PROJECT FINAL REPORT

Grant Agreement number: 227020

Project acronym: ICEPURE

Project title: Impact of Climatic and Environmental Factors on Personal Ultraviolet Radiation Exposure and Human Health

Funding Scheme: 7th Framework Programme

Period covered: from 01 February 2009 to 31 January 2013

Name, title and organisation of the scientific representative of the project's coordinator:

Professor Antony Young, King's College London

Tel: +44 207 188 6367

Fax: +44 207 188 8050

E-mail: antony.r.young@kcl.ac.uk

Project website address: www.icepure.eu

Protect coordinator:
Antony Young
Kings College London
antony.young@kcl.ac.uk
www.icepure.eu

1. Executive Summary

The aim of ICEPURE was to define factors that determine biomarkers of solar UVR-induced health outcomes. These included adverse acute factors that are associated with skin cancer and the beneficial effect of vitamin D synthesis. We also addressed behavioural factors. Field studies were done in adults and children in work and leisure situations in 4 EU countries in which personal UVR and ambient exposure was monitored.

- Skin cancer is a major health burden in the EU, and the incidence of malignant melanoma (the cause of the vast majority of skin cancer deaths) has increased in recent decades.
- Extensive epidemiological data show an association between UVR exposure and skin cancer, and this is supported by data on skin cancer mutations that are caused by UVR-induced damage to the skin's DNA
- Different types of UVR-induced skin cancer are dependent on patterns of UVR exposure, e.g. acute holiday exposure or chronic occupational exposure, or sunburning exposure in childhood
- Personal UVR exposure was measured in holiday and work situations and we studied the relationships between behaviour, biological outcomes and UVR dose
- Laboratory studies were also done to help interpret the field data
- More than 500 electronic personal dosimeters were individually calibrated against all day clear sky solar UVR
- Danes, Poles and Spaniards received very high levels of erythemal UVR exposure over a large body surface area during a week in March in Tenerife, resulting in:
    - A very high frequency of sunburn
    - High levels of DNA damage in skin and urine
    - Complete suppression of the skin's immunity
    - A significant increase in vitamin D
- Personal behaviour has a critical role in exposure to UVR
- Polish children on a 2-week Baltic Sea summer camp obtained high UVR doses with a significant increase in vitamin D, but very high levels of DNA damage
- Vitamin D increase in the sun is inversely proportional to baseline levels (as previously demonstrated in the laboratory)
- Combined data from Danes, Austrians and Spaniards on ski and beach holidays showed that increased vitamin D and DNA damage are related to UVB dose (including body surface area) and that it is virtually impossible to increase vitamin D without considerable collateral DNA damage
- Farmers' studies showed some regional differences in UVR exposure. In general the highest doses were received by the Spanish farmers, though the Danish farmers showed more "risk behaviour"
- Laboratory studies on human volunteers showed:

    - Irrespective of UVR spectrum, erythema is predictive of the suppression of the skin's immunity (thus is a marker of immunosuppression) but not of vitamin D
    - DNA damage assessed in urine correlates with such damage in skin
- Animated body models were developed (and verified) to determine UVR exposure on any given surface area under any environmental/climatic situation
- Modelling personal UVR exposure correlates well with that measured
- It is possible to predict future personal UVR exposure using climate models
- Surrogates of UVR exposures (e.g. latitude and ambient UVR) that are routinely used in studies of UVR health effects can result in a considerable exposure measurement error that in turn can lead to errors in estimating health effects
- The error in estimating UVR health effects due to exposure measurement error accompanied by using surrogates of UVR exposure can be corrected by fortifying these aggregated estimates of UVR exposure by personal measures of UVR exposure obtained for a subset of study participants
- Based on Danish holidaymakers, people seek maximal UVR exposure and have ignored "safer sun" messages. There is possible scope to engage with the large EU sunscreen in the development of positive "safer sun" education
- Body models may be a good tool for public education on the health outcomes of UVR exposure
- Work is still required to determine UVR dose → outcome and risk benefit relationships. This is much more difficult in the field than in the laboratory, but the field data are much more important
- The SunSaver used in the project has been shown to be a good research tool, but will require further development for routine use in epidemiological studies

2. Summary description of project context and objectives

Solar ultraviolet radiation (UVR ~ 295-400nm) has important beneficial and adverse impacts on human health. The overall aim of the project was to define personal UVR exposure doses received, and their health consequences to the skin, during common leisure and working activities in Europe. This was done in field studies, also supported by some laboratory studies. Eight partners in 6 EU countries took part in the project.

