of the group at the time. The attendance to our monthly meetings has been good, averaging between 51 and 88% (Fig. 1).

As of October 2022 the group has raised its number of members to 52 (29F:23M), 15 of which are young researchers. Members come from 24 different countries (10 ITC).

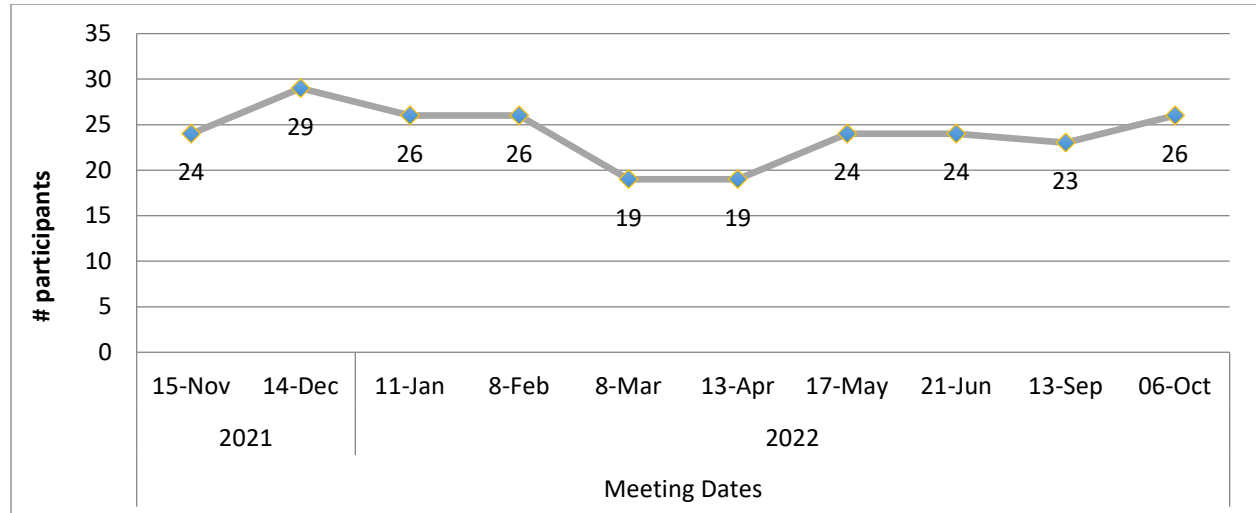


Fig 1. WG2 meeting dates and attendance

According to our Tasks and first year Deliverables a summary of the main activities of WG2 are described here below and in Fig 3, all documents and files are available in Teams:

- **Home Cage Monitoring (HCM) system definition**

Group Discussions, comparison with definition in Systematic Review and North American 3Rs collaborative (Translational Digital Biomarker), production and posting of an olog/diagram on Action Website cost-teatime.org (Fig. 2)

