



IARC Fellowships Programme: 30 Years of Experience

The IARC fellowship programme was initiated in 1966. At the time the programme was set up, and for a significant period of time, an IARC Fellowship was one of the few ways to obtain training in cancer research in a major institute in another country. Between 1966-1996, over 446 such fellowships were awarded to talented young scientists from over 58 countries.

In 1996, the impact of the IARC fellowships programme was evaluated. The results of this analysis are presented here.

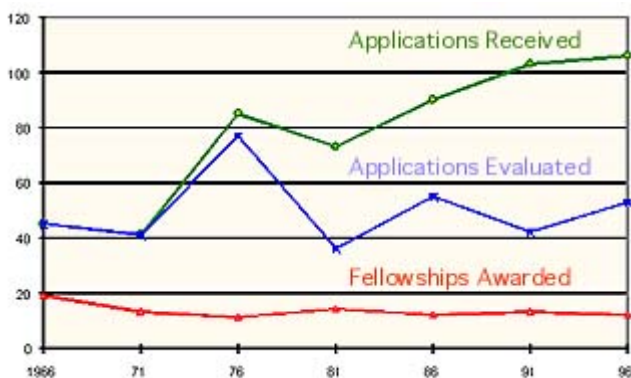
Read also: R. Montesano & E. El Akroud (1999) International Agency for Research on Cancer fellowships programme - over 30 years of experience, *Carcinogenesis* [Commentary], 20, 11, 2041-2044.

The IARC fellowship programme, initiated in 1966, is designed for young postdoctoral fellows, with no previous postdoctoral experience, from any country in the world who wish to receive training in another country and subsequently return to their own country to implement and develop programmes in cancer research or cancer control. The areas of training cover various disciplines relevant to the aetiology and pathogenesis of cancer and particular attention is given to training in cancer epidemiology.

Selection Procedure

In recent years some 100-120 applications have been received annually from all over the world; out of these, 50-60 applications are reviewed by an ad-hoc Selection Committee composed of 10 scientists from outside the Agency and two IARC scientists, with expertise in various biological disciplines, including epidemiology. Approximately one in four of the applications evaluated are awarded, representing about 15 fellowships per year (see Fig. 1).

Figure 1



Number of IARC Fellowship Applications - Received, Evaluated and Awarded

Table 1 - Analysis of IARC fellowships awarded during 1966 - 1996

Out of the 446 fellowships awarded so far, the majority of the fellows (349 out of 446, 78%) have been men, but the ratio of females to males has increased progressively from 0.14 (1966 to 1976), through 0.32 (1977 to 1986) to 0.50 (1987 to 1996). The median age of the fellows over the last 30 years was 31.2.

IARC Research Training Fellows - Countries of Origin and Host Countries (1966-1996)

	Country of Origin	Host Country
France	46	33
IARC		53
Japan	41	3
Italy	31	1
USA	28	215
ex-USSR	26	-
Israel	24	-
United Kingdom	24	92
People's Republic of China	21	1
India	21	-
Australia	14	3
Czechoslovakia	14	-
Germany	14	17
Poland	13	-
Bulgaria	12	-
Belgium	10	3
Canada	7	9
Sweden	7	28
Finland	6	-
Hungary	6	-
Netherlands	6	5
Nigeria	6	-
Argentina	5	1
Colombia	5	-
Spain	5	1
Ukraine	5	-
Switzerland	4	4
Austria	3	-
Brazil	3	-
Egypt	3	-
New Zealand	3	2
Romania	3	-
Denmark	2	-
Greece	2	-
Lithuania	2	-

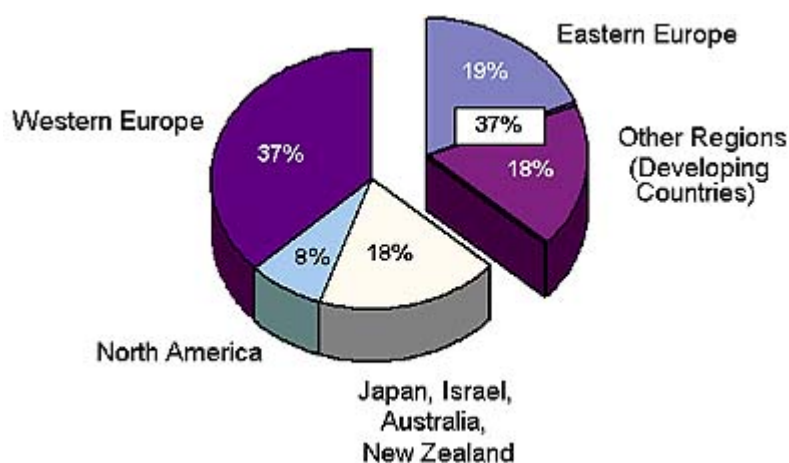
Norway	2	2
Rest of the World*	22	-
Total	446	473**

