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Citation for final published version:

Poppelaars, Felix, Gaya da Costa, Mariana, Inkeri Lokki, A., Mallah, Khalil, Nord, Dianna, Reddaway, Jack and Schäfer, Nicole 2022. ECCO - A new initiative to support early-career researchers in the complement field. Molecular Immunology 141 , pp. 104-107. 10.1016/j.molimm.2021.11.018 file

Publishers page: http://dx.doi.org/10.1016/j.molimm.2021.11.018 <http://dx.doi.org/10.1016/j.molimm.2021.11.018>

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Title Page

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

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Running head: Early-Career Complementologists

Keywords: Complement, Early-career researcher

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Abbreviations

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

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

– *Pearl S. Buck*

Early-career researchers in times of COVID-19

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

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

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

Addressing the challenges of early-career researchers

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

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

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

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

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

The rise of young scientist groups

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

ECCO: a task force for early-career complementologists.

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

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

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

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

Conclusions and outlook

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

Conflict of Interest

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

Author contributions statement

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

Acknowledgment

The authors thank Diana Pauly for her contribution to the start of an early-career complementologists network, and Martin P. Reichhardt as well as Nikolaj Kirketerp-Møller for their contributions to the establishment of ECCO. Furthermore, the authors thank the ECN and ICS for their support.

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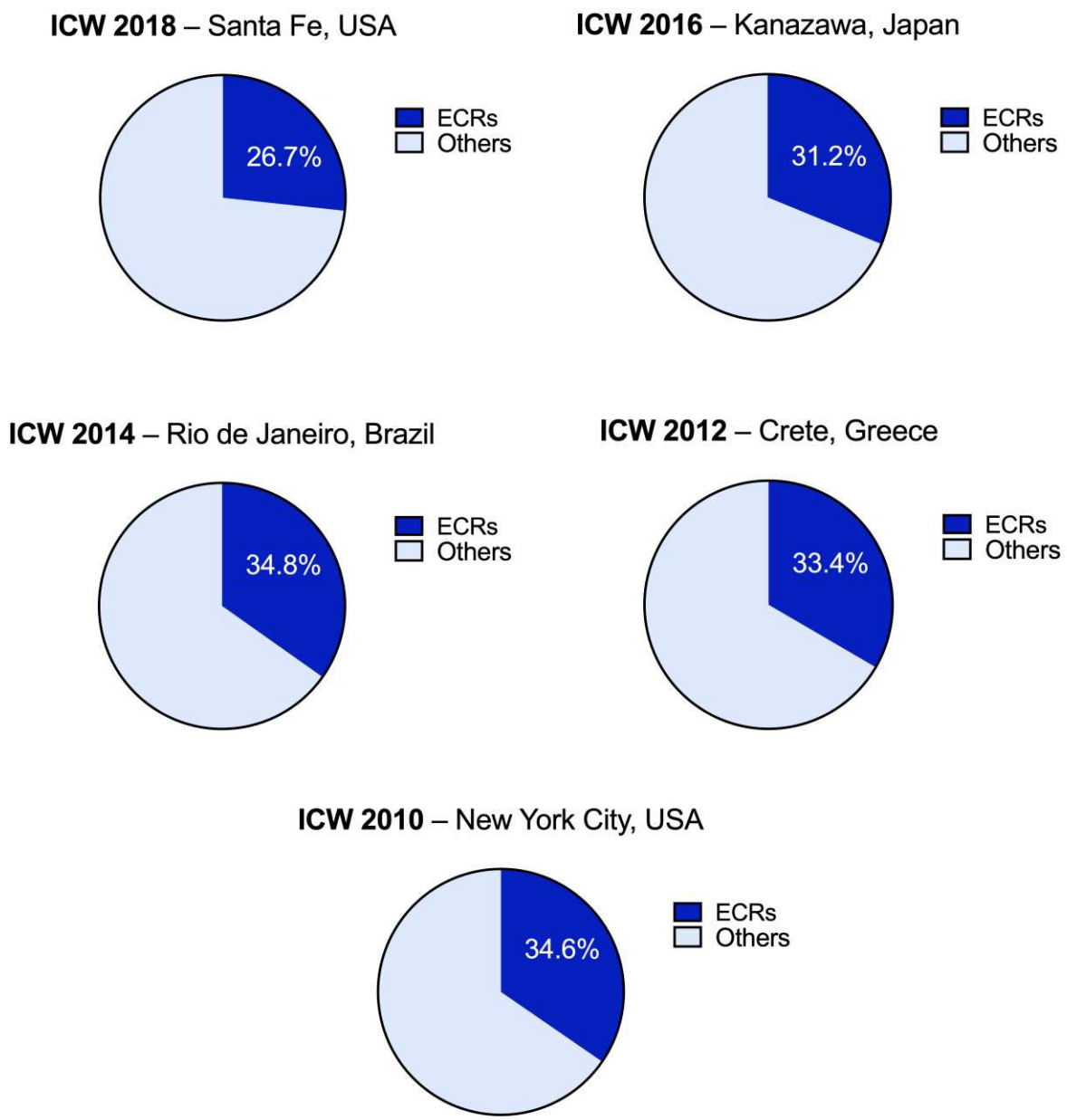
Figure 1

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



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