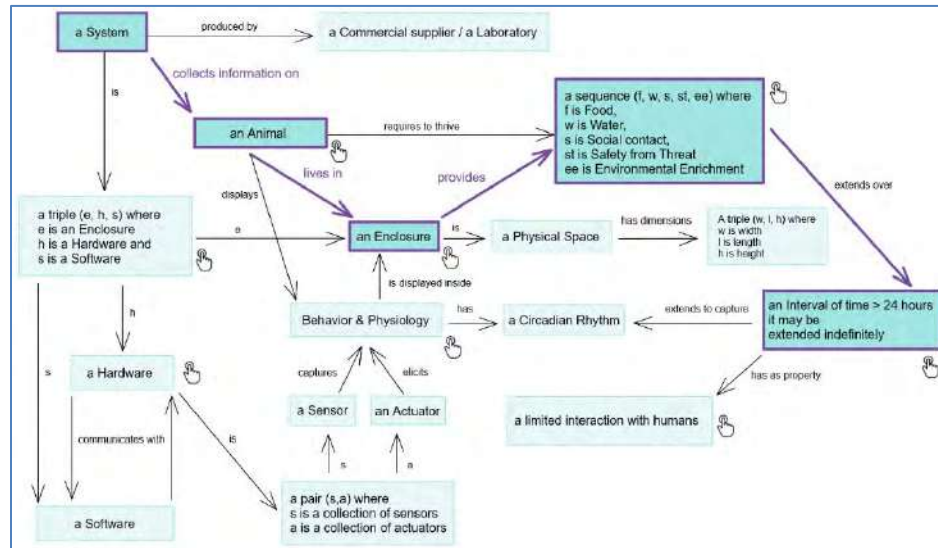


Fig. 2. HCM definition diagram

- Systematic Review paper on current status of HCM systems**
 Completed Full Text Review and Extraction (Phase 2-3), Data have been analysed and discussed within WG2 and during the Prague meeting with all TEATIME members. Draft will be circulating soon.
- Catalogue of existing Home Cage Monitoring systems**
 Compilation of list of systems, definition of categories, insertion of details for each system, an interactive table has been produced
- WG2 Webinars**
 Organized to present procedures, technical details and limitations of the systems used by WG2 members (EcoHAB, IntelliCages, Conditioned fear), available on YouTube channel (https://www.youtube.com/channel/UC_4tIkOQsT2kOA1uDRum5SA)
- Participation to international meetings**
 Several group members have participated to MB, MNS, FELASA, FENS, DVF2, PoILASA meetings with oral and/or poster presentations on the Action and HCM
- First TEATIME Training School contribution**
 Some members of the group have contributed to the organization and participated as faculty

WG 2 meetings, events and activities Year 1

| | |
|--|---|
| • TEATIME annual Meeting | October 2021 > Online |
| • WG 2 meeting | 15 Nov 2021 h14 |
| • WG 2 meeting | 14 Dec 2021 h14 |
| • WG 2 meeting | 11 Jan 2022 h14 |
| • WG 2 meeting | 8 Feb 2022 h14 |
| • WG 2 meeting | 8 Mar 2022 h14 |
| • WG 2 meeting | 13 Apr 2022 h14 |
| • WG2 first Webinar – Alicja Puscian Eco-HAB | 22 April h 14:00 >YouTube |
| • WG 2 meeting | 17 May 2022 h14 |
| • Measuring Behavior 2022 | 18-20 May Online |
| • Mediterranean Neuroscience Society 2022 meeting | 29 May-2 June Dubrovnik, Croatia |
| • FELASA 2022 meeting | 13-16 June, Marseille, France |
| • WG 2 meeting | 21 June 2022 h14 |
| • WG2 Webinar V Voikar, E Knapska, D Wolfer, A Kiryk IntelliCages | 21 June h 16:00 >YouTube |
| • FENS 2022 Networking Event | 11 July, Paris, France |
| • Digital Vivarium Forum DVF2 | 6-8 September, Varese, Italy |
| • WG 2 meeting | 13 Sept 2022 h14 |
| • TEATIME Training School | 19-23 September, Varese, Italy |
| • WG2 Webinar – Oliver Stiedl Conditioned fear in HC | 14 September h 14:00 >YouTube |
| • TEATIME annual Meeting | 6-7 October, Prague, Czech Rep |

Fig. 3 Calendar of WG2 activities

As a result of discussions during the WG meetings in Prague, it was decided that WG2 and WG3 should work together on gathering information on HCM systems, comparing them and making the information available on the TEATIME website. The first joint on-line meeting is scheduled for November 2022 and a joint face-to-face meeting will be planned for GP2 in 2023. We plan to discuss together how to improve the HCM systems and data analysis tools, combining the knowledge we already gathered.

WG3: Development of new technologies, analysis tools and databases

Jan Rozman, Marion Rivalan, Sonia Bains, Hamish Forrest

WG 3 has three major deliverables: 1) Production of a roadmap for innovations in data analysis, and data curation to enable the development of an HCM data repository, 2) Identify key researchers in ML and neural networks who have an interest in HCM and organise interdisciplinary meetings to determine how to work together, 3) Report on the progress of participants sharing software and bioinformatics tools to analyse the output of HCM.

Currently, WG 3 has 57 Members from 22 countries: Albania, Bulgaria, Czechia, Denmark, Luxembourg, Netherlands, Slovakia, Sweden, Belgium, Croatia, France, Israel, Latvia, Norway, Portugal, Spain (all 1 or two members), Estonia (3), Italy (3), Germany (4), Switzerland (5), Turkey (5), and United Kingdom (12).