*(Albania, Bangladesh, Burkina Faso, Chile, Ethiopia, Hong Kong, Iceland, Iran, Ivory Coast, Republic of Korea, Lebanon, Luxemburg, Myanmar, Pakistan, Peru, Singapore, Thailand, Tunisia, Turkey, Uganda, Vietnam, ex-Yugoslavia)

** (Twenty-seven fellows had two host countries)

Table 1 lists the countries of origin of the fellows. India, the People's Republic of China and the ex-USSR figure among the nine countries that received more than 20 fellowships, indicating that a significant number of fellows originated from developing countries or Eastern Europe. In fact 37% of the total number of fellowships awarded came from developing countries and Eastern Europe and the others from Western Europe (37%), North-America (8%) and other countries (18% - Japan, Israel, Australia and New Zealand) (see Table 1 and Fig. 2). It should be noted that, up to 1990, the IARC fellowships programme was one of the few programmes that permitted young scientists from Eastern Europe to visit other countries and maintain a scientific link with the international scientific community. In more recent years the number of applicants for IARC fellowships from these countries has declined, partly due to the possibility of obtaining other fellowships but also to the present difficulty for young scientists, specially in Russia, to pursue a scientific career. On the other hand, applications from the People's Republic of China began to increase upon the termination of the cultural revolution in the late 1970s and continue to be significant.

Figure 2 - Origins of IARC Fellows by Region 1966-1996

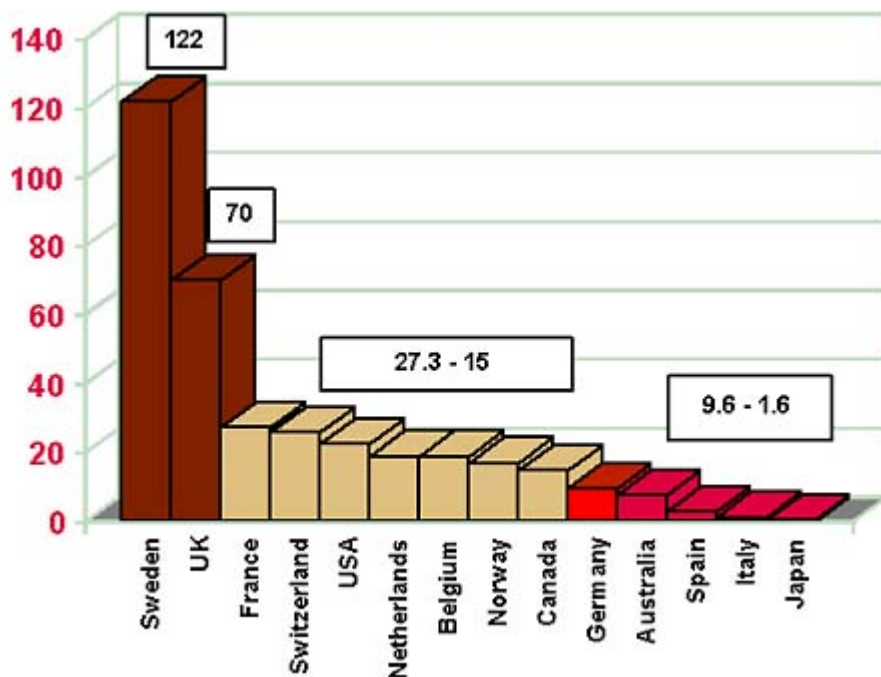


As is to be expected, North America and Western Europe are the regions preferentially selected by 98% of the fellows for training, and the USA (43%) remains by far the most frequently selected country for a host laboratory, followed by the UK (19%), France (7%), and Sweden, Germany and Canada (Table 1). This is not surprising in the light of the size of these countries and the level of their 'scientific wealth' (May, R.M. 1997). It is also of interest to make a comparison among the host countries, not only on the basis of absolute numbers, but in terms of the number of visiting fellows relative to the numbers of research/development scientists-engineers of the host countries (see World Science Report-1993, UNESCO, for the numbers of scientists in these countries). A rather interesting picture emerges (Fig. 3): Sweden having 122 fellows / 105 Swedish scientists, followed by the UK (70), France (27.3), Switzerland (26), USA (22.7) and The Netherlands and Belgium (19). It is noticeable that some countries, namely Spain, Italy and Japan, have unexpectedly low numbers of visiting fellows. A similar picture emerges from the analysis of the UICC-American Cancer Society fellowships programme (data from the UICC). Data from the EMBO fellowships also show low numbers of fellows in molecular biology who visited

countries of southern Europe, in particular Italy, Spain and Greece (Anderson, A., 1992). This could be attributed to a combination of factors such as high cost of living, cultural difference and the organisation and level of scientific research of the host country as compared to other countries.