The main adverse effect of UVR exposure on human health is skin cancer, which includes basal cell carcinoma (BCC), squamous cell carcinoma (SCC) and malignant melanoma (MM). Photoageing of the skin is also caused by long-term exposure to solar UVR but we lack epidemiological data on this outcome. Furthermore, this is widely perceived as a cosmetic problem. BCC and SCC, though different in their pathogenesis, are often referred to as non-melanoma skin cancer (NMSC) and are much more prevalent than MM. Lethality is rare from NMSC and they are often poorly recorded in Europe, and in other parts of the world. Nonetheless, they place high financial burdens on European health services. The registration of MM is better but is very variable within Europe. The data on incidence of MM show large regional variations within Europe, but there is less variation with mortality. Options for the treatment of MM have improved recently, but MM remains a very serious diagnosis that is responsible for the vast majority of skin cancer deaths in Europe. The best options for MM are early diagnosis and prevention. Epidemiological data indicate that solar UVR is the most common cause of skin cancer in fair-skinned people who are at the greatest risk of skin cancer (for example most skin cancers appear on sun exposed sites). This means that, in theory, the majority of skin cancer could be prevented by behavioural modification. In practice, the incidence of MM

has increased in many European countries, e.g. by approximately 7-fold between 1960-2010 in the Nordic countries (http://www-dep.iarc.fr/nordcan) and incidence of non-melanoma skin cancer in this region has increased about two fold between 1980-2010. In the UK, there has been a 10-fold increase in MM older males between 1975-1977 and 2008-2010 (http://www.cancerresearchuk.org). One possible explanation for this is the increase in travel for short holidays to sunny destinations which has become much more affordable because of budget airlines.

It is estimated that about 52 % of the EU-27's population took part in tourism in 2011, in other words made a trip of at least four nights during the year. In 2011, EU27 residents made 1.0 billion holiday trips, of which, about one quarter were outside the country of residence (outbound trips). Looking in more detail at these outbound holiday trips, Spain was the top foreign destination of EU27 residents in 2011 (13% of all outbound trips), followed by Italy and France (both 9%). It should be noted that these figures refer to trips made by EU residents. They do not include trips made by non-EU residents to the EU (data from Eurostat, the statistical office of the European Union). Many EU citizens also travel widely to non-EU destinations such as Florida and the Red Sea (before the "Arab Spring").

Patterns of UVR exposure can determine skin cancer outcome. Chronic low dose UVR exposure is associated with SCC, whereas sunburning exposure is associated with MM and probably BCC. Sunburn in childhood has also been associated with MM later in life.

Skiing and beach sun holidays are popular in Europe and so were chosen as representative leisure activities. Holidays, especially sun-holidays enable sudden changes of climate where un-acclimatized skin cancer be exposed to high dose UVR. In the case of skin holidays, UVR intensity increases with altitude and snow reflects UVR. The destinations for weeklong breaks in March were Tenerife for the beach holidays and the Austrian Alps for skiing holidays. Tenerife is a very popular destination for tourists from Northern EU countries, and is approximately the same latitude as Florida and the Red Sea. In these studies, we compared adult populations from Austria, Denmark, Poland and Spain. In addition, we also studied Polish children during a two-week summer camp holiday on the Baltic Sea.

Farming was chosen as a representative working activity because it a ubiquitous and important outdoor economic activity in Europe, and represents a "chronic exposure" situation. Furthermore, it was possible to study families, including children, in which the spouse may not work on the farm or only work part-time. This enables comparisons of different occupations within families as well as comparisons between adults and children. Thus, we studied farmers in Austria, Denmark, Poland and Spain during 6-month periods.

The participants in all the studies wore personal UVR dosimeters (SunSavers) on their wrists. These electronic devices make frequent time stamped measurements of UVR exposure. The readout is in standard erythema doses (SED), which is a measure that is independent of personal sensitivity to erythema or the spectral quality of the UVR exposure. Participants of some studies also wore devices that measure solar UVB (~295-320nm) and UVA (320-400nm). Ambient UVR was also measured during the studies using a modified version of the SunSaver housed in ground stations. A major task in the project was the calibration of the SunSavers, which had to be done on an instrument-by-instrument basis against whole day clear sky conditions.

