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### Progress Report: Mid-term Check

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### Dissemination Level of Report

PU	Public	<input checked="" type="checkbox"/>
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CO	Confidential, only for members of the consortium (including the Commission Services)	<input type="checkbox"/>

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**Progress report – ITN****1. General progress of the action**

Training activities completed by the ESRs in pursuit of their research/research training is outlined in Table 1. All ESRs have undertaken University/Departmental and Group inductions on arrival at the University. Those undertaking laboratory work have undertaken or are about to take appropriate inductions for these facilities and specific pieces of equipment. In terms of ESR progress, this has largely been focused on understanding and synthesising the scientific literature, undertaking laboratory training, formalising the research objectives and preparing initial reports. A number of the earlier ESRs have begun utilising equipment as a start to delivering on their research deliverables. Each ESRs has been enrolled on the first BioTrib Network Wide Event, 'Research Management and Innovation' which takes places in January 2022.

**Table 1 - ESR Training Activities within BioTrib**

ESR	Fellow #	Formal Training Activities completed	Practice-based Training
1	6	ETH Microscopy Training Course, Biomechanics Colloquium, Basic German 1	Training on SEM, microCT, tribometer; Lab safety training
2	8	ETH Microscopy Training Course, Biomechanics Colloquium; Online programming course	Training on SEM, microCT, tribometer, electrospinning; Lab safety training
3	5	Focus has been on software education Gambit and Ansys.	Further training and support in terms of the software packages to be utilised including COMSOL Multiphysics, AutoCAD and SolidWorks.
4	13	Course: Introduction to Unlubricated contact	Division and University Level Induction.
5	15	Course: Introduction to Unlubricated contact	Division and University Level Induction.
6	9	Introduction to doctoral studies (disciplinary domain of medicine and pharmacy), Introduction to Computer Aided Design & 3D printing (U-PRINT SciLifeLab), Career paths in Academia and Industry.	Practice of: extrusion and FRESH 3D bioprinting (E3D Tool Changer & Motion System), RepRapFirmware supported G-codes, CAD Fusion 360 Autodesk, spectrophotometry. Initiation to confocal microscopy.
7		Laboratory safety introduction course 18/01/2022	CALPHAD database introduction, Induction and training on laboratory best practice as well as 3D printing
8	14	A formal course on clean room safety has been completed	Inductions and training on clean room equipment & practice and 3Dprinting has been undertaken
9	10	Radioprotection course	FELASA Pig, Training with PET analysis software, Biomaterials testing via cytotoxicity assays in vitro. Radiochemistry lab introduction, "Bonelab" introduction, Wet lab introduction,
10	4	Induction as a new employee and welcome to the group. Lab based training (safety inductions, sample mounting, polishing and etching), microscopy imaging and analysis. PhD workshop on 'Becoming an effective researcher'.	Fundamental Autodesk Fusion 360
11	7	Induction as a new employee and welcome to the group. Currently attending a finite element modelling course to support their research.	Instruction on the use of the group's workstation. Discussions of methods for lubrication modelling and tools to be used (Matlab or python based)
12	2	ETH Microscopy Training Course, Biomechanics Colloquium, Biocompatible Materials Course; Online chemical biology course	Training on electrospinning, cell culturing, SEM, XPS; Lab safety training
13	1	Academic Writing, Critical Thinking, Academic Integrity and Plagiarism. X-ray Photoelectron Spectroscopy Training. 3 x health and safety courses. Data security. Professional Conduct, Equality and Inclusion.	General Laboratory Induction – General Guidelines, Chemical Storage and Disposal, and Working Safely during COVID-19 in IFS Labs. 4 x specific lab inductions.
14	12	Academic Writing, Critical Thinking, Academic Integrity and Plagiarism, Research Ethics. X-ray Photoelectron Spectroscopy Training. 3 x health and safety courses. Data security. Professional Conduct, Equality and Inclusion.	General Laboratory Induction – General Guidelines, Chemical Storage and Disposal, and Working Safely during COVID-19 in IFS Labs. 3 x specific lab inductions.
15	11	XPS Training Course. Workshop Surface Metrology in Orthopedic Applications. Career Planning and making Good Decisions .	General Laboratory Induction, 5 x specific lab inductions

In terms of milestones and deliverables, these have been delivered in accordance with the Grant Agreement. Table 2 - Deviations in the DoA outlines the minor deviations have occurred with respect to the original DoA.

**Table 2 - Deviations in the DoA**

Deviation	Reason
<b>Start Dates</b>	Negotiations of with ESRs and effects of SARS-Cov-2 have impacted on the actual against the nominal start date.
<b>Secondment</b>	Slight amendments to these activities due to SARS-Cov-2 and deviations in start dates. The details have been outlined in D2.3

## 2. Recruitment

The recruitment details are provided in Table 3.

