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1 Title Page

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3 **ECCO – a new initiative to support early-career researchers in the complement field**

4

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1 **Abbreviations**

2	COVID-19	Coronavirus disease 2019
3	ECCO	Early-Career Complementologists
4	ECN	European Complement Network
5	ECRs	Early Career Researchers
6	EFIS	European Federation of Immunological Societies
7	ICS	International Complement Society
8	yEFIS	The EFIS Young Immunologist Task Force

1 "To find joy in work is to discover the fountain of youth."

2 – *Pearl S. Buck*

3

4 **Early-career researchers in times of COVID-19**

5 Early-career researchers (ECRs) represent the transition phase from being a student to becoming an
6 independent senior investigator in an academic position. In this article, we define ECRs as students or
7 scholars who are at the undergraduate, graduate, Ph.D. or post-doc level up to 5 years post-Ph.D. A
8 report in 2014 by the Global Young Academy on the state of ECRs worldwide concluded that young
9 scientists are passionate about doing research and highly motivated to pursue an academic career, but
10 they are faced with significant challenges (Friesenhahn and Beaudry, 2014). Lack of resources and
11 funding, unmet needs for appropriate mentoring and supervision, unhealthy work-life balance, and
12 pressure to publish in high-impact journals are just some of these challenges. The coronavirus disease
13 2019 (COVID-19) pandemic has only exacerbated the problem (Levine and Rathmell, 2020; Termini
14 and Traver, 2020). University closures have limited ECRs access to their laboratories, which has greatly
15 delayed research projects and Ph.D. completions. Social distancing has made hands-on training and
16 in-person collaboration unattainable, while travel bans have prevented ECRs from starting new jobs
17 abroad or allowing them to return to their universities, thus slowing down learning possibilities and
18 restricting job opportunities. Research productivity was further reduced due to the intensified domestic
19 and caregiving responsibilities of ECRs with young children, especially for women (Gewin, 2020).
20 Adding to all of what has been mentioned is the issue of canceled (or postponed) research conferences
21 as well as grant applications, significantly limiting career opportunities for ECRs. Simply put: It was
22 already difficult to get a foot in the research door, and it has only gotten harder. It is, however, important
23 to note that the pandemic has also created and increased opportunities for research in areas relevant
24 to COVID-19 and other communicable diseases (Norton et al., 2020).

25 In recent years, the challenges faced by ECRs have been counteracted by newly formed
26 international associations and workgroups in an attempt to try and find solutions. An important objective
27 for these bodies is to increase visibility of ECRs and address their specific needs. In this special issue
28 of *Molecular Immunology* for the 28th International Complement Workshop, we, therefore, want to
29 introduce a new ECR Task Force: the Early-Career Complementologists (ECCO). ECCO is an initiative
30 that has grown organically and is supported by the European Complement Network (ECN) and the
31 International Complement Society (ICS), two professional societies led by researchers and clinicians
32 investigating the complement system in health and disease. ECCO wants to provide ECRs with a voice

1 and aims to support, engage and connect ECRs in the complement field worldwide. Since ECRs include
2 the next generation of leaders in the scientific community, recruiting, retaining, and cultivating talent will
3 not only benefit ECRs but also the field of complement research in general.

4 5 **Addressing the challenges of early-career researchers**

6 Researchers of all career stages face significant challenges, and this issue is not unique to ECRs. We
7 do not aim to compare and measure the challenges faced by senior scientists and ECRs. Rather, the
8 purpose of this paper is to provide a snapshot of the challenges faced by ECRs based on existing
9 published literature. It is important to note that the specific challenges faced by ECRs depend on their
10 geographical location, career stage, and gender as well as specific characteristics linked to under-
11 represented minority groups. Despite these differences, a set of global challenges have been identified
12 that are shared among ECRs. Here, we will discuss three generally unmet needs of ECRs that require
13 acknowledgement and action:

14
15 *Mentor and peer support:* Every established researcher understands the importance of being mentored
16 at the early stages of one's career. It is, therefore, not surprising that there is vast literature
17 demonstrating that effective mentorship strongly predicts the success of an ECR (Ma et al., 2020;
18 Malmgren et al., 2010). Examples of brilliant mentors in the complement field are plentiful (Castellano,
19 2015; Díaz, 2021; Würzner, 2021), but mentoring support is not universal (Christian et al., 2021;
20 Friesenhahn and Beaudry, 2014; Margaret K. and Shannon, 2021). Rather than acquiring a technical
21 skill, ECRs see career guidance as the most important support element provided by mentors (Christian
22 et al., 2021). A graduate survey by *Nature* found that mentorship added more to respondents'
23 satisfaction with their Ph.D. program than any other factor (Woolston, 2017). In addition, peer support
24 can help ECRs by providing emotional, logistical, as well as professional support, thereby
25 complementing mentor support (Dickson et al., 2021). Peer support has also been shown to positively
26 impact the academic output of ECRs (Margaret K. and Shannon, 2021). Unfortunately, peer support is
27 not routinely available to all ECRs. In sum, there is a need for ECRs to have increased access to peer
28 and mentor support, which will enable them to receive constructive mentoring and increase
29 interpersonal skills with peers. Cultivating these relationships is also important for ECRs to receive
30 adequate psychosocial support and benefit from shared resources and knowledge.