The adverse health effects of solar UVR to the skin are both acute and long term, with skin cancer being the most serious long-term consequence. It is not possible to study the

direct effects of solar UVR on skin cancer in a 4-year project, so DNA photodamage was chosen as an acute biomarker. The specific endpoint was the thymine dimer (T=T), which is a cyclobutane pyrimidine dimer (CPD). CPD are known to initiate the "UVR-signature" mutations (e.g. in p53) that are common in non-melanoma skin cancers such as BCC and SCC. They are also found in actinic keratoses (AK), which are a biomarker for SCC risk. There is good evidence that CPD may initiate sunburn, immunosuppression and photoageing. Immunosuppression is thought to play an important role in non-melanoma skin cancer and so was also chosen as an endpoint in field and laboratory studies. Acute clinical endpoints such as sunburn (as risk factor for melanoma) were also assessed as well as naevi (moles) that may also be a risk factor for skin cancer. It should be noted that not all endpoints were measured in all studies, some of which had biases to address specific aspects.

Vitamin D is the only established health benefit of solar UVR exposure. Its major role in bone health is well established, but there is increasing, though controversial, evidence that it is also important for a wide range of other health outcomes. Many studies have shown that people are insufficient or deficient and that status is seasonal with the highest values in summer. It is estimated that most people get most of their vitamin D by solar UVR-induced photosynthesis. In this context, we measured changes in vitamin D status during our studies. This was done by measuring serum 25(OH)D by mass spectrometry which is the most reliable way of assessing vitamin D status.

UVR-induced DNA damage (e.g. T=T) has been typically assessed in skin from punch biopsies, which is an invasive procedure that is not suitable for routine use. We have measured T=T in urine, which is a measure of the nucleotide excision repair (NER) of DNA damage. One of the goals of the project was to assess the relationship between DNA damage in the skin and its presence in urine. This was done in a laboratory study.

Exposure dose of UVR has been shown to be a major determinant of outcome, primarily in laboratory studies. However, irradiation spectrum is also very important because the effects of UVR on health are very wavelength dependent. Solar UVR spectra (i.e. UVB:UVA ratio) vary considerably with the height of the sun. Sunburn (erythema) is the most widely used clinical method of assessing UVR exposure, and the SED index was used in all the field and laboratory studies. Laboratory studies were done to determine if erythema was predictive of immunosuppression and vitamin D synthesis, irrespective of irradiation spectrum. This is important because erythema is the most widely used measure of UVR exposure at and individual level and the SED is increasingly used in population studies.

Behaviour is known to be an important determinant of UVR exposure. One factor in behaviour is climate. Thus we aimed to improve measurement techniques and radiative transfer models to develop a better estimate of UVR in climate models and for prediction of future UVR levels that may occur with climate change.

There is a lot of epidemiological literature on the health effects of UVR, but most is based on surrogate measures of UVR exposure, such as latitude. The goals of the project included a review such literature and to determine UVR measurement error, and a means of correcting such error. The overall aim of this was to gain a better understanding of the relationship between UVR exposure and health outcomes.

Summary of Objectives

Measure personal UVR exposure in different work and leisure environments in Europe

- In relation to important leisure (skiing, beach) and working activities in Europe

        - To validate existing UVR estimates in epidemiological studies
        - To correlate personal UVR exposure with satellite and ground station data
            - UVR
            - Albedo
            - Aerosol
            - Cloud cover
- Use combined personal, satellite and ground station UVR data to develop new radiative transfer models that can be used in climate models to predict future UVR levels
- Determine the beneficial and harmful biological effects of UVR, and critical dose levels, in relation to personal UVR exposure including
    - Vitamin D synthesis
    - DNA damage
    - Immunosuppression
- Review the current health risks of UVR exposure and assess the impact of using personal UVR data on existing exposure relationships, and where possible, determine critical levels of exposure. The project was divided into 6 work packages (WP) and the results are presented under their respective WP.