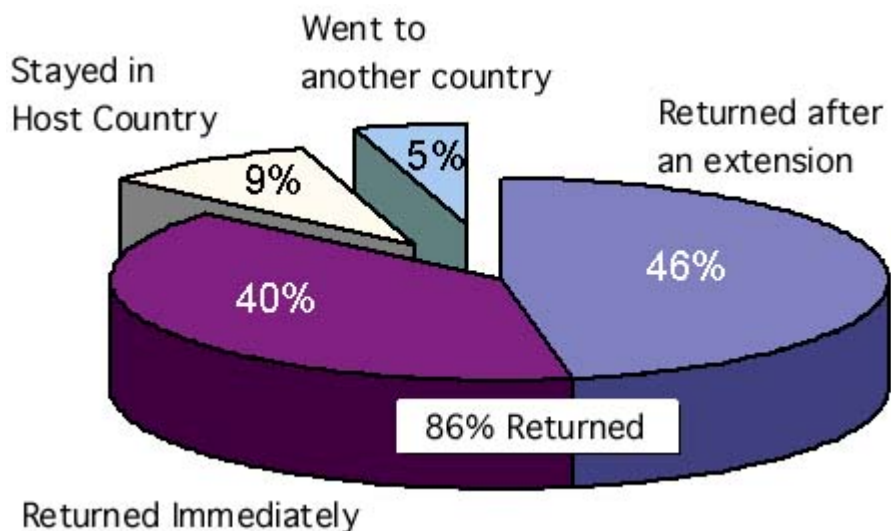
Figure 3 - Distribution of IARC fellows

Distribution of IARC fellows (total 473) among various host countries, expressed as number of fellows / 10 5scientists of the host country. (The number of scientists in each country was obtained form the UNESCO World Science Report, 1993).



The follow-up of the fellows enables us to know the number of fellows who returned to their home country upon termination of their fellowship or after an extension funded from sources other than IARC. A survey covering the period 1966 to 1984 (Sohier et al., 1986) and a more recent one covering the last decade (internal IARC document) show that 82-85 % of fellows returned to their home countries (Fig. 4). Out of the 126 fellows awarded during the years 1985 to 1994, 17 failed to return to their home country; this group includes nine fellows originating from developed countries who went to countries of the same geographical area, 2 from China and 3 from Russia who stayed in the host country and 3 from China who went to another developed country. Ten of these fellows were in the field of epidemiology.

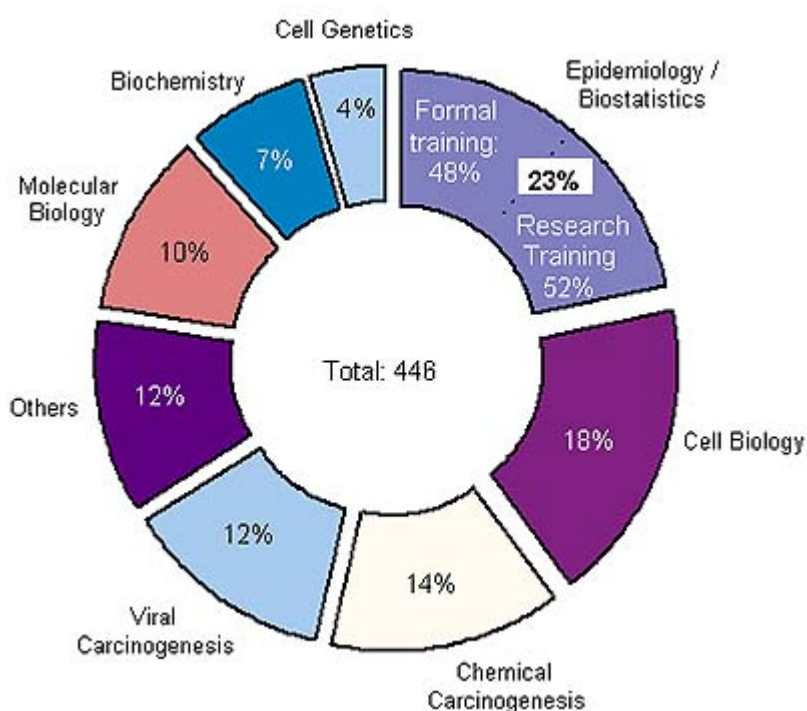
Figure 4 - IARC Fellows who returned 1985-1994