**Table 3** - Recruitment data

Fellow ID	ESR #	Last Name	First Name	Last Country of residence of researcher prior to MSCA	Name of recruiting participant	Country of recruiting participant	Academic / Non-academic	Recruitment Start date	Recruitment End date	Contract Type <sup>1</sup>	Family charges	Working time commit (100%)	Duration within reporting period FTE	PhD enrolment
6	ESR1	Bissacco	Elisa	Italy	ETH Zurich	Switzerland	Academic	01.09.2021	31.08.2024	A	■	100%	36M	Y
8	ESR2	Amicone	Alessio	Italy	ETH Zurich	Switzerland	Academic	01.10.2021	30.09.2024	A	■	100%	36M	Y
5	ESR3	Mosayebi	Mahdieh	Iran	ETH Zurich	Switzerland	Academic	01.01.2022	31.12.2024	A	■	100%	36M	Y
13	ESR4	Shrestha	Dilesh Raj	Nepal	LTU	Sweden	Academic	29.11.2021	28.11.2024	A	■	100%	36M	Y
15	ESR5	Clegg	Benjamin	UK	LTU	Sweden	Academic	09.01.2022	08.01.2025	A	■	100%	36M	Y
9	ESR6	Moulin	Marie	France	UU	Sweden	Academic	11.10.2021	10.10.2024	A	■	100%	36M	Y
16	ESR7	Cavaliere	Giulio	Belgium	UU	Sweden	Academic	10.01.2022	09.01.2025	A	■	100%	36M	Y
14	ESR8	Leviandhika	Vidhiaza	Portugal	UU	Sweden	Academic	13.12.2021	12.12.2024	A	■	100%	36M	Y
10	ESR9	De Berardinis	Niccolò	Italy	UU	Sweden	Academic	08.10.2021	07.10.2024	A	■	100%	36M	Y
7	ESR10	Shi	Qingyue	United Kingdom	Imperial	UK	Academic	23.09.2021	22.09.2024	A	■	100%	36M	Y
4	ESR11	Qazi	Sallar	Sweden	Imperial	UK	Academic	06.09.2021	05.09.2024	A	■	100%	36M	Y
2	ESR12	Souza Plath	André Mathias	Germany	ETH Zurich	Switzerland	Academic	01.08.2021	31.07.2024	A	■	100%	36M	Y
1	ESR13	Lima Dos Santos	Pedro Luiz	Portugal	UNIVLEEDS	UK	Academic	01.07.2021	30.06.2024	A	■	100%	36M	Y
12	ESR14	Raihan	MM	United Kingdom	UNIVLEEDS	UK	Academic	01.11.2021	31.10.2024	A	■	100%	36M	Y
11	ESR15	Hyla	Edona	Kosovo	UNIVLEEDS	UK	Academic	01.11.2021	31.10.2024	A	■	100%	36M	Y

<sup>1</sup> A: "employment contract" or B: "Fixed amount fellowship"

### 3. Recruitment strategy

Deliverable D1.1 detailed the recruitment processes set out in the GA, which were discussed at the 'BioTrib Planning' and the 'BioTrib Committee Planning' meetings on 24th November 2020 and 10th December 2020, respectively. Based on the experience of the academics in other ITNs including Nu-Spine and Green Tribos further recommendations were made including the use of a standard score sheet. All posts were advertised on Euraxess as well the host university's own jobs website. Posts were also advertised on third party websites including:

- (1) BioTrib Website
- (2) Biomch-L
- (3) European Society of Biomechanics
- (4) Jobs.ac.uk
- (5) LinkedIn (personal pages of the supervisory team)

Each host University followed their own rigorous recruitment practices and were responsible for their own administration. Following discussions, it was deemed that central administration of the recruitment process would be unnecessarily bureaucratic given that each University had significant experience of ETNs and managing the recruitment process. The interview process at the UNIVLEEDS is set out below with minor differences at the beneficiaries to reflect host best practice and guidelines. A standard scorecard was used across all 15 posts.

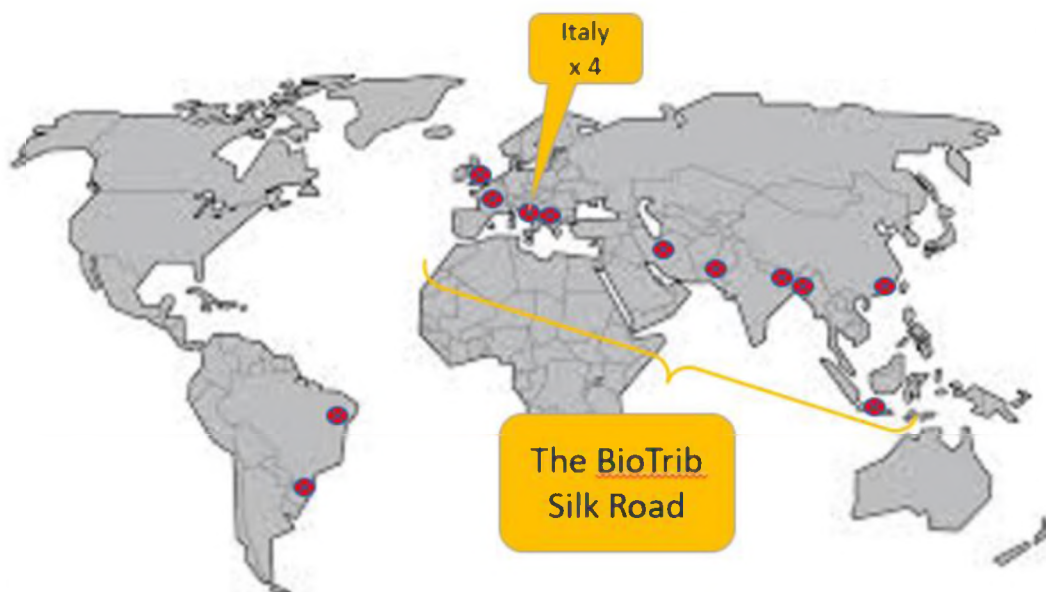
- Post advertised with deadline.
- Following the deadline the applications are assessed based on the CV and application response to the person specification. This is undertaken, without conferring, by at least two members of the supervisory team.
- A short list was produced and validated with the supervisory team. Candidates not shortlisted are told of their unsuccessful application either at this stage or at the end of the recruitment process.
- Short-listed applicants are called for interview. Each applicant was required to undertake one or more additional tasks such a presentation and/or a written assignment.
- An interview panel was convened. Each candidate was assessed through the interview process together with the additional tasks. Each interviewer has a record sheet, which sets out the observations on each candidate through various stages of the process.
- Following the interview process, discussion on the candidates' suitability was undertaken taking account of the marks and comments within the score sheets.
- The preferred candidates was told, informally, of their success and were given an agreed time to consider the proposed position. If the candidate verbally accepts the post then the other candidates are informed of their lack of success.
- The University Administration draws up a contract and liaises with the candidate over Visas etc.