3. Summary of Main Results (see Appendix for fuller details)

- The personal dosimeters and ground stations performed as expected and gathered the UVR data as planned. However, the dosimeters required more manual intervention than expected to correct for background noise
- We compared some of our vitamin D analyses with an independent laboratory and found an excellent linear correlation (R2 = 0.91) with an intercept close to zero
- Danes, Poles and Spaniards received very high levels of erythemal UVR exposure over a large body surface area during a week in March in Tenerife, resulting in:
    - A very high frequency of sunburn
    - High levels of DNA damage in skin and urine
    - Complete suppression of the skin's immunity
    - A significant increase in vitamin D
- We estimated that Danes had over 40% of their annual UVR exposure during a single week on a sun holiday in March. This is on un-acclimatized skin and such exposure may be major factor for melanoma risk
- Personal behaviour has a critical role in exposure to UVR. Danes essentially followed the sun
- Polish children on a 2-week Baltic Sea summer camp obtained high UVR doses with a significant increase in vitamin D, but very high levels of DNA damage
- Vitamin D increase in the sun is inversely proportional to baseline levels (as previously demonstrated in the laboratory)
- Combined data from Danes, Austrians and Spaniards on ski and beach holidays showed that increased vitamin D and DNA damage are related to UVB dose (including body surface area) and that it is virtually impossible to increase vitamin D without considerable collateral DNA damage
- As might be expected, filed data show much more variation than laboratory data where parameters can be tightly controlled
- Farmers' studies showed some regional differences in UVR exposure. In general the highest doses were received by the Spanish farmers, though the Danish farmers showed more "risk behaviour"
- Summer exposure resulted in a significant increase in vitamin D in farmers, their spouses and children

- Laboratory studies on human volunteers showed:
    - Irrespective of UVR spectrum, erythema is predictive of the suppression of the skin's immunity (thus is a marker of immunosuppression) but not of vitamin D
    - DNA damage assessed in urine correlates with such damage in skin
- Animated body models were developed (and verified) to determine UVR exposure on any given surface area under any environmental/climatic situation
- Modelling personal UVR exposure correlates well with that measured
- It is possible to predict future personal UVR exposure using climate models
- Surrogates of UVR exposures (e.g. latitude and ambient UVR) that are routinely used in studies of UVR health effects can result in a considerable exposure measurement error that in turn can lead to errors in estimating health effects
- The error in estimating UVR health effects due to exposure measurement error accompanied by using surrogates of UVR exposure can be corrected by fortifying these aggregated estimates of UVR exposure by personal measures of UVR exposure obtained for a subset of study participants

4. Potential Impact of ICEPURE

The ICEPURE project has given us detailed quantitative and qualitative information of behaviour in the sun, as well as the short-term consequences of such behaviour. One of the most striking conclusions from our studies is that people, especially of Nordic origin, greatly over-expose themselves to holiday solar UVR and seem to misuse sunscreens as a licence to do this. In other words, they overestimate the level of UVR protection that they receive because the do not apply sunscreen at the thickness that is used for sun protection factor (SPF) testing. For example, people who use an SPF = 30 product will in practice get an SPF = 4, which is about 1/8th of the labelled protection. Our recent paper in the British Journal of Dermatology reported that Danes received >40% of their total annual UVR burden in a one week holiday with exposure to about 1/3 of ambient UVR. A Polish study group also received comparable levels of exposure. Such patterns of behaviour result in considerable sunburn that is an established risk factor for malignant melanoma and probably basal cell carcinoma. It seems that several decades of well intentioned advice to educated populations has been ignored. Our observations show that we have a long way to go in public health education and we need to devise much better strategies for this if we want to reduce the incidence of skin cancer in Europe.

An analyses of sun-behaviour within Danish farmer families showed that parents have little influence on the sun-behaviour of their children, with the exception of daughters being influenced by their mothers. This suggests that public health campaigns should be targeted directly at children. The most obvious approach is via the school system. This will require the education of teachers.

