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Training and mobility: a priority for the Organization of the European Cancer Institutes. How a national mobility initiative could enhance EU cooperation in cancer research contributing to the development of an European Research Area: the example of the Italian Comprehensive Cancer Centers' Network "Alleanza Contro il Cancro"

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ABSTRACT

It is widely recognized that productivity gains, sustained economic growth and employment are largely determined by technological progress, innovation and human capital. The 2000 Lisbon strategy to make Europe a competitive knowledge-based economy by 2010 and, more specifically, the Barcelona objectives agreed upon in 2002 to increase R&D investment in the EU to approach 3% of GDP, ensuring that there are sufficient human resources for research, are a preliminary step in this direction. If we want to reach this goal we have to succeed in retaining the best researchers, creating the right environment where they can perform their activities and develop their careers.

To this aim the Organization of European Cancer Institutes (OECI) has set up a working group on Education and Training with the mandate to encourage continuing education in cancer research and applications and to verify the feasibility to promote mobility programs inside the network and in association with industries.

Until now only few OECI training programs have been launched and a full mobility program has not been developed yet due to limited budget resources.

The Italian Network of Comprehensive Cancer Centers, Alleanza contro il Cancro, has planned the launch of a mobility program awarding 70 annual fellowships over a period of 36 months. This program, which will be open to the world research community, could represent a first interaction through mobility among the members of the OECI network also involving industries. The program is a tangible approach to sustain the translational process needed for the development of an European Research Area in the field of cancer and its related biomedical disciplines, thus providing a practical answer to the 2005 renewed Lisbon Strategy.

Key words: *cancer, training, mobility, ERA, comprehensiveness.*

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Introduction

Cancer is a complex, chronic, degenerative, invalidating disease that requires a multidisciplinary approach more than any other disease. Cancer research needs an improved contribution from "translational" expertise, so as to encourage a rapid

bench-to-bedside transfer of research findings into clinical use. This approach requires enormous efforts that can only be sustained in a concerted way where continuing education, mobility programs as well as multidisciplinary research with a strong integration with industries must be supported.

In order to provide an answer to the above needs, the European Economic Interest Grouping "Organisation of European Cancer Institutes" (OECI) was established in Brussels in 2000 under the provisions of EC Regulation No. 2137/85 of the Council of 25 July 1985. The primary objective of the OECI is to encourage a harmonious development of oncology in Europe with the aim to reduce the mortality and morbidity due to cancer and increase the survival and quality of life of patients. Therefore, the OECI promotes a model of oncology based on a global vision of cancer which emphasizes the integration of research and education with diagnosis, prevention and care, seeking to promote the development of a comprehensive and multidisciplinary approach within the European Cancer Institutes.

Information and communication, research, treatment, rehabilitation, guideline drafting, specimen and data storage and evaluation, cost-benefit analyzes, clinical and preclinical research, telemedicine and telematics, accreditation and labelization, translational research, epidemiology, ethical and social aspects related to cancer are the main areas of interest of the OECI.

In order to develop common activities and disseminate outcomes, a continuing education and training program is necessary in which mobility plays a crucial role.

The OECI Education and Training Working Group and its mandate

The OECI has recently set up the Education and Training Working Group (E&T WG) with the purpose of improving existing research and development abilities, promoting continuing education, and stimulating international mobility of young and experienced scientists.

The main goals of the E&T WG include contributing to the building of a European Research Area (ERA) for E&T in the cancer field, stimulating a better relationship among the members of the OECI (the Group), and establishing better links with external bodies.

The mission of the OECI E&T WG is:

- to disseminate and help the implementation of the OECI working groups' activities
- to promote bottom-up initiatives involving the OECI and its partners
- to encourage partnership initiatives between the OECI and the business community
- to employ fixed-term and permanent staff
- to organize and launch fellowships and return grants programs

The main benefits to the European Cancer Community include:

- improving Research, Technological Development and Demonstration (RTD&D) activities and stimulating competition
- encouraging the coordination of national cancer training policies
- promoting the OECI among its members and vis-à-vis international bodies and organizations, companies and the general public
- promoting excellence and the definition of "Comprehensiveness".