All ESRs in place by January 2022, with the first recruited in July 2021. The statistics for the applications and their start dates are shown in Table 4. Two candidates Clegg and Cavaliere had slight delays in the recruitment start date by 9 and 10 days, respectively. These delays were caused by delays in the visa processing and communication.

**Table 4** - Application details for each ESR position (no of female candidates is given in brackets). Where there are two sets of figures for the shortlist, the first is for a preliminary list and the second after a further discussion and the final interview.

ESR no. (fellow ID)	Number of Applicants	Number Shortlisted	Gender of Final Candidate	Visas Issued	Start Date Planned	Start Date Actual
1 (6)	112 (37)	14 (8) 5 (2)	F	████████	M9	01-Sep-21
2 (8)	61 (26)	7 (2) 5 (2)	M	████████	M10	01-Oct-21
3 (5)	85 (24)	9 (3) 6 (3)	F	████████	M13	01-Jan-22
4 (13)	64(14)	10(1)	M	████████	M8	29-Nov-21
5 (15)	116(29)	8(3)	M	██████	M13	09-Jan-22
6 (9)	142 (62)	5 (4) 4(4)	F	████████	M8	11-Oct-21
7	244 (59)	6 (2)	M	████████	M8	10-Jan-22
8 (14)	188 (44)	6 (3)	M	███ ██████	M13	13-Dec-21
9 (10)	85 (38)	7 (5) 3 (1)	M	████████	M13	08-Oct-21
10 (7)	36(5)	8(3)	F	████████	M8	23-Sep-21
11 (4)	36(5)	8(3)	M	████████	M8	06-Sep-21
12 (2)	111 (51)	11 (6) 5 (1)	M	███ ████████	M8	01-Aug-21
13 (1)	65 (17)	6 (2)	M	████████	M13	01-Jul-21
14 (12)	42 (15)	6 (1)	M	████████	M13	01-Nov-21
15 (11)	50 (16)	7 (2)	F	████████	M13	01-Nov-21

The geographical spread of the final ESR appointment is provided in Figure 1. Eight candidates came from outside Europe (two from South America and six from Asia) and 7 from within Europe.



**Figure 1** - Geographical Location of the ESRs

#### 4. Career development plan for each recruited researcher

Each ESR is provided with a Welcome pack comprising a formal letter welcoming them to BioTrib, the Fellows Note, PCDDP template, a copy of the GA, AMGA, Vitae Research Framework, Partnership Statement, Consortium Agreement and the Principles of Innovative Doctoral Training. This is followed by a 'welcome meeting' between RMH, the Co-ordinator, the project manager, the ESR and their supervisory team.

Supervisory arrangements are in keeping with the guidance and regulations of the host institution. All ESRs have more than one supervisor in what are termed supervisory teams. Such teams allow different perspectives and experience to be brought to the fore as well as acting as a safety net if one of the supervisors is unavailable over an extended period due to, for instance, ill health. At the University of Leeds, Prof Anne Neville has had to retire due to ill health and Dr Greg de Boer will now form part of the supervisory team for ESRs 13, 14 and 15. Details of the supervisory practice for the ESRs at each University is outlined in Table 5.

Table 5 - Supervisory Practice in each of the Beneficiaries

Institution	Supervisory Practice
<b>UNIVLEEDS</b>	Supervisory team comprise three or more supervisors. Lead supervisors have significant experience in this domain. The ESR meets with the team formally every two weeks, with additional ad hoc meetings for deeper discussions. Meeting discussions including actions are recorded in the online GRAD facility and are signed off by the lead supervisor. Annual meetings are mandatory for each ESR with an independent panel. This includes the transfer (upgrade) at the end of year 1.
<b>ETH Zurich</b>	All ESRs participate in the bi-weekly research meeting of the Laboratory for Orthopaedic Technology (Ferguson group). Each ESR is required present their latest progress or problems on 1 - 2 PowerPoint slides and the work is discussed. Prof. Ferguson maintains an open-door policy for ad hoc consultations, which results in typically weekly consultations on research questions or results. These meetings have functioned well in the online work-from-home environment.
<b>Imperial</b>	Supervisory Teams comprise two or more supervisors. The ESRs has weekly meetings with the supervisory meetings. The ESRs have at least bi-weekly supervisory meetings and ad-hoc meetings as required. Supervision notes are kept for the relevant meetings using MS Onenote. Supervisors and ESR is able to access and contribute to these notes. Regular chat discussions also take place as required with the ESRs.
<b>UU</b>	Meetings with the main supervisor are arranged, at least, once per month and the project group is meeting at least every 3 months. Furthermore, there are regular meetings (once per week) with the research group. A presentation to the group/division by the ESR on recent progress is completed at least every semester. The ESRs are required to keep minutes from the supervision meetings. The progress is recorded in the individual study plan required by Uppsala University and is updated at least once per year.
<b>LTU</b>	Each candidate is supported by a supervisory team. Principal supervisor will coordinate activities and support student in order to achieve overall objectives stated within PhD studies. Principal supervisor will ensure communication between student, co-supervisor(s) and external collaborators. Meeting with principal supervisor is weekly based (during the first year of the PhD), co-supervisors are welcome to join but it is not mandatory. Monthly meeting with all supervisors and external partners. ESRs are keeping the meeting notes and every six months Individual Study Plans (ISP), according to Swedish higher education authority, are updated and evaluated by head of the post-graduate at the department.



Those candidates that were appointed on or before the 1<sup>st</sup> November 2021 have completed their initial PCDP. Those employed after that date have a two-month period in which to complete their initial plan. Once the plans have been approved by the supervisor and submitted to the Training and Career Development Subcommittee (TCDSC) they are reviewed. If there are no outstanding comments, they are passed to the Supervisory Board (SB) for final sign-off. The plans will be updated every 6 months and reviewed by the TCDSC and the SB. Further details of the PCDP and the initial template are located in the Deliverable D2.1 'Training Plan' although the template has been updated since this submission.