In general, government bodies and health organizations issue public health information. In the UK for example, by Cancer Research UK (CRUK) and the British Association of Dermatologists (BAD). Such messages are intermittent and generally have to be sought by individuals; they also tend to be negative. A more powerful approach might be for public health bodies to develop formal partnerships with the sunscreen industry that has large budgets for the promotion of sunscreens. Campaigns that successfully promoted the correct use (i.e. thickness) of sunscreens would reduce the level of molecular and clinical damage received by the skin. This would also be beneficial to the companies because they could sell more product and would have an impact on the

European economy because many of the world's major global sunscreen companies (products and raw ingredients) are based in Europe, for example L'Oreal, Beiersdorf, Boots, BASF, DSM, Lancaster, Boots, Pierre Fabre.

Studies on children on a summer camp and holiday makers have shown that 1-2 weeks in the sun results in a very substantial increase in 25(OH)D which is the "gold standard" measure of vitamin D status. This clearly shows the benefit of solar exposure, albeit at very high UVR doses. However, as we show in figure 5.3.1, this is associated with very high levels of potentially carcinogenic DNA damage (CPD). This is not surprising given the similarity of the action spectra for the synthesis of pre-vitamin D and CPD (although the chromophores are different).

Previous studies by the coordinator have shown that the action spectra for erythema and CPD are the same, which suggests that erythema is initiated by DNA damage. This suggests that erythema is a surrogate for DNA damage (which can occur with sub-erythemal exposure). The laboratory work in the ICEPURE project also suggest that erythema is a surrogate for immunosuppression which we demonstrated in the field studies (see figure 5.4.3). In these studies we also showed that 3 SED (about 1 minimal erythema dose (MED)) UVA-1 (340-400nm: which is the major region of solar UVR from a physical point of view) suppresses skin immunity as well as 3 SED from solar type spectra. There are very few data that show a clinical outcome from environmentally relevant doses of UVA-1 and our results support the inclusion of UVA-1 filters in sunscreens, as has been required by the EC. In general, European companies have led the development of UVA-1 sunscreen filters.

Laboratory studies, including those done under ICEPURE, have shown vitamin D synthesis occurs with sub-erythemal UVR doses over small areas of skin. This project has also shown that sub-erythemal whole body exposure also results in considerable DNA damage. Further analyses/work will be required to determine the dose-response and spectral relationships between vitamin D synthesis and DNA damage for the development of public health advice.

Our accumulation of personal UVR exposure data, in the context of location and ambient UVR, is a valuable resource that can be used to validate behaviour/UVR exposure modelling studies of the type pioneered by Professor Brian Diffey (with whom we worked on one publication). Furthermore, we have developed animated human body models that can be used determine biologically weighted (e.g. erythema, vitamin D, DNA damage) exposure doses to any body site under any given climatic condition. We believe that these constructs may be developed as tools for public health information and well as studying the relationships between UVR exposure patterns and skin cancer. Our modelling of UVR exposure data matches actual UVR exposure (e.g. figure 6.3.3) and we are refining our model to predict UVR exposure into the future based on climate models. This will allow public health bodies to have advance warning and develop strategies to modify behaviour if UVR exposure levels are expected to be high.

Many studies have attempted to assess the relationship between UVR exposure and health outcomes by using surrogates of exposure such as latitude. These data have been used to suggest a relationship between UVR levels, vitamin D status and health outcomes. Our analyses however shows that this is a rather crude approach which may only work on large studies with a wide geographical distribution and is prone to ecological biases and measurement error. As part of this study, we demonstrated that the variation in personal exposure within the same city is about three times higher than the between-city variance in Europe. Behavioural factors such as time spent outdoors and summer holiday destination and behaviour are important determinants of personal

UVR exposure, and determine to a great the variability in UVR exposure between people. We have developed statistical tools to integrate ambient UVR exposure and personal behavioural factor and quantity and calibrate exposure response relationships for this type of measurement error. We anticipate that our publication will influence future epidemiological studies to take personal UVR exposure and behaviour into account.

The SunSaver was the core of the ICEPURE project and has provided a vast amount of personal UVR exposure data. However, this device is very much a research tool that requires a considerable amount of work to obtain usable data. There is substantial variation in the sensitivity of the "erythema sensor" which meant that each SunSaver had to be individually calibrated under clear day conditions. Furthermore, there is variation in the background "noise" of each device which means that background has to be subtracted manually on a day by day basis which is very labour intensive. These problems would have to be resolved before the SunSaver could be advocated for "routine" epidemiology use.

The following improvements are intended to incorporate into the next generation of the UVR dosimeter, SunSaver. The result will be a combination of technical possibilities, battery lifetime, size of the housing and the cost.