1 Working conditions: Many ECRs face extreme workloads to advance their careers and to fulfill
2 expectations by supervisors, research institutes, and funding organizations. Research activities often
3 do not fit into a 9-to-5 schedule; however, ECRs should not be forced into long working hours either. In
4 the report by the Global Young Academy, the average workweek of ECRs was roughly 55 hours
5 (Friesenhahn and Beaudry, 2014), making a healthy work-life balance challenging. Moreover, rates of
6 burnout among ECRs are concerning (Primack et al., 2010). Against these difficulties, there are also
7 some benefits that come with the scientific profession, for example; the freedom to plan your working
8 day, the flexibility to change schedules, and the opportunities for creativity (the ability to come up with
9 your own ideas and hypothesis). Moreover, these advantages are also important requirements for
10 pursuing a successful career in science. The lack of fairness and transparency is another challenge for
11 ECRs. Transparency is particularly important in regards to evaluation procedures, promotion criteria,
12 and academic standards in research. Fairness is essential in terms of workload distribution and
13 responsibilities of ECRs, taking into account their personal situation and career stage. Furthermore, it
14 is particularly vital to emphasize that science must break with the custom of using ECRs as "cheap
15 labor". Alternatively, research systems should learn to cultivate and inspire talent by providing
16 opportunities for creativity and the means to achieve a better work-life balance.

17
18 The imbalance between career interests and prospects: The future is not looking bright for current ECRs
19 as highlighted by a recent analysis. Ghaffarzadegan *et al.* estimated that in the United States, on
20 average, there is only one tenure-track position in biomedical sciences for every 6.3 Ph.D. graduates
21 (Ghaffarzadegan et al., 2015). Simultaneously, international surveys revealed that nearly 75 - 78% of
22 Ph.D. candidates aspired a job in academia (Ghaffarzadegan et al., 2015; Woolston, 2017). This makes
23 the current system unstable, but there are no easy solutions given the uncertain funding of research
24 within many countries. Because of the uncertainty of career prospects, ECRs are often faced with
25 extreme competition and a constant need to get ahead, leaving little time for other priorities. This creates
26 an environment that pushes ECRs to be conservative, rather than ambitious. More specifically, since
27 scientific evaluations are often based on previous performance (i.e., publications and citations), ECRs
28 are driven to prefer projects that will produce scientific papers rather than to embark on an open question.
29 All to not risk stepping off the track to a faculty position. ECRs feel that originality and creativeness in
30 science takes second place (Friesenhahn and Beaudry, 2014). The ability to pursue findings that with
31 significance over research that only lengthens publication lists is vital to ensure proper incentives. It is
32 prudent to mention that these points are not unique to ECRs. In general, there is a constant pressure

1 for productivity in science, which negatively affects the impact and reproducibility of research findings
2 (Bertamini and Munafò, 2012). And while there probably are no easy fixes for this problem, safeguarding
3 proper incentives should be a concern for all scientists, industry, journal editors/publishers and grant
4 funders. Overall, there is a need for funders and institutions to develop alternative strategies to support,
5 recognize and award talent of the next generation of scientists.

6 7 **The rise of young scientist groups**

8 Associations of ECRs such as the World Association of Young Scientists (WAYS, launched by UNESCO
9 in 2004) and the Global Young Academy (GYA, launched by the Global Network of Science Academies
10 in 2010) have been around for more than a decade. However, over the past years, there has been a
11 rise in associations of young immunologists (Schober et al., 2020). These associations are established
12 within the national societies of immunology and aim to support and connect ECRs working in the field
13 of immunology. In 2020, a task force was established to unite the different national associations of young
14 immunologists in Europe under the umbrella of the European Federation of Immunological Societies
15 (EFIS), named young EFIS (yEFIS) (Costas-Ramon et al., 2020). Through various activities, these
16 groups aim to increase the visibility of ECRs by hosting training events as well as scientific conferences.
17 Furthermore, a key action of these young scientist groups is to host a specific research session featuring
18 ECRs during the annual congress of their national society. Social events are further organized to
19 connect ECRs and enable networking within these young scientist groups. Lastly, young immunologists'
20 groups have extensive contact with the senior members of their national immunology societies to share
21 the perspectives of ECRs and to find ways to address their needs.