## **5. Secondment Plan**

BioTrib set out an ambitious and carefully planned set of secondments. There have been some changes to the original secondment plan that was submitted in January 2020 as part of the original application and the DoA. The changes to the secondments are set out in Table 6 and are largely due to variance with the ESR start dates and the ongoing SARS-Cov-2 pandemic. Further details of the secondments and the overall plan are provided in deliverable D2.3 'First Secondment Starts'.

**Table 6** - Secondment Amendments. Those secondments that have been modified are underlined. The main reasons for the changes are related to ongoing SARS-Cov-2 restrictions and delay in the appointment of the ESR from that originally envisaged.

ESR #	Name	Host	Secondment Organisation	Proposed date Duration	Modified Date Duration	Reason for the Secondment	Rationale for changes
1	Elisa Bissacco	ETHZ	IMPERIAL ZIMMER	<u>M13 3M</u> <u>M18 4M</u>	M18 2M M21 4M	Establish a fibre-reinforced poroelastic model; Transfer and application of tribological testing methods and standards (i.e. pin-on-disc)	1-month delay in start date and SARS-Cov-2 restrictions at Imp. Knock on effect of the start date for the first secondment.
2	Alessio Amicone	ETHZ	IMPERIAL ZIMMER	M24 2M M28 4M	M24 2M M28 4M	Training on computational modelling of fracture mechanics; Perform pin-on-disc fibrillation experiments.	No changes
3	Mahdiah Mosayebi	ETHZ	IMPERIAL ZIMMER	<u>M18 4M</u> M27 4M	M18 2M M27 4M	Multi-scale modelling of unit cell flow and flow network. Collaboration on arthroplasty design and composite structures.	Reduced duration: Green Agenda/Digital working
4	Dilesh Shrestha	Raj LTU	Evonik Lanzhou UNIVLEEDS	<u>M12 1M</u> <u>M16 4M</u> M31 3M	M16 1M M20 4M M31 3M	Introduction to polymer processing, Self-lubricating biomaterial and prototyping of component, Evaluate the wear mechanism of AM carbon based UHMWPE	Delay in ESR start date by 4 months. Delay in ESR start date by 4 months.
5	Benjamin Clegg	LTU	SIMSOL UTS UNIVLEEDS	<u>M16 1M</u> M30 4M M40 3M	M14 1M M30 4M M40 3M	Simulator experience and training; Wear particle characterisation; Advanced wear testing including adverse conditions.	Moved forward to fit in with the simulator verification task.
6	Marie Moulin	UU	Cellink ULL UNIVLEEDS	<u>M13 3M</u> M16 1M M29 2M	M21 3M M16 1M M29 2M	Bioprinting and development, Garner information on clinical need and the lesion type; Tribological assessment of the bone-cartilage constructs.	Delay in app. 2 months and restrictions on Cellink laboratory
7	Giulio Cavaliere	UU	SWERIM AB UNIVLEEDS	<u>M12 2M</u> M24 4M	M17 2M M24 4M	Learn about and fabricate powder for printing. Evaluate the corrosive properties of the material.	ESR will start their project 1 <sup>st</sup> Jan 2022 (delay 5M).
8	Vidhiya Leviandhika	UU	SWERIM AB IMPERIAL UNIVLEEDS	M17 3M M22, 1M M36 3M	M17 3M M22, 1M M36 3M	Learn in-house printing processes. Characterisation of the surface for modelling wear. Assessment of the tribological properties in specimens.	No changes
9	Niccolò De Berardinis	UU	ULL Orthotek	M18 4M M24 2M	M18 4M M24 2M	Define clinical need for the Mg-based alloys; Preliminary testing of the constructs to produce debris.	No changes.
10	Qingyue Shi	Imperial	UNIVLEEDS ETH Zurich Orthotek	<u>M14 2M</u> <u>M18 2M</u> M24 2M	M17 2M M21 2M M24 2M	Multiscale modelling of bearings with topography, AM and design of implants, Knee testing with a 3D printed polymer component.	Delay in app. 1M (M9), ongoing restrict'ns for laboratory access. SARS-Cov-2 restrictions and knock effects of UNIVLEEDS delay.
11	Sallar Qazi	Imperial	UNIVLEEDS Orthotek UNIVLEEDS	<u>M10 1M</u> <u>M18 2M</u> M30 4M	M17 1M M21 2M M30 4M	Developing an understanding of the tribo-corrosion process; Familiarisation with experimental testing methods; Validation experiments - fundamental tribo-corrosion problem.	Delay in app.1M (M10), ongoing restrict'ns for laboratory access Orthotek delay due to SARS-Cov-2 and knock effects of UNIVLEEDS delay.
12	André Mathias Souza Plath	ETHZ	ZIMMER IMPERIAL	M15 4M M22 2M	M15 4M M22 2M	Application of tribological testing methods and standards; Generation of a boundary lubrication simulation model.	No changes.
13	Pedro Luiz Lima dos Santos	UNIVLEEDS	SIMSOL IMPERIAL LHT	<u>M15 2M</u> M21 3M <u>M13 1M</u>	M14 2M M21 3M M17 1M	Simulator training and underpinning engineering to simulator. Ascertain the predictive qualities of computer simulation. Clinical orientation – understanding of clinical need.	Secondment brought forward to fit in with the simulator verification, a key activity in utilising simulator technology. Ongoing laboratory restrictions.
14	MM Raihan	UNIVLEEDS	UU LTU Orthotek	<u>M12 2M</u> <u>M18 2M</u> M36 2M	M17 2M M19 2M M36 2M	Development of sensing for light alloys; Spectroscopy for polymer components and debris isolation, Integration into simulator technologies	Fits in better with the courses being undertaken in Sweden. Knock on effect of changes in first secondment
15	Edona Hyla	UNIVLEEDS	UU SIMSOL	<u>M13 3M</u> <u>M19 3M</u>	M17 3M M14 2M	Biological/cell culture assessment of debris, Electrochemical instrumentation of simulators.	Ongoing laboratory restrictions. Secondment brought forward to fit in with the simulator verification