The WG organized monthly online calls with 15-19 WG members attending. As part of the WG calls several presentations were given by WG members and invited speakers e.g. Luis Santos (IMPC data processing), Dominik Lutter (CALIMERA analysis tool), Sonia Bains and Hamish Forrest (data processing). The problem-solving café is an integral part of the meetings and turned out to be an excellent platform for discussion and exchange. The main topics that were discussed covered general aspects e.g. what different HCM systems are used currently, can output be compared, and are there in-house data storage solutions. Other topics addressed housing and experimental design, methodology of video monitoring, details on data processing and software solutions and the question of translating findings from animal experiments to humans.

At the first hybrid in-person and virtual meeting of WG members on 6-7/10/2022, three breakout discussion groups discussed: 1) Survey of existing commercial and in-house developed HCM - focus: data collection, storage, curation, details on methodology and parameters (chaired by Marion Rivalan), 2) Software tools for data curation and analysis, repositories (chaired by Dominik Lutter and Jan Rozman), 3) Suggestions for state-of-the-art HCM experimental and data processing pipeline (chaired by Hamish Forrest).

The following bullet points briefly summarize the discussions:

- Use the momentum gained during the WG meeting to identify synergies coming from collaborations between COST TEATIME partners
- Develop WG activities based on the catalogue of HCM and the systematic review (interaction with WG 1 & 2), especially regarding 1) troubleshooting section or frequently encountered problems/solution section that could be added, 2) collect specific often occurring issues with storage and delays in data analysis, 3) highlight importance of training, apply consistent and transparent procedures, 4) to suggest “best practice” pipeline for given HCM systems from calibration of the system to data analysis, 5) to compare and evaluate the statistical methods used, 6) standardisation of data, metadata, data structure and experimental parameters.
- Harmonization of terminology (wiki) considering the above mentioned topics.
- Distinguish system requirements depending on the application HCM (e.g. animal welfare monitoring and/or behavioral phenotyping)
- Further development and testing of a data analysis tool for time series data analysis (in particular indirect calorimetry data, CALIMERA) including data curation tools
- Enable transfer of knowledge (e.g. HCM common problem/solutions information). Discussion about a repository containing raw data (plus metadata) to enable the virtualization of HCM data.

From this discussion, the following goals were identified for 2022/23: 1) further identify expertise in and outside the WG and find gaps (by the end of 2022), 2) regarding data analysis tools, suitable applications will be identified and initial projects will be defined (by the end of 2022), 3) further enable transfer of knowledge (FAQ, problems & solutions) by establishing a wiki-like platform (by the end of 05/2023).



WG4: Training and knowledge transfer

Lior Bikovski, Anna Olsson

WG 4 is working to promote networking and training opportunities through a number of channels, with focus on organization of training courses.

During the first half of the year, WG4 had three virtual meeting in which we discussed the various ways of knowledge transfer and the theoretical side of establishing a training school. In the second half of the year, the work on the training school turned to be practical and WG 4 leaders (Anna Olson and Lior Bikovski) performed monthly meetings with selected members of the group who volunteered to take part in the event. In addition, WG leaders reached out to other WG leaders (e.g. communication) to promote the event, identify potential speakers, and to enhance our program event.

According to plan, this was a lecture-intensive introductory course, mainly aimed at PhD student. It was held in the end of September 2022 in Varese, Italy, with 24 participants of which most were PhD students. In total 13 faculty contributed as teachers, the majority of which are members of COST TEATIME. Several of the major companies were present, allowing the workshop participants opportunity to get expert input regarding the different systems. The teaching was organised into lectures (one hour talks starting from 9:00 until 15:00) and hands-on sessions (starting at 15:00 until 18:00) and addressed basic biological considerations for working with rodent behaviour, 3Rs/ethics, experimental design, behaviour tests for different purposes, and different aspects of home cage testing. Participant feedback was overall very positive, with students highlighting the general organization, the interactions between participants (and faculty) and the academic level as particularly positive. From the constructive criticism received through the feedback, the workshop organizers learned that the hands-on sessions need further investment in terms of organization, and that the presence on site by teachers is essential to ensure the scientific discussion which proved to be a highly valued component of the course. These are important insights for the organization of future training schools, and for the elaboration of the manual for training schools.