1. Automatic baseline adjustment (very labor demanding to do manually) (has been confirmed that it is possible)
2. Smaller in size, possible designed as a jewelry (we cannot get a smaller sensor at this time)
3. Rechargeable battery, possibly wireless by induction
4. Movement sensor (confirmed possible)
5. Wireless transfer of data (confirmed possible, but may increase size and lower battery lifetime)
6. Each averaged UV and movement measurement is followed by the Standard deviation to show the variations during the measurement period.
7. Waterproof
8. High speed sample rate mode (more than 1 measurement per second)
9. Larger memory (confirmed possible)
10. Add on: GSM modem (or a smartphone) that can transfer data using the mobile network (confirmed possible, useful in ground stations)

ICEPURE has initiated two successful current grant applications that have been based on the experience gained from the project and the use of some of the material from the participants. One is to Professor Young and is supported by the UK Department of Health; a two-year project (£310,426) entitled "Vitamin D photosynthesis: interactions with melanin and UVR spectrum. The other, awarded to Professor Mark Nieuwenhuijsen, is "Solar ultraviolet radiation exposure: genetic background and molecular mechanisms" which is a 3 year project (€194,000) supported by the Spanish Government.

Professor Mark Nieuwenhuijsen is conducting an EC funded project (HELIX) in 6 birth cohorts in Europe that will assess as many environmental exposures as possible (exposome). This will include UVR exposure in the form of modelling and measurement using the SunSaver in collaboration with Professor Hans Christian Wulf.

Finally, ICEPURE was a truly multi-disciplinary European study that enabled dialogue and interaction between a very diverse group of clinicians, biological and physical

scientists and epidemiologists. All have benefited from this experience that is likely to result future collaborations and enhanced research programmes.

Main Dissemination Activities

The project has resulted in several publications in peer-reviewed journals, a list of which is given in Table A1. Several other manuscripts are in various stages of submission.

The ICEPURE coordinator arranged and chaired two ICEPURE themed symposia at major international photobiology congresses, one at the 14th Congress of the European Society for Photobiology (ESP), Geneva, 1-6 September 2011 and the other at the 36th Congress of the American Society for Photobiology (ASP), Montreal, 23-27th June 2012. The ESP and the ASP are the world's the main photobiology societies. Both symposia were very well attended and were an excellent opportunity to publicize and disseminate the ICEPURE programme. Thus, there can be few interested parties in all parts of the world who are not aware of the ICEPURE project.

ICEPURE was also highlighted at a lecture given by Professor HC Wulf during at conference on Human Health and the Impact of Environmental and Climatic factors held in Copenhagen on 25th April 2012. We were also invited to present a poster at this meeting to summarize the ICEPURE project. This meeting was well attended by scientists, journalists and policy makers including Per Okkels, Permanent Secretary of State at the Danish Ministry of Health and Christel Schaldemose, who is a member of the European Parliament and is a member of the European Parliament Against Skin Cancer (MAC); an all-party informal group committed to promoting action on cancer as an EU priority and harnessing European health policy support to that end. Representatives of EUROSKIN, the European Skin Cancer Foundation, Euromelanoma and the International Task Force on Skin Cancer Screening also attended the meeting. These organizations have an interest in the prevention of skin cancer. Thus, this meeting was an excellent opportunity to promote the ICEPURE project. In parallel with this meeting was a well attended poster exhibition open to the public and the press. HRH Princess Marie of Denmark opened this event.

Professor Young has given ICEPURE-based presentations to the UK Department of Health and its Scientific Advisory Committee on Nutrition (SACN), which is preparing a report on vitamin D. He has also be been asked to join the Advisory Group on Non-ionizing Radiation (AGNIR) to co-prepare a report on vitamin D. AGNIR provides advice which may be used for public health purposes via Public Health England.

Professor Young was also a member of the FP6 EU GenoMEL (Melanoma Genetics Consortium) project. He also informed this group of the ICEPURE project and presented an overview of some of the data at its meetings, including its meeting in Tel Aviv, 3-5th May 2011. Professor Young and the group from BBH made informal connections with the US-based Gene, Environment, Melanoma (GEM) international group and were invited to give presentations on the ICEPURE project at their meeting in Toronto, 27-29th July 2009.