Disciplines

The IARC fellowships programme covers a broad spectrum of biological disciplines and these are well represented among the 446 fellowships awarded (Fig. 5). It is noteworthy that 100 fellowships (23% of the total) have been awarded in cancer epidemiology and biostatistics. At present, IARC fellowships are one of the few international fellowships to provide training in this discipline, and in most regions of the world, including various countries in Western Europe, there is a virtual absence of graduate training programmes in chronic disease epidemiology. For these reasons and in the light of the fact that epidemiology, a major component of IARC's activities, is a major tool in cancer aetiology and cancer control, particularly in developing countries, considerable emphasis is given to this discipline in the IARC fellowship programme. In addition, recent progress in understanding the processes of carcinogenesis at the cellular and molecular level and in molecular biology permit effective integration of more basic research disciplines with epidemiology.

Figure 5 - IARC Fellows' Disciplines (1966-1996)



Since 1966 a total of 100 fellowships have been awarded in epidemiology or biostatistics, equally distributed between formal training (following a university course leading to a recognized degree) and research training (carrying out a research project). These are listed in Table 2 according to the countries of origin. The proportion of fellowships awarded in this discipline compared to other disciplines was higher over the last two decades.

Table 2 - IARC Fellows in Epidemiology and Biostatistics 1966-1996

	Country of Origin	Host Country
Italy	11	
Japan	9	
P.R. China	7	
India	6	
Canada	6	2
Colombia	5	
France	5	4
The Netherlands	4	
IARC		25
USA	4	43
Finland	3	
Ex-Czechoslovakia	3	
Ex-USSR	2	
Argentina	2	
Brazil	2	
Bulgaria	2	
Denmark	2	
Lithuania	2	
Poland	2	
UK	1	40
Australia	1	2
Belgium		1
Rest of the World*	21	
TOTAL	100	117**

(*Albania, Bangladesh, Chile, Egypt, Germany, Greece, Hungary, Iceland, Iran, Israel, Ivory Coast, Lebanon, Myanmar, New Zealand, Peru, Spain, Switzerland, Turkey, Uganda, Viet Nam, ex-Yugoslavia
 **Some fellows stayed in more than one country)

The majority of IARC fellows in epidemiology originate from developing countries or developed countries in which the teaching of chronic disease epidemiology at university level is deficient or absent. Ninety-two percent of fellows in epidemiology went to the USA, the UK or the IARC and all of them returned home to hold a key position in their home institution, with the exception of a total of 10 cases. The expertise these fellows acquired through their training was instrumental in the establishment of various cancer registries and in the development of analytical and descriptive epidemiological studies in countries like Italy and France as well as various developing countries.

Evaluation and Conclusions

Analysis of the publication record shows that the great majority of fellows are still actively engaged in cancer research and that the fellowship played a critical role in the development of their research career and of cancer research in general.

Another satisfying outcome is that a substantial proportion of the fellows originate from developing countries or countries where certain disciplines in cancer research are under-represented (Fig. 2), and that, with a few exceptions, they all returned to their home country and contributed significantly to the development of cancer research and cancer control. From India, 6 fellows received training in cancer epidemiology and they are now the leading persons in the maintenance of cancer registries in this country. A similar impact of the IARC fellowship programme is the noticeable development of cancer epidemiology in countries like Italy, France, Eastern Europe, and Japan.

The IARC has received considerable input into its activities through its fellowship programme. A total of 53 fellows worked at the Agency and their number has increased in the last decade; in addition, 12 former fellows have occupied or at present hold a senior position at the Agency.

The conclusion to be drawn from this analysis is that the IARC fellowship programme is an effective tool in the development and implementation of IARC activities as well as in the provision of training in cancer research to young scientists world-wide, selected on the basis of scientific excellence. The selection criteria for IARC fellowships clearly do not impede access to these fellowships to applicants from developing countries, as indicated by their high success rate in basic science and in cancer epidemiology. Non-communicable diseases are the major cause of death in the adult population of developing countries and cancers of the liver in man and of the cervix are among the ten most frequent causes of deaths (Murray and Lopez, 1994). In the future, the number of cancer cases in developing countries is certain to rise due to increased exposure to major risk factors like tobacco smoke, lack of effective intervention programmes for HBV vaccination and appropriate screening programmes, as well as an increase in the population age. Thus the provision of trained scientists is one important means for reacting to this situation, together with development in the home countries of the appropriate health care structure and the political will to confront the problem.

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Publication

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