## 6. Management of the action

Overall management structure is set out in the GA and reported in D1.2 'Supervisory Board', which also included the Terms of Reference for the SB. Each of the committees; SB, Research and Innovation Subcommittee and the Training & Career Development subcommittee meets on a bimonthly basis. The Gender Opportunities subcommittee meets on a quarterly basis. Agendas and Minutes are recorded for each meeting. The ESR forum was set up in November 2021 when a significant number of ESRs had been recruited. At this point, the ESR representation on the SB and subcommittees was arranged through this ESR Forum. The membership of the committees including representation of the ESRs is provided in Table 7. Up to November, ESR representation has been provided by an ESR from Nu-Spine (Kaushikk Iyer from Key Engineering Solutions) in which Uppsala, Leeds and ETH Zurich are members.

**Table 7** - Membership of the BioTrib committees and subcommittees

Members	Co-ordinator	Beneficiaries	PO	ESR representation	External
SB	Yes	Yes x 5	Yes x 1	Yes x 2 - Cycle Annually (Sallar, Elisa)	No
RISC	Yes	Yes x 5	Yes x 1	Yes x 2 - Cycle Annually (Alessio, Edona)	No
TCDSC	Yes	Yes x 5	Yes x 1	Yes x 2 - Cycle Annually (Alessio, Edona)	No
GO	No	Yes x 5	No	Yes x 2 (Marie, Pedro)	No
AB	Yes	Yes	No	Yes - Chair of the ESR Forum Elisa	Yes: Chair + 4 others
ESR Forum	No	No	No	ESR all: Elisa – Chair, Secretary - Qingyue	No

The Kick-off meeting was held on 15th January 2021 and, due to COVID restrictions, was held virtually. The first External Expert Advisory Board was delivered on 15th November 2021. Outcomes of the EEAB meeting recommended the following activities to enhance the BioTrib experience for the ESRs:

- Ensure patient and clinician involvement.  
**Response:** An extra face-to-face Network Wide Event has been put in place to replace the face to face component of the Research Management Course which will now be delivered solely on-line. Within this four-day meeting, a day where the ESRs engage with patients will be arranged. Here ESRs will discuss the benefits and challenges of the patients' arthritic conditions and joint replacement (morning session) and pitch their research projects to the patients for scrutiny (afternoon session). This is being delivered via one of the PO, Leeds Teaching Hospitals Trust, which has an NIHR sponsored Biomedical Research Centre and has an international reputation in patient engagement.
- *Ensure networking and the development of inter-personal relationships.*  
**Response:** Within the four-day course outlined above, time for building inter-personal relationship will be developed through ESR participation in team exercises and other activities to develop networks.
- *The ESRs had also indicated that they would like to develop networks beyond BioTrib.*  
**Response:** An approach has been made to the ETN DiscforAll which started in November 2020. Discussions with Disc4All are ongoing with a view to the delivery of a joint meeting in late 2022/early 2023 on a common topic or theme. This may include the Nu-Spine ETN.

Risks have been identified and were submitted as the Risk Register in deliverable D1.3. No further risks have been identified following review of the register.

Ethical issues have been resolved following the feedback from the Ethical Review of the original proposal. These are set out in the deliverables D9.1 to D9.5, which have been submitted, recently.

At this moment in time there are no current issues beyond the current SARS-Cov-2 pandemic and the rise of the new Omicron variant. This will invariably lead to continued, reduced laboratory access and other restrictions, designed as public health measures to protect the population. All the researchers at the beneficiaries, except for Imperial, have been involved in other current but earlier starting ITNs. These ITNs were severely hampered by the ongoing SARS-Cov-2 pandemic including the occurrence of lockdowns, tighter regulations on close working especially in laboratory environments and home working. Up to now, these issues have affected the BioTrib ESRs little, in that they have only recently been appointed. However, going forward we aim to mitigate against the effects of this pandemic using the experience we have already gained and the risk assessments produced. These measures are set out in Table 8.

**Table 8 - Issues Implementing the Work Plan**

Country	Difficulty possible (or future issues)	Response or proposed mitigation (if any)
Sweden	Visa for one of the ESRs [REDACTED] [REDACTED] [REDACTED]	Due to the long-term COVID-19 pandemic, its impact on the administrative work force, and large number of visa applications, the visa processing for countries outside EU, has become longer than normal processing time which is between 2-4 months. Notification of a positive visa outcome was provided on 10 <sup>th</sup> January 2022. To mitigate this delay, since 15 December 2021 Benjamin has been formally accepted and registered at LTU as PhD student and have started his education (full access to all though courses, research lab and other necessary facility for his education). He has office and personal email, laptop etc. similar all other PhD students in the group.
ALL	SARS-Cov-2 Pandemic Lab restrictions	<ul style="list-style-type: none"> <li>Rejig the project aims and objectives to emphasise proportions that do not require extensive lab access.</li> <li>Utilise further safe working practices within labs.</li> <li>Maximise lab usage.</li> </ul>
ALL	SARS-Cov-2 Pandemic Home-working	<ul style="list-style-type: none"> <li>Ensure that the ESR has adequate homeworking facilities (Laptop etc) to complete non-lab work to the appropriate quality.</li> <li>Ensure contact between ESRs through digital media in both professional and personal circumstances.</li> <li>Outline possible issues between mental health, exercise and homeworking.</li> </ul>
ALL	SARS-Cov-2 Pandemic Travel restrictions	<ul style="list-style-type: none"> <li>Delay secondments with additional underpinning material delivered virtually.</li> <li>Move secondments to in-country where possible where travel is easier.</li> <li>Ensure that the relevant risk assessments for travel are produced and followed.</li> </ul>

## 7. Communication Activities

The dissemination and publication engagement activities in the first year have revolved around two main aspects:

- Website and Social Media provision. This included the BioTrib Website, with an active blog and the BioTrib Conversation Series. There is a growing presence within LinkedIn where BioTrib appears to be a leading ITN in terms of followers. There is also a Twitter and YouTube account.
- BioTrib/University of Leeds MSCA ESR/IF careers meeting – 26th April 2021.