22 23 **ECCO: a task force for early-career complementologists.**

24 The complement field has always been perceptive to the needs and challenges of ECRs. This is
25 demonstrated by the different arrangements by the ECN and ICS to support ECRs, such as the teaching
26 day during the European Meeting on Complement in Health and Disease as well as the International
27 Complement Workshop. Other initiatives include the travel grants for ECRs and the Training Award as
28 well as the Early Career Award. So then why is there a need for an ECRs task force? Because such an
29 initiative will give ECRs a chance to share their perspective with policymakers, which can be used as a
30 guideline to create better support networks and research systems that cultivate and retain talent.
31 Moreover, a task force would encourage ECRs to analyze the obstacles in their career path and to
32 actively participate in order to find support and solutions. Furthermore, ECRs represent a significant

1 portion of the complement field. In accordance, during the last five International Complement Workshops,
2 between 27% and 35% of attendees were ECRs (Figure 1).

3 The idea for a task force for early-career complementologists came separately from two small
4 groups of ECRs that wanted to begin an early-career complementologists network. The Young
5 Complement Investigators (YCI) had started an online platform using social media, while the
6 Complement Society of the Youth (CoSY) organized an informal meeting for ECRs in 2018 in Germany.
7 By joining forces and under the auspices of the ECN and the ICS, ECCO was officially created as a new
8 Task Force in 2019. ECCO aims to give ECRs a voice in the complement field. ECCO is already
9 operating on social media via Facebook (www.facebook.com/EarlyComplement), Twitter
10 (@EccoComplement), and LinkedIn ([early-career-complement-society-ecco](https://www.linkedin.com/company/early-career-complement-society-ecco)). On these platforms,
11 ECCO highlights a research article by an ECR every week, and has a monthly showcase of an ECR as
12 “Scientist of the month”. We have also launched our own page within the website of the ECN
13 (www.ecomplement.org/early-career-complementologists.html) and ICS (www.complement.org/early-career-complement-investigato). In 2019, we hosted our own scientific meeting in Luxembourg, thanks
14 to the help of Dr. Xavier Dervillez (Senior research scientist, Luxembourg Institute of Health,
15 Luxembourg) and during the 17th European Meeting on Complement in Human Disease in Madrid, we
16 organized a social evening for ECRs. Through these initiatives, we aim to increase the visibility of the
17 work of ECRs, boost international collaborations between ECRs, and provide recognition and support
18 to ECRs worldwide. Furthermore, during the upcoming 28th International Complement Workshop,
19 ECCO will award for the first time their “ECCO – Early Career Journal Article Award” to recognize
20 complement work by an ECR. This award will not be given based on metrics (i.e., impact factor, citations),
21 thereby avoiding narrow evaluations that simply look at conventional indicators of academic impact, but
22 neglect quality, creativity, and originality. In the future, we aim to survey ECRs in the complement field
23 to obtain detailed feedback on their barriers and needs. We have, therefore, set up a free registered
24 membership to enable direct contact with ECRs and we encourage all ECRs to register
25 (<https://bit.ly/ECCOMembership>). At the same time, ECCO is also intending to establish collaborations
26 with other ECR networks and organizations such as yEFIS, to boost international and interdisciplinary
27 collaborations. Lastly, ECCO is committed to promote equality and diversity in research. The ECCO
28 committee is composed of ECR representatives (the authors of this article) and is currently gender-
29 balanced. However, we encourage ECRs from South America, Africa, Asia, and Oceania to join the
30 committee of ECCO to develop a more inclusive approach encompassing all regions, not just Europe
31 and North America. Altogether, through these efforts, ECCO aims to come up with solutions through a
32

1 bottom-up approach with the input of ECRs, complementing current top-down efforts made by the ECN
2 and ICS. It is also hoped that as members of ECCO “graduate” to become mid-career investigators,
3 they will become better mentors and continue to support the next generations of ECRs.
4

1 **Conclusions and outlook**

2 ECRs are the next generation of scientific leaders, bringing with them unique talents, ideas, and
3 creativity to advance the field of complement research. To ensure that ECRs have opportunities to excel,
4 meet their career goals, and achieve a healthy work-life balance, we urge the complement community,
5 from individual researchers to institutions and funders to offer help and support to ECRs. Furthermore,
6 we encourage ECRs to analyze the obstacles in their career path and to actively participate with ECCO
7 to create support networks and to find solutions. Whether it be through social media, mentoring sessions,
8 informal meetings, or webinars, we believe that discussing the distinct needs and challenges of ECRs
9 will help to fix the problem as well as to advance research communities that best serve ECRs.