ACKNOWLEDGEMENTS

Several institutions have provided vital data for the project. We would like to thank Alexander Orlik at the Zentralanstalt für Meteorologie und Geodynamik (ZAMG) in Vienna for providing meteorological data for several locations in Austria. Likewise we thank Gabriela Klimek at the Instytut Meteorologii I Gospodarki Wodnej (Institute for

Meteorology and Water Management, IMGW) in Warsaw for providing meteorological data for Łodz. We also sincerely thank Juan Ramón Moreta and Mariá López Bartolomé at the Spanish Agencia Estatal de Meteorología (AEMET) for providing UVR data for Barcelona.

Other institutions have provided opportunities for calibration of the dosimeters that have been used ICEPURE. We are grateful for the help provided by Dr. Emilio Cuevas and Dr. Alberto Redondas at the Spanish Agancia Estatal de Meteorología (AEMET) in Tenerife for the use of the Izaña Observatory during a dosimeter calibration campaign. We also thank the staff at the Izaña Observatory for help during our visit. We are also very grateful for the help and kindness of Dr. Robert Delmas and Dr. Jean-Luc Baray for providing for us the opportunity to make a calibration campaign at the L'Observatoire de Physique de l'Atmosphère de la Reúnion (OPAR), University of Réunion. We particularly thank Jean-Marc Metzger for his help and interest during our visit.

We also that Dr. Thierry DOUKI, Chef du Service de Chimie Inorganique et Biologique, INAC LCIB UMR-E3 CEA-UJF/CEA-Grenoble for doing some of the CPD analyses.

A1: LIST OF SCIENTIFIC (PEER REVIEWED) PUBLICATIONS, STARTING WITH THE MOST IMPORTANT ONES

NO.	Title	Main author	Title of the periodical or the series	Number, date or frequency	Publisher	Place of publication	Year of publication	Relevant pages	Permanent identifiers[1] (if available)	Is/Will open access[2] provided to this publication?
1	Temperature correction of UV spectral solar measurements for ICEPURE project.	Katarzyna Baczynska	Photochemistry Photobiology	No 87, August 2011	John Wiley & Sons Inc	Hoboken, New Jersey	2011	pp1464-1467	10.1111/j.1751-1097.2011.00981.x	no
2	Measurement errors in the assessment of exposure to solar ultraviolet radiation and its impact on risk estimates in epidemiological studies.	Payam Dadvand	Photochemical & Photobiolological Sciences	No 10, July 2011	RSC publishing	Cambridge	2011	pp1161-1168	10.1039/c0pp00333f	no
3	A library of action spectra for erythema and pigmentation	Alois W. Schmalwieser	Photochemical & Photobiolological Sciences	No11, Feburary 2012	RSC publishing	Cambridge	2012	pp251-268	10.1039/c1pp05271c	no

[1] A permanent identifier should be a persistent link to the published version full text if open access or abstract if article is pay per view) or to the final manuscript accepted for publication (link to article in repository).

[2] Open Access is defined as free of charge access for anyone via Internet. Please answer "yes" if the open access to the publication is already established and also if the embargo period for open access is not yet over but you intend to establish open access afterwards.

4	Validation of self-reported erythema: comparison of self-reports, researcher assessment and objective measurements in sun worshippers and skiers.	Bibi Petersen	Journal of the European Academy of Dermatology and Venereology	No 2, February 2013	John Wiley & Sons Inc	Hoboken, New Jersey	2013	pp214-219	10.1111/j.1468-3083.2011.04447.x	no
5	Effect of Altitude on Solar UVR and Spectral And Spatial Variations of UV Irradiances Measured in Wagrain, Austria in Winter	Katarzyna Baczynska	Radiation Protection Dosimetry		Oxford University Press	Oxford	Epub ahead of print October, 2012		10.1093/rpd/ncs261	no
6	Determinants of personal UVR exposure-doses on a sun-holiday	Bibi Petersen	British Journal of Dermatology	No 5, May 2013	John Wiley & Sons Inc	Hoboken, New Jersey	2013	pp1073-1079	10.1111/bjd.12211	no
7	UVA1 is Skin Deep: Molecular and Clinical Implications	Angela Tewari	Photochemical Photobiological Sciences	No 12, December 2012	RSC publishing	Cambridge	2012	pp 95-103	10.1039/c2pp25323b.	no
8	Measurements Of Personal UV Exposure On Different Parts Of The Body During Various Activities	Alois W. Schmalwieser	Photochemistry Photobiology	In press 2013	John Wiley & Sons Inc	Hoboken, New Jersey	2011			no
9	A sun holiday is a sunburn holiday	Bibi Petersen	Photodermatology, Photoimmunology & Photomedicine	In press 2013	John Wiley & Sons Inc	Hoboken, New Jersey			10.1111/phpp.12048	no