### BioTrib Website and Social Media Provision

The BioTrib website (BioTrib.eu) was completed and launched alongside Twitter, LinkedIn and YouTube social media profiles on 01 April 2021. Included in this launch activity was an agreed branding with an associated logo, which can be downloaded<sup>2</sup>. The homepage for the website can be seen in Figure 2. The homepage was redesigned to allow greater prominence of the new material especially blog postings after a review of the site in October 2021. The new version was released on 1<sup>st</sup> December 2021.

A broad range of content types are used to populate the BioTrib website and public social media profiles. These include image and text articles, dynamic articles (Microsoft Sway), interactions and re-sharing of content from similar tribology research groups. Video lectures and interviews are also being produced with an initial series of 'BioTrib Conversations' now on YouTube where the Lead Co-ordinator Prof Richard Hall interviews academics and industry experts within tribology and medical technology fields.

Blog content is provided mainly by the BioTrib Early Stage Researchers and supplemented with articles written by the BioTrib Management Team and Web Manager. The posted content is informed by a set of social media guidelines<sup>3</sup> with various post types recommended, which include:

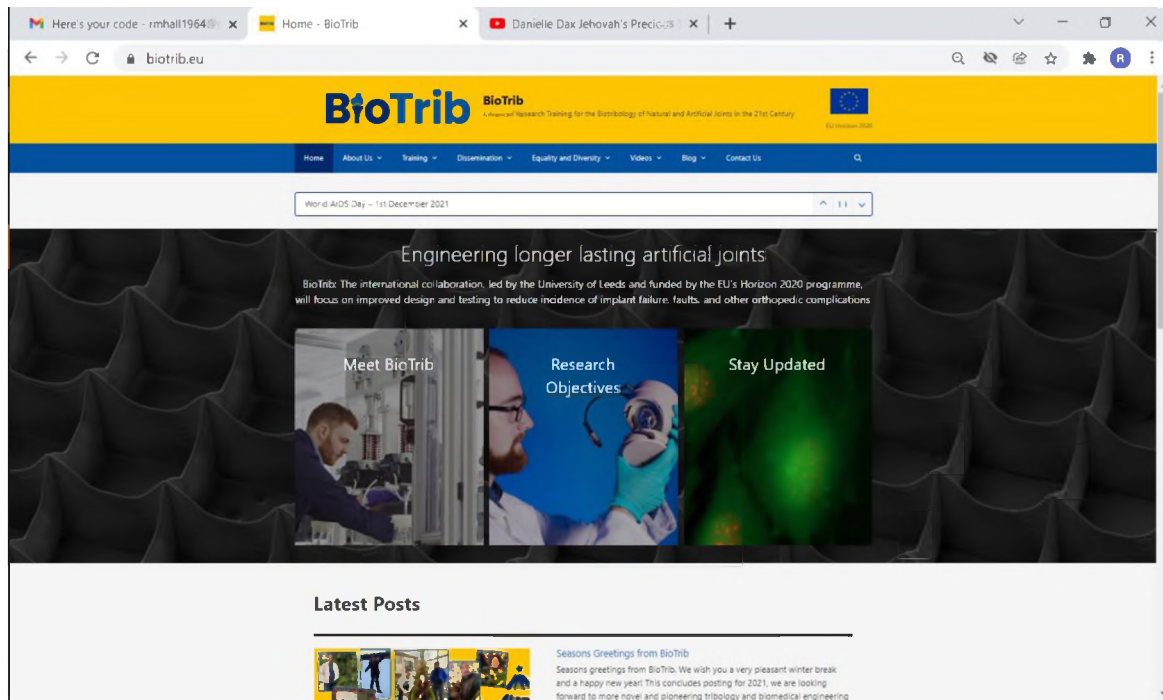
- ESR profiles and introductions;
- research project summaries;
- publications and awards;
- accessible literature reviews and science communication;
- academic or outreach events;
- equipment and facility showcases; and,
- postgraduate life and advice articles.

All content is moderated by the web manager to ensure it is related to biotribology, orthopaedic biomaterials, medical implant design, ESR experiences, and equality & diversity in STEM. Each of BioTrib's 15 ESRs are encouraged to produce 6 – 9 posts per year, which allows for a posting schedule of at least 2 new articles for the BioTrib blog and social media per week. In line with BioTrib's equality and diversity objectives, a series of posts have also been made for special event days for LGBT and women in STEM.

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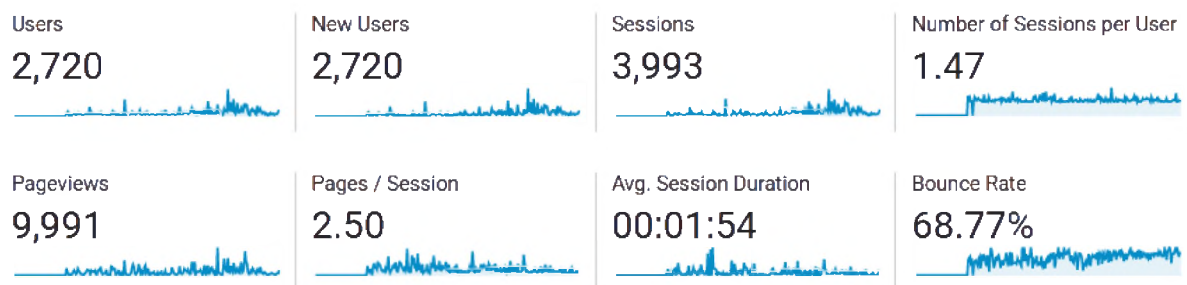
<sup>2</sup> BioTrib Logo Package and PowerPoint Template can be downloaded at <https://biotrib.eu/dissemination/downloads/>