The OECI members must be seen as users or providers of knowledge. Therefore, training activities should be addressed to members or third interested parties with a plan of activities that could contribute to provide a practical answer to the Lisbon goals, tackling fragmentation of training and sharing knowledge and facilities among comprehensive cancer centers (CCCs).

The OECI considers education and training a key instrument to create a spirit of belonging to the Group. This goal can be better pursued thanks to a planned approach to specific EU programs in order to strengthen the OECI's efforts and make in-house initiatives more attractive and effective.

The difficulties encountered up to now in the OECI E&T WG are mainly linked to a working attitude that concentrates all activities internally instead of also establishing long-term links with existing international educational bodies and industries. Therefore, considering the nature of the OECI as a network of CCCs where all professionals are represented, better links should be established with other cancer associations and societies for training and mobility purposes, so as to avoid duplications and divisions in an already fragmented research community. In this respect the E&T WG will become a means to strengthen the Group's external affairs, foster its political connections, and better advertise the Group's role in the framework of the European Cancer Area.

Other collaborative actions should be further investigated in order to move from "centrifugal" initiatives to "centripetal" ones, with a larger involvement of the OECI members and the willingness to work together with external bodies.

Emigration flows for qualified scientists: past, present and future

The likely shortage of highly qualified science and technology (S&T) personnel in the research and development (R&D) activities anticipated for the next 10 to 15 years represents undoubtedly one of the biggest threats to Europe's long-term innovative strength and productivity growth. Europe produces a large number of university graduates, doctorate recipients and post-

doctoral students. A significant share of them is obliged to find research positions outside of Europe. This may be one of Europe's biggest obstacles in its attempt to become the world's most competitive knowledge-based economy.

The drain of highly skilled Europeans to countries like the US, Canada and Australia is a part of Europe's social and political past and present, and more than likely future. International mobility is driven by political events such as the end of World War II when, apart from European exiles who chose to stay in the US, an estimated figure of more than 372,000 professionals, scientists and technicians moved to the US between 1946 and 1965. The 1970s and 1980s saw the flow of mature researchers from Europe to the US expand beyond reliance on countries like the UK, France, Germany and Italy to include less wealthy European nations. The change in the political landscape in Eastern Europe in the 1980s and 1990s brought about significant East-West migration. Today's migration patterns have an expanded rationale, influenced by R&D-related circumstances, such as global scientific networking, higher qualifications, additional specializations and endowments increasingly designed to beat the competition in filling domestic R&D posts. At the same time, flows of highly skilled scientists and engineers are enhanced through improved social, political and technical framework conditions.

International mobility depends on conditions such as the commitment to R&D funding, the reputation of the host organization/employer, research facilities available, the presence of other research institutes, salary/job benefits, and the physical environment.

The Italian delay in research, development and technology (RDT) investments and lack of human resources

Italy does not currently have *any systematically planned program* for outgoing mobility to assist scientists who wish to carry out their training through research abroad. This means they are often faced with the taxing task of having to find financial support for their mobility. Obviously, this is a discouraging factor that contributes to further hindering any prospects of growth for the country with respect to R&D.

As shown by OECD and European Commission Science and Technology indicators[1-6], Italian R&D investments as a percentage of gross domestic product (GDP) have remained unchanged over the last 20 years, actually slightly dropping compared to the 1980s. Although the average investment in research in EU countries has not grown in relation to the goals set by the Council of Lisbon in view of the need to transform Europe into a knowledge-based economy by 2010, Italy is considerably below the European average with an investment accounting for just over 1.16% of GDP against the European average of 1.93% of GDP (Figure 1). The lack of research investments also affects the ability to cope with the need to increase the number of researchers working in the public and private sectors. This situation has led to a slow but inevitable aging of the population of active researchers, while the new generations of graduates, following their PhD studies or a few years of research often carried out on a voluntary basis after obtaining a specialist degree, have enormous difficulties integrating into a system where a strong boost and a generational turnover are urgently needed. Indeed, figures published by the OECD and the EU show that the number of researchers in Italy amounts to 2.8/1,000 people employed as opposed to the European average of 5.2/1,000. Also the total number of researchers (about 71,000) is much lower than that of France (186,000), Germany (265,000) and the UK (168,000), and their average age is considerably higher (Figure 2).