Ethics and 3Rs

Nuno Franco

Aside the scientific advantages of home-cage monitoring, there are also upsides in regard to animal welfare and the 3Rs. By reducing disturbance of the cage and minimizing handling events, animal welfare is enhanced (Refinement), while variability caused by handling stress is reduced, thus likely improving quality and reproducibility of the data. More accurate and reliable data helps reduce wasting animals in unreproducible research. Also, as a higher 'signal/noise' ratio can be achieved through minimizing of environmental stressors, fewer animals may thus be required to detect a given effect size (Reduction).



Grant Awarding (STSM, ITC Conference Grant & Dissemination grant)

Indrek Heinla

We have set up a Grant evaluating committee and worked out the guides to apply for grants.

We have also agree the evaluation criteria for ITC Conference grants and STSMs.

During the first year of the action we funded 1 dissemination grant and 1 ITC conference grant. We consider both of these successful.

Even though we have asked members of the action to offer STSMs in their labs and we were open to fund any relevant (and qualifying by COST rules) STSMs, we received no relevant STSM proposals. To remedy this for the next period we plan to:

- 1) increase and spread the information about laboratories that are able to host good quality missions (via our website & social media)
- 2) reach more potential new applicants with the help of *inclusiveness and social media representative* – a new position in our core group
- 3) support graduates from our first year training school that have shown interest in STSMs and already made contact with potential host laboratories

WG 5: Communication, engagement and dissemination

Maša Čater, Lars Lewejohann

Communication and Dissemination Working Group 5 has been active from the very start of the 1st year of TEATIME Action, as the main communication channels needed to be set and starter materials designed. MS Teams has been selected as a medium for internal communication within the working group and between different working groups. Our first tasks in the first months were to design a logo, establish a website and to open few social media accounts. Twitter and LinkedIn were selected as the most appropriate ones. A plan for social media communication was discussed and Maša Čater and Aleksandra Bartelik were selected as social media communicators. Throughout the year we have disseminated the Action with lectures and posters at many conferences (Measuring Behaviour 2022, Mediterranean Neuroscience Society Conference 2022, FELASA 2022, FENS Forum 2022, PoILASA 2022, 2nd Digital Vivarium Forum) and also at a networking event at FENS 2022 called Stories from the home cage – An evening event focused on working with mice in the home cage. For these occasions, we designed different flyers. We have designed a general TEATIME flyer with general information about the Action, our main goals, grant offers, and information on how to join. Additionally, a special flyer has been designed for our survey with information on the Action itself, the purpose of the survey and with provided link to the survey and also to our website. For the Introductory training school, which we organized in September 2022, we have designed a flyer containing information on the Action, the purpose of the training school, grant offers and a preliminary program. Apart from the flyers, which were handed to people at the conferences and training school, we have prepared a TEATIME template for slides, posters and also for email signature.



The website has been established timely and it was updated regularly with the help of MRC Harwell team. A pop-up tab to fill in the survey has been established on the website and an option to sign in for a newsletter has been added. After establishing all that, we have produced a 1st welcome newsletter for all who have subscribed. Further newsletters will be produced quarterly. We have also advertised different open calls for grants on our website and in the future, we are planning to provide a special section with grant receiver's testimonials. By the end of the 1st year we have finished a Communication and Dissemination Plan, which will be updated and edited regularly if needed.

TEATIME Communication and Dissemination Plan

Sabine Hölter-Koch

The purpose of the Communication & Dissemination plan of CA20135 COST-TEATIME is to outline the communication and dissemination activities to be undertaken during the duration of the Action, their goal and the means, in order to promote the Action as a whole. Since COST-TEATIME has a dedicated Communication working group (WG5), an additional goal is to meet the specific objectives of this WG. Importantly, the planning of the timing of communication activities is not fixed in the Communication & Dissemination plan, but handled by WG5 throughout the course of the Action.

The Communication & Dissemination plan describes the process and the tools that have been installed to support timely communication activities and identifies responsible personnel. In addition, the plan identifies the target audiences and the tools and channels COST-TEATIME has chosen for communication and dissemination activities. It states that the mission of COST-TEATIME is to improve animal research and animal welfare for the sake of translational medicine, and that for communication purposes, the key message is that new monitoring technologies for laboratory animals will benefit biomedical research, and ultimately patients.