<sup>3</sup> Copies of the guidelines can be accrued from Robert Elkington, the BioTrib Web Manager; mnrje@leeds.ac.uk



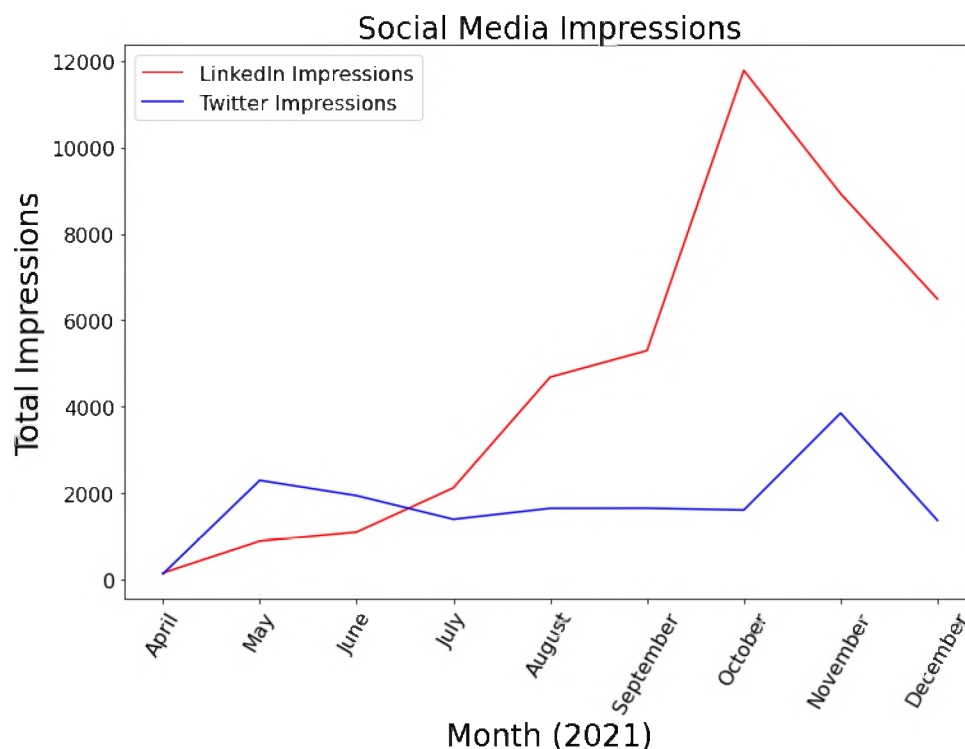
**Figure 2 - Homepage for the BioTrib Website**

Analytics of these profiles have been available since 1<sup>st</sup> May 2021 in order to measure the growth of BioTrib’s web presence and value as a dissemination network. A summary of the BioTrib.eu website audience is shown in Figure 3 for the period 1<sup>st</sup> May 2021 – 1<sup>st</sup> January 2022. In this 7 month period the website has had 2720 unique users who have accessed the website for 3993 sessions with an average of 2.50 pages viewed per session. The bounce rate (percentage of visitors who enter the site and then leave) is 68.77 %, indicating that approximately 1/3<sup>rd</sup> of visitors stay to browse more of the BioTrib website. In December 2021 an updated homepage has been implemented with a design optimised to feature larger call to action buttons along with a greater focus on new blog content in order to reduce the bounce rate further.



**Figure 3 - Google Analytics summary of users for BioTrib.eu for period 1<sup>st</sup> May 2021 – 1<sup>st</sup> January 2022**

As of 1<sup>st</sup> January 2022 the social media profiles for LinkedIn had 456 followers and Twitter had 190 followers. Figure 4 shows the number of impressions (unique views of posted content) for each social network, both platforms are sustaining growth with impressions peaking in the October-November period before the winter break. Since their launch, cumulatively LinkedIn has achieved approximately 41,000 impressions and Twitter 16,000. The YouTube channel has 14 subscribers with a total of 371 video views.



**Figure 4 - Total monthly impressions for LinkedIn and Twitter BioTrib Social Media pages for the period 1<sup>st</sup> May 2021 – 1<sup>st</sup> January 2022**

A broad range of content types are used to populate the BioTrib website and public social media profiles. These include image and text articles, dynamic articles (Microsoft Sway), interactions and the sharing of content from similar tribology research groups. Video lectures and interviews are also being produced with an initial series of ‘BioTrib Conversations’ now on YouTube where the Lead Co-ordinator Prof Richard Hall interviews academics and industry experts within tribology and medical technology fields.

**Table 9 - BioTrib ETN LinkedIn page statistics compared to other tribology and EU programmes in the subject area. LinkedIn company pages for the 6 month period of 01/06/2021 – 01/01/2022.**

Page	Total Followers	New Followers	Total post engage's	Organisation Type	Date Founded
<b>ITNs</b>					
OrganoVIR	498	30	263	ITN	Jan 2019
BioTrib	456	315	739	ITN	Jan 2021
EUROoC ITN	230	47	98	ITN	Dec 2018
Disc4All EU Project	183	82	248	ITN	Nov 2020
EJD GreenTRIBOS	136	53	202	ITN	Jan 2020
NU-SPINE	74	48	181	ITN	Jan 2019
BioInspireSensing	43	16	1	ITN	Jan 2021
<b>Other Med Tech or BioTribology Activities</b>					
Inst. of Functional Surfaces UNIVLEEDS	662	105	143	Research Group	-
iPSpine	253	31	193	H2020 RTD	Jan 2019
Friction: The Tribology Enigma	194	189	228	EPSRC Programme Grant	Sept 2017

LinkedIn is the most valuable social network for BioTrib dissemination activities demonstrating a sustained increasing trend of post impressions and follower growth. Compared to the LinkedIn company pages of competing tribology and EU programmes, the BioTrib ETN page consistently outperforms; gaining more followers, post interactions, and page reach as shown in Table 7.1.