Quite disappointing are also the figures relating to the presence of EU or third-country researchers in Italy, causing our country to be left behind and reducing the attractiveness of our public and private research centers and universities alike.

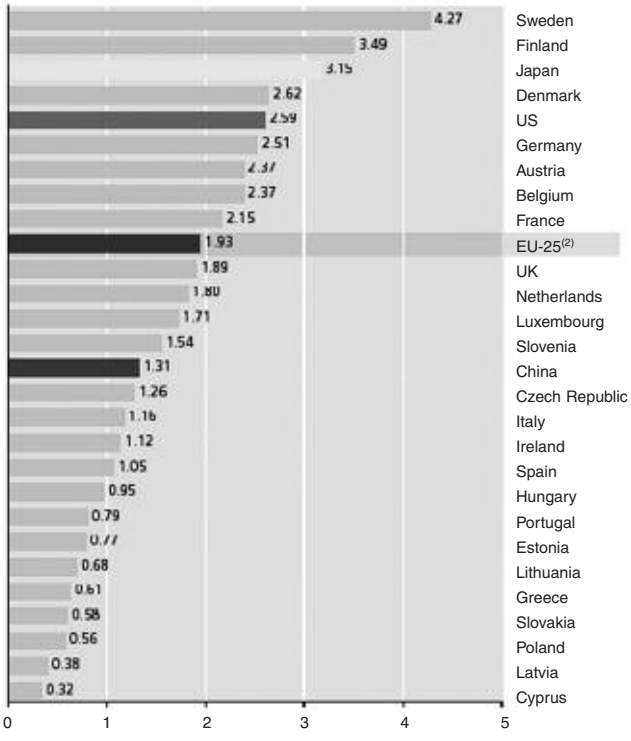

Figure 1 - Research and development intensity (Gross domestic expenditure on R&D as % of gross domestic product) 2003[1].

Source: DG Resoarch; data: Eurostat, OECD.
[1]LU: 2000; SE: 2001; IE, IT, NL: 2002; BE: 2004; AT: 2005. [2]EU-25 was estimated by DG Research and does not include LU and MT.

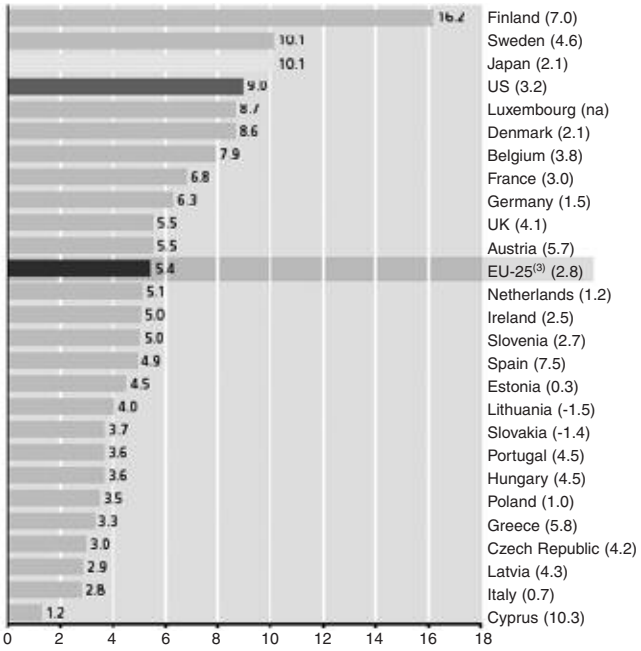

Figure 2 - Number of researchers per 1000 labour force, 2003[1]. In brackets: average annual growth rates (%), 1997-2003[2].