A2: LIST OF DISSEMINATION ACTIVITIES								
NO.	Type of activities[3]	Main leader	Title	Date/Period	Place	Type of audience[4]	Size of audience	Countries addressed
1	Presentation	Dan Segerback	The measurement of UVR-induced DNA damage in the skin and urine	12-14 April 2010	Edinburgh	Others/ Medical Community	300	UK
2	Poster	Katarzyna Baczynska	The Impact of Climate Change on Personal UV Exposure and Human Health	12-16 June 2010	Providence, RI, USA.	Scientific Community	200	US
3	Conference	Antony R Young, Ann R Webb	The impact of climatic and environmental factors on personal UV radiation exposure and human health	September 2011	Geneva	Scientific Community	150	Europe Wide
4	Conference	Katarzyna Baczynska	The Impact of Climate Change on Personal UV Exposure and Human Health	September 2010	Warwick, UK	Scientific Community	50	UK
5	Presentation	Jakob Heydenreich	Personal electronic UVR dosimeter and corresponding ground station	1-6 September 2011	ESP Congress, Geneva, Switzerland	Scientific Community	30	Europe

[3] A drop down list allows choosing the dissemination activity: publications, conferences, workshops, web, press releases, flyers, articles published in the popular press, videos, media briefings, presentations, exhibitions, thesis, interviews, films, TV clips, posters, Other.

[4] A drop down list allows choosing the type of public: Scientific Community (higher education, Research), Industry, Civil Society, Policy makers, Medias, Other ('multiple choices' is possible).

			for sun behaviour field studies					
6	Presentation	Hans Christian Wulf	Population Ultraviolet exposure today	6-10 October 2010	Gothenburg, Sweden	Scientific Community &Policy Makers	100	Denmark
7	Poster	Grage, M. M.-L	The UVI measured for the EU ICEPURE-project	2-5 May 2011	København	Scientific Community	200	Europe, Australia
8	Poster	Grage, M. M.-L	The ICEPURE project	2-5 May 2011	København	Scientific Community	200	Europe, Australia
9	Poster	Grage, M. M.-L	Comparison of modelled and measured UVR on horizontal and inclined surfaces	1-6 September 2011	Geneva	Scientific Community	150	Europe Wide
10	Poster	Grage, M. M.-L	The UVI measured for the EU ICEPURE-project	28-30 September 2011	Hellerup	Scientific Community	50	Nordic
11	Poster	Grage, M. M.-L	The ICEPURE project	28-30 September 2011	Hellerup	Scientific Community	50	Nordic
12	Poster	Grage, M. M.-L	The ICEPURE project	21/06/2010	Hellerup	Scientific Community	20	Denmark
13	Poster	Grage, M. M.-L	The ICEPURE project	6-8 September 2010	Rostock, Germany	Scientific Community	100	Global
14	Poster	Grage, M. M.-L	The UVI measured for the EU ICEPURE-project	2/05/ 2011	København	Scientific Community	30	Europe, Australia
15	Presentation	Grage, M. M.-L	The Calibration Ordeal in the ICEPURE Project	5/05/2011	København	Scientific Community	20	Nordic
16	Presentation	Grage, M. M.-L	ICEPURE-projektet	7/04/2011	Århus	Scientific Community	20	Denmark
17	Poster	Payam Dadvand	Measurement errors in the assessment of exposure to solar ultraviolet radiation and its impact on risk estimates in epidemiological studies.	13-16 September 2011	Barcelona	Scientific Community	50	Europe
18	Poster	Margarita Triguero-Mas, Payam Dadvand, Mark J. Nieuwenhuijsen	Self-reported sun exposure behaviour and