In summary, a targeted and comprehensive social media action plan has been implemented that is effective at growing the web presence of BioTrib and its activities. Presently across all of BioTrib's online profiles it is possible to reach in excess 12,000+ unique views of content per month. This provides a powerful dissemination network that is still growing and able to reach highly targeted biotribology and medical engineering groups along with the wider STEM and European higher education communities.

### **BioTrib/University of Leeds MSCA ESR/IF careers meeting**

In April 2021 an MSCA ITN/IF careers meeting was held for those individuals at the University of Leeds. This had two purposes for BioTrib:

- Raise the brand and importance of BioTrib within the University of Leeds
- To allow the development of materials for the website in terms of career development.

The meeting was undertaken on-line and comprised two parts. Firstly there was a series of short punchy lectures providing International and EU opportunities at the postdoctoral research level, followed by a series of 4 presentations and a panel discussion delivered by exemplar researchers 3 of which were MSCA ITN alumni. This meeting was extremely well received and can be accessed through the BioTrib website<sup>4</sup>. This model for the dissemination for on-line career development was used by Mechanical Engineering at the University of Leeds.

### **Further Dissemination**

- Currently, ETH Zurich and UNIVLEEDS are placing a proposal into the journal Frontiers in Bioengineering and Biotechnology for a special issue on 'Pre-clinical and pre-surgical assessment in MSK disease'.
- Press release was place on the University websites of 25<sup>th</sup> February 2021.
- A press release was produced for the launch of BioTrib, which was subsequently picked up by NS Medical Devices<sup>5</sup>.

## **8. Impact of the Action**

Impact so far has been minimal given the reduced person-months the ESRs have been in place. However, there are a number of activities of note:

- A prestigious UK national research grant has been award to two consortium members, UNIVLEEDS (lead) and Imperial for investigations into metastatic bone disease (secondary cancer) in the spine. This award also involves UU (expertise in 3D printing) and ETH Zurich (spinal biomechanics) as part of the international network focusing on this pathology (enhances both institutional and the ERA).
- Currently, ETHZ, Leeds, Imperial and Uppsala are working on a multidisciplinary proposal for assessing the risk of bone fracture in secondary osteoporosis (Institution and ERA).
- Best practice around recruitment was shared including the use of scorecard for recording the interview process (ESR and Institution).

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<sup>4</sup> <https://biotrib.eu/category/videos/presentations/>

<sup>5</sup> See <https://www.nsmmedicaldevices.com/analysis/testing-next-generation-artificial-joints/>



## 9. Fellow's rights:

**Administration: Researcher's Declarations, Grant Agreement provisions awareness, working conditions (employment contracts, eligible allowances, visa issues, administrative support), tuition fees.**

Each of the ESRs was provided with an information pack sent from the Co-ordinator on or just after their arrival to their host beneficiary. This is followed up by a meeting between the individual ESR, the Co-ordinator, project manager and ESR's supervisory team at which the ESR can raise queries about the information sent. The documents sent are as follows:

BioTrib Grant agreement inc. Annex 1 (required by the EU)	Principles for innovative doctoral training
Consortium agreement for BioTrib (outlines the agreement between the Beneficiaries)	The BioTrib Partnership Statement (what is expected of the research and staff as part of BioTrib plus other info)
ESR Personal Development Career Plan (required by the EU – you will need to complete part I over the first 2 months)	Researcher-Development-Concordat (background on researcher development)
MSCA-ITN-fellows-note (required by the EU)	Further information from the Annotated Model grant Agreement

### Career development plan

As noted in section 4 all Fellow's are provided with a PCDP proforma. All those required to complete the proforma have done so and it has been signed off.

### Supervision and integration: quality of the supervision, integration within the research team/the network/ the host institution/the country

See section 4 for supervisory arrangements. Additional integration of the ESRs is through the formation of topic groups, which are held quarterly, and ESR group meetings with the Co-ordinator, which are held every two months.

### Planned training activities, individual research projects, secondments, PhD courses, planned courses, workshops/conferences, language courses and complementary skills training.

The Network Wide Events (NEW) that have been undertaken or will be delivered over the next 6 months are provided in Table 10. Each ESR has access to well developed training in complementary skills delivered through these NWE or their host institution – see Table 1. Planned Secondments are shown in Table 6.

**Table 10 - Network events in the next 6 months of BioTrib**

Network Wide Event	Lead	Proposed Delivery	Actual Delivery
Supervisor Training Meeting (1 day): Supervision processes, ESR training and development and good practice	UNIVLEEDS	3 On-line	2 On-line
Kick-off meeting (1 days): Attended by Supervisory board, as well as staff from each beneficiary. Overview of BioTrib and expected outcomes.	UNIVLEEDS	3 Face to face	1 On-line
Research Innovation & Management (4 days): Responsible Innovation/Open Science skills, project management, ethics, regulation and IP protection	UNIVLEEDS	11 Face to face	13 On-Line
Advanced Biotribology and Corrosion (4 days): Multiscale modelling of the tribo-corrosive environment relating to natural and artificial joints.	LTU	13 Face to face	16 Hybrid
Industry event – Showcase event with project reviews by industry representatives. To coincide with the 12 <sup>th</sup> month review.	LTU	13 Face to face	16 Face to face
Innovative Biomaterials Science and Evaluation (4 days): Additive manufacturing of biomaterials, materials analysis including TEM/SEM etc.	UU	14 Face to face	16 Hybrid
Innovation Management, Entrepreneurship and IPR (4 days): This will build on the Research Management NWE and provide an advanced course on enterprise and innovation management and the importance of Open Science.	UU	14 Face to face	16 Hybrid
Additional Summer School (4 days): Patient engagement, networking, industry and clinical visits.	UNIVLEEDS	-	19 Face to face