Source: DG Resoarch; data: Eurostat, OECD.
[1]UK: 1998; US: 1999; LU: 2000; EL, SE: 2001; FR, IE, IT, NL, AT: 2002; BE: 2004.
[2]UK: 1996-1998; US: 1997-1999; DK, EL, SE, JP: 1997-2001; FR, IT, NL: 1997-2002; BE: 1997-2004; AT: 1998-2002; EE, CY: 1996-2003; IE: 2000-2002.
[3]EU-25 was estimated by DG Research and does not include LU and MT.

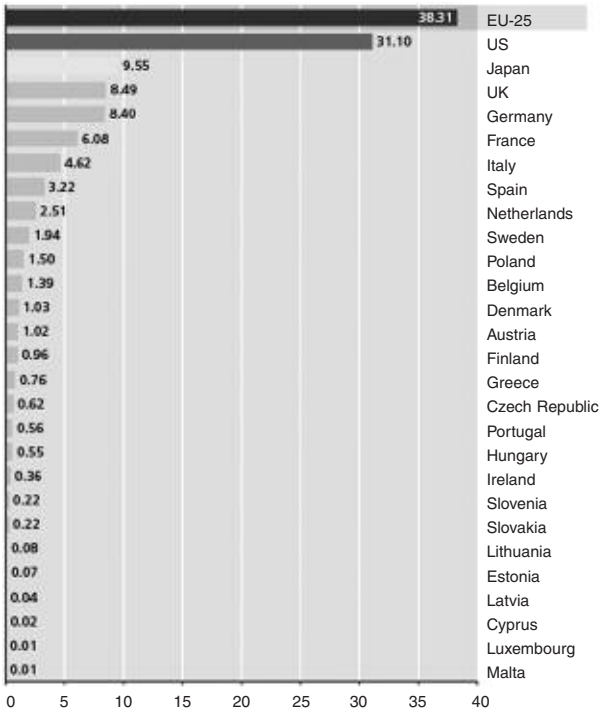

Figure 3 - World shares of scientific publications (%), 2003.

Source, DG Research; data: Thomson Scientific/CWTS, Leiden University (tractinal counting method has been used).

With regard to the pharmaceutical industry, although Italy is still at the forefront on an international level in terms of scientific production in relation to the number of researchers (Figures 3 and 4), there does not seem to exist an equivalent ability to transform research outcomes into patents, thus showing the strong need to further stimulate the relationship between public and private sector, promote policies aimed at launching spin-offs, and boost private research investments.

The pharmaceutical industry in Italy no longer represents one of the most promising sectors of the national industrial context as it did in the 1960s. The large multinationals have preferred other locations that offer better opportunities.

The situation outlined above jeopardizes the future of the Italian high technology industry as well as the country's ability to support the levels of competitiveness required by the global market with serious repercussions on employment. In light of this lack of funding, the Istituto Superiore di Sanità (ISS) and Alleanza Contro il Cancro (ACC) have launched an internationalization program through research within the framework of the activities provided for by a ministerial decree dated 21

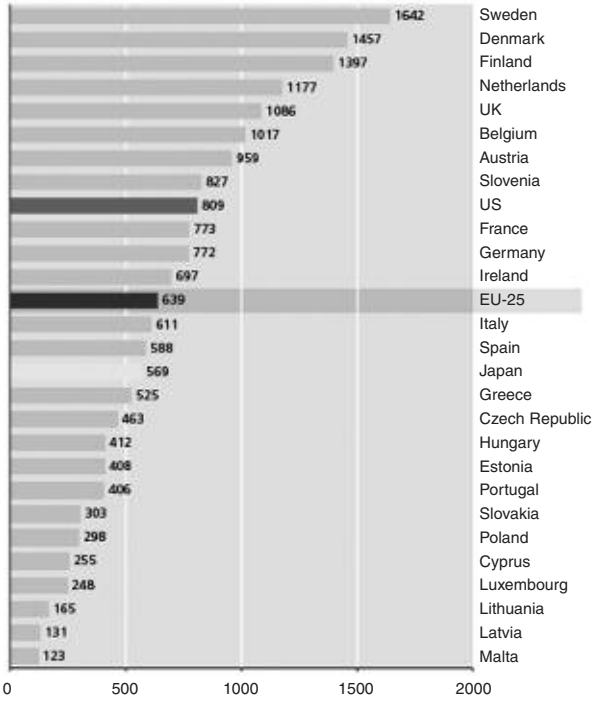

Figure 4 - Number of scientific publications per million population, 2003.