Core Group activities and management of the Action

Chair, Vootele Voikar and Vice-Chair, Sara Wells

An open discussion was held on management, engagement and information people want to see from Core Group. What else would people like us to be doing, in terms of meetings, training, information, development of HCM, information on HCM, etc.. The points raised below are grouped by subject area.

1. Engagement with suppliers

- a. Can we set up a group to communicate on IntelliCage to share things and discuss any issues?
- b. Bottom-up community. IntelliCage would be interested if such a community exists. So many labs have IntelliCages but not many published.
- c. How do company follow-up when they sell equipment?
- d. Need to be careful to not just focus on just one commercial system.



- e. Are we getting feedback from providers? Some engaged others are not. But it was suggested that the size of the company reflects in the level of involvement. Small companies are busy. Noldus and Tecniplast are big companies can afford to participate.
 - f. Building on problem-solving done in WG3. Can collate issues and solutions on a platform, e.g. Microsoft document works well. Put questions on and people answer.
 - g. The WG2 YouTube channel have at least 4 TEATIME webinars that use a variety of cages. People interested can watch these to get information and get in contact with the presenter if they would like more information.
2. Contribution from Action members
- a. There are a lot of deliverables on grant and potential for what the Action can achieve. With a lot of people doing things we can move forward. Currently a few people doing a lot. How get more people to volunteer?
 - b. Action is voluntary. If you are passionate about topics, please help core group and WG leaders. Ask questions and contribute in WG meetings.
 - c. It was suggested that the training course next year could be held in conjunction with MC meeting. Allow students to network with MC. There could be a conference with posters.
3. Integration of WG
- a. Need better integration of the WG. Currently they are working in silos. Need to identify here we can have joint WG meetings. Also invite WG leaders to update other WG.
4. Supporting involvement of Young Researchers
- a. Young people who would like to attend training course. Have data from homecages. We could invite young people to solve problem. It was suggested that WG3 could elect a committee to judge solutions and give a grant who are best, but there is no mechanism to give grants outside STSM, ITC, etc.,
 - b. It was suggested that we should propose to the MC that there is a new leadership position to help engagement with Young Researchers.
 - c. Need to engage with Young Researchers and find out what their research is?
 - d. Young researcher of the month.
 - e. Young researchers can edit the newsletter.
5. Communication
- a. Information about group leaders in the newsletter: where they work what they do.



Work Budget Plan (WBP) for GP2

Chair, Vootele Voikar and Vice-Chair and Grant Holder Scientific Representative, Sara Wells

A draft WBP for the next grant period was presented and various activities, locations and budget were discussed. The WBP was further refined in the MC2 meeting that followed this meeting so the draft is not included here.

Panel discussion planning for GP2

Chair, Vootele Voikar and Vice-Chair and Grant Holder Scientific Representative, Sara Wells

Panel: All WGs represented by WG leaders or deputies

A panel discussion was held to share planning for GP2 with each WG represented by a leader or deputy presenting the WG plans and opening them to discussion with all delegates. The resulting plan for WG activities next Grant Period (GP2) was a (Annex 3).

Acknowledgement

COST Action CA20135 TEATIME and this meeting are supported by COST (European Cooperation in Science and Technology).

COST (European Cooperation in Science and Technology) is a funding agency for research and innovation networks. Our Actions help connect research initiatives across Europe and enable scientists to grow their ideas by sharing them with their peers. This boosts their research, career and innovation.