1 **Conflict of Interest**

2 The authors declare that the research was conducted in the absence of any commercial or financial
3 relationships that could be construed as a potential conflict of interest.

4

5 **Author contributions statement**

6 All authors were involved in writing the manuscript and editing the final manuscript. All authors read and
7 approved the final manuscript.

8

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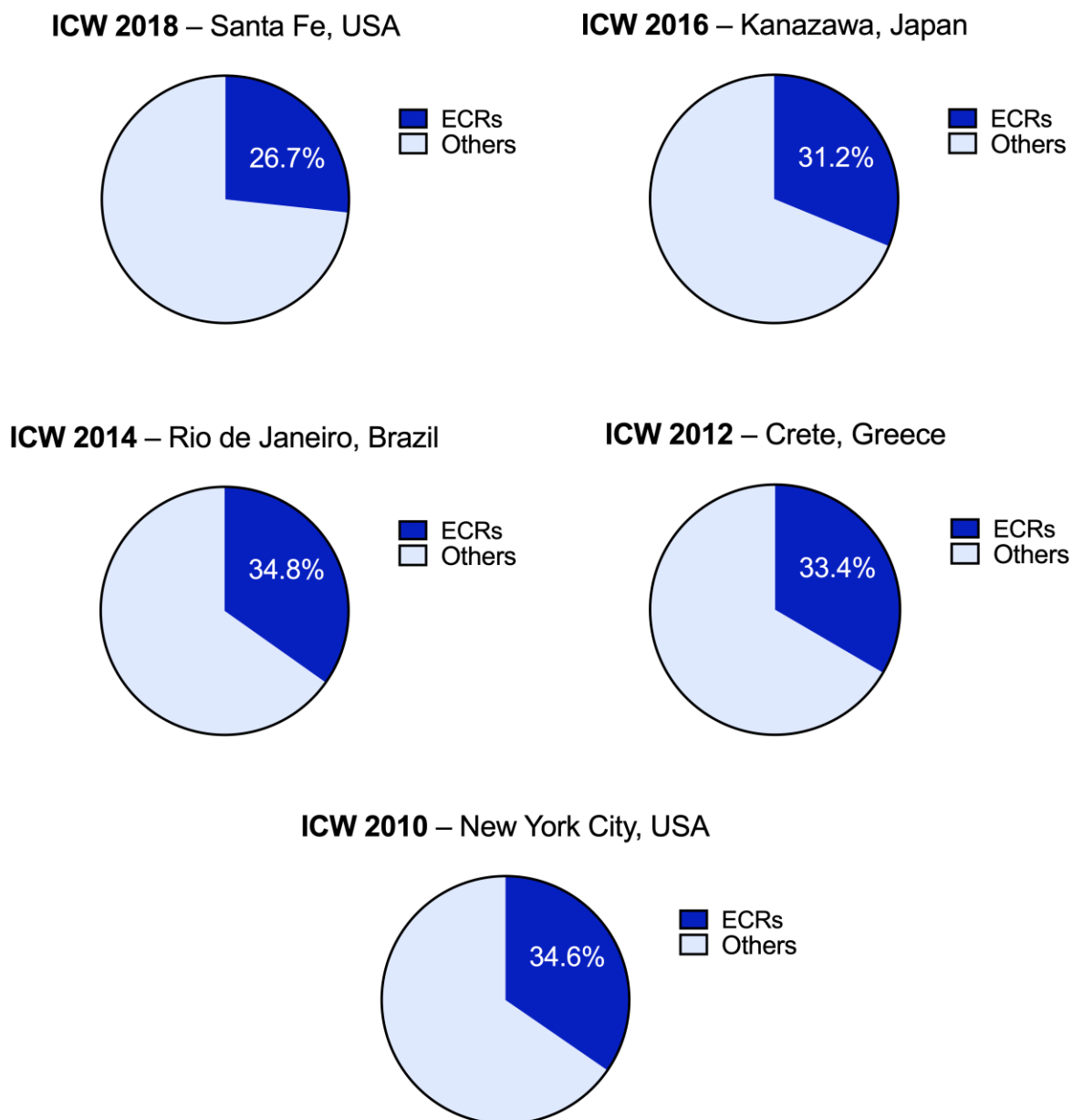
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13
14

1 **Figure 1**

2 **Attendance of early-career researchers to the annual International Complement Workshop**



3
4 The percentage of early-career researchers (ECRs) attending the annual International Complement
5 Workshop (ICW) during the past five meetings. Attendance was determined by registration type, the
6 category "Students/Postdocs" were defined as ECRs.