Population for US and JP was estimated.
Source, DG Research; data: Thomson Scientific/CWTS, Leiden University; OECD, Eurostat.

July 2006, "Joint national network and international cooperation initiatives", aimed at fulfilling the Lisbon Strategy and promoting the Italian participation in the development of an ERA[6,7] with particular reference to oncology. The creation of a common national awareness is the first step towards a nationally funded program directed towards promoting Italy's willingness to cooperate with worldwide partners at a scientific and cultural level.

One of the objectives of ACC within the international sphere is the launch of a mobility scheme which, on the one hand, provides Italian scientists with the possibility of training at internationally recognized research institutions and, on the other, allows experienced scientists who have been trained outside Italy to come back and pursue their career in their home country. Moreover, this program has been also designed to attract non-Italian researchers to Italy.

Training through Research Application Italian iNitiative "TRAIN". An example of mobility towards the coordination of the ERA for cancer

It is widely recognized that Europe's full research potential will be achieved only when its member states have gathered the necessary awareness of the need to design national research plans that could be extended to a wider context with the involvement of other countries. This is the only way to ensure the fulfilment of research goals that, if pursued in an isolated way, could not be reached or would take too long for their benefits to be fully reaped in a global market.

The European Commission has made several attempts to identify the appropriate methods to raise the awareness of both the member states and the scientific community towards this issue. Cancer research in Europe is still too fragmented and there is an increasing awareness of the need for the Commission to play the role of coordinator rather than of funder, also considering the limited EC budget for research in relation to the overall budget of member states. If we look at some of the main instruments made available thanks to the launch of specific European coordination policies, the European vision is actually oriented towards a supranational coordination capable of reducing fragmentation and of having a larger impact at least on those research sectors that have been identified as a priority.

The oncology sector cannot be excluded from such coordination policies. Therefore, the launch of a targeted mobility program within a coordinated action plan for cancer research similar to the one set out in the European feasibility study EUROCAN+PLUS is highly desirable and should have the support of all member states.

The role of national research funders as catalysts for a European coordination process was introduced by Italy as early as 2002 when ACC, the network of Italian CCCs, was established. Among its objectives ACC has included acting as a research manager or funder in a desirable European coordination process involving entities similar to ACC, which could contribute to supporting joint initiatives.

While waiting for this coordination process to take place, and led by internal needs, as briefly outlined above, ACC has launched a 3-year mobility program called TRAIN (Training through Research Application Italian iNitiative), with a first call starting in January 2009, aimed at creating a clear mobility process which would preferably involve the OECI's circuit of CCCs. TRAIN is a centripetal example of a European and worldwide mobility initiative that can help create a stable interaction among CCCs.

TRAIN provides for 3 types of fellowships: incoming, outgoing and reintegration. It is open to the Italian and the international scientific community interested in a better approach to translational cancer research.

TRAIN will be launched by ISS, the Italian National Institute of Health, together with ACC to enable a larger number of researchers to gather experience abroad and to be reintegrated into the national scientific community. Each fellowship will have a maximum duration of 12 months yearly.

The awarding of fellowships (70 for 36 months) will be organized as follows:

No. 10 outgoing fellowships to the UK

No. 36 outgoing fellowships to any country in the world

No. 9 incoming fellowships from any country in the world

No. 15 reintegration fellowships.