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Annex 1



COST Action CA20135

"Improving biomedical research by automated behaviour monitoring in the animal home-cage"

Working Group Meetings

6th and 7th October 2022

Hybrid meeting

**Institute of Molecular Genetics of the Czech Academy of Sciences, Videnska 1083, Prague 4,
Czechia**

DAY 1

- 09:00 - 09:10 Welcome
- 09:10 – 09:30 **HCM Survey** presentation on aims, content, submissions to date
Discussion on methods of analysis and format for the report
- 09:30 - 10:05 Breakout groups to discuss the survey:
Science
Welfare
Commercial
- 10:10 - 10:30 Report from Breakout Groups (5 min each – then discussion)
- 10:30 - 11:00 COFFEE
- 11:00 - 11:15 **Definition of HCM**
- 11:15 - 11:30 **Systematic Review of HCM**
- 11:30 - 11:45 **Catalogue of HCM systems**
- 11:45 - 12:10 Breakout 1 – Systematic Review of HCM
Breakout 2 – Catalogue of HCM systems
- 12:15 - 12:30 Report from Breakout Group 1 & 2 (5 min each – then discussion)
- 12:30 - 13:00 **Welfare** - Discussion on how to promote welfare aspects and engage with 3Rs groups & other COST Actions
- 13:00 - 14:00 LUNCH
- 14:00 - 14:30 Development of new technologies, analysis tools and databases - update and first experiences



- 14:30 - 15:30 Breakout Groups – Problem-solving cafés. Individuals have the chance to describe an issue and get input from delegates.
- 15:30 - 15:45 COFFEE
- 15:45 - 16:30 **First TEATIME training school** report including lessons learned for future Beginners Training school and discussion. Discussion on format for Advanced Training school and potential locations.
- 16:30 - 17:30 **Grants** (STSM, ITC Conference Grant & Dissemination grant) - presentation of uptake this year. Discussion of how to improve uptake in year 2
- 17:30 - 19:00 **Reception** at IMG
- 19:00 Delegates find evening meal (if still hungry) or go to Prague - at own expense

DAY 2

- 09:00 - 09:20 **TEATIME communications plan**
- 09:20 - 10:00 **TEATIME communication and dissemination activities**
- 10:00 - 10:30 COFFEE
- 10:30 - 11:00 **Core group and management**
Open discussion on management, engagement and information people want to see from Core Group. What else would people like us to be doing, in terms of meetings, training, information, development of HCM, information on HCM, etc.?
- 11:00 - 12:00 **Panel discussion planning for Year 2** with each WG leader/deputy - discussion on work plans, activities and budget for Year 2
- 12:00 Meeting ends for non-MC delegates

MC2 meeting - MC members by invitation only (see separate agenda)

Outline

- 12:10 - 13:00 MC2 agenda items
- 13:00 - 13:45 Lunch
- 13:45 - 15:30 MC2 agenda items
- 15:30 MC2 ends – MC delegates leave



Home Cage Monitoring Survey



Your opinions will contribute to shaping the future of laboratory animal science!



The purpose of this survey is to assess the unique opportunities for Home Cage Monitoring in automatically recording 24/7 data and analysing undisturbed behaviours and physiology in rodents.

Most work on rodents has involved them living in one cage (their home cage) and undergoing procedures or experiments in other environments. The idea of home cage monitoring systems is to allow data collection from mice in their home cage by modifying the cage to enable different kinds of measurements and observations.

We aim to gather views to inform future developments and challenges in systems which monitor animals in home cage environments.

To take part visit:

bit.ly/3xe1Dje

cost-teatime.org



Annex 3: WG plans for next Grant Period (GP2)

| WG 1 | WG 2 | WG 3 | WG 4 | WG 5 |
|---|---|--|---|---|
| Analyse survey and report(s). Reports published 1 st May | Publications of the Systematic review Dissemination of the draft end of 2022 | Further identify expertise in and outside the WG Gather information on expertise and identify gaps end of 2022 WG leaders to plan next steps | Complete the training manual and upload from the Introductory training school End Nov 2022 | Continue to develop the website/twitter/blogs All year objective |
| Increase sign-up to network (All year target) | Increase the webinars on the U- Tube channel One per month | Data Analysis tool Identify existing tools and Define initial projects (end of 2022) | Advance training school (incorporating other WG) May 2023 | Contacting other COST initiatives with overlapping interests Early 2023 |
| Update and exploit stakeholder tracker (All year target) | Finalise the catalogue First version by end of the year | Enabling transfer of knowledge (FAQ/Solutions/Problem) Establish platform for this by May 2023 (wiki?) | STSM-strategy for bottom up and top down ways of attracting take up 6 STSM | Discuss a strategy around ERC etc Increase young researchers in the action to 40% |
| | Face to Face WG meeting | | Advance training school | |