More fellowships have been allocated to outgoing mobility to allow an increasingly large number of Italian researchers to acquire new skills and gather experience abroad as well as to create the right conditions to establish tangible relations with the main European and third-country research institutes. Part of the mobility program will be focused on the integration of Italian researchers into British research institutes. This is because, in addition to the long history of collaboration between British and Italian institutes, there is a high demand for outgoing fellowships also in relation to improving language skills. Special attention will be devoted to the "reintegration" of Italian researchers having a research experience abroad of 3 years, with the objective of stimulating their return and promoting their reintegration into national facilities with multiple purposes, such as strengthening the research abilities of the host center, stimulating education and training, competition among researchers, and encouraging continuous interaction with foreign research centers. The Fellowships Program will have an initial duration of 36 months, with the possibility of extending it beyond

thanks to national funds, in light of the far-reaching experience of the proposing institutions in the management of mobility programs and considering the growing need for mobility expressed by the government institutions responsible for the allocation of ad hoc funds.

Within this framework, outgoing, incoming and reintegration mobility is one of the key factors to give new hope to the country, as it will increase internal competition also thanks to the mutual exchange with expert researchers of other nationalities. TRAIN intends to support a mobility program for the cancer sector promoting the necessary generational turnover to deal with innovation and competitiveness through the creation of the leaders of tomorrow.

The 3 types of mobility schemes defined by the program are:

Outgoing mobility In Italy, because of the serious lack of funding for research, the possibility of benefiting from national programs supporting international mobility is becoming increasingly difficult and researchers holding a postdoctoral degree are precluded from any chance to continue their experience in a foreign research center or facility. Though limited in scope, the opportunity offered by ISS, ACC and the other TRAIN partners makes it possible to at least launch a process which could in the future attract more attention from the relevant ministers as well as the industrial parties.

Reintegration The Italian brain drain is a well-known phenomenon and is the result of a national market that was unable to absorb the skilled graduates coming out of universities and postgraduate courses. In oncology, in particular, the emigration flow of researchers has involved North-American research centers, where entire generations of Italian researchers were trained and subsequently found a stable position while maintaining a link with Italian universities and research centers. Such links generated an ongoing emigration of subsequent generations of researchers, who only rarely have the possibility of going back to their institutions of origin. Some attempts by the Italian Ministry of Research to attract senior scientists of Italian origin back to Italy by offering them full professorships have not resulted in the hoped-for outcome due to administrative obstacles, the impossibility to guarantee adequate funding to support not only salaries but also research expenses, and the impossibility to set up the necessary teams to provide returning researchers with proper conditions to carry out their activities. Although it does not seem possible to guarantee the appropriate environment for the return of senior scientists, it would be extremely useful to offer this opportunity to Italian researchers who are still young and have carried out significant research activity in third countries after their doctoral degree. This program would allow them to return for at least 1 year and work together with a research team on a project they submitted, with the following results:

– the researchers could assess the possibility of returning indefinitely and obtaining a stable employment position in Italy, while having the time to become familiar with the Italian research environment and allowing the research center or company (i.e., prospective employer) to get to know them.
– an educational and training contribution could be given to Italian research groups interested in the research topic and ready to invest in the sector.
– there would be the necessary competitive effect to promote growth and give new hope to a sector steeped in crisis.

Incoming mobility The possibility to host non-national expert researchers in Italy has become an absolute priority in order to promote the necessary scientific and cultural exchange to boost competitiveness in our research system. The launch of a process that also involves incoming mobility would put an end to an inevitable loss of scientific talent due to the brain drain. Despite its limited size, TRAIN represents a condition to alert public authorities to the need for a change and for investments aimed at financing mobility as a tool to promote the ongoing growth of our new generations of researchers.

Conclusions

TRAIN is aimed at promoting the development of international mobility in order to accelerate interaction between basic research and industry in favor of competitiveness and innovation in a field with a strong social and economic impact. The multidisciplinary nature of TRAIN should contribute to accelerating the transition from discovery to application, while also encouraging solidarity towards the new generations who represent the future of our society.

Because TRAIN is a mobility program open to both Italian and foreign scientists, it may be considered a good starting point to encourage a fruitful exchange of researchers and clinicians among CCCs operating both in Europe and in third countries. This would trigger a process that could, and hopefully will, involve the OECI as much as possible, acting as the foundation for an action plan which may involve other European countries under the coordination of the OECI through its E&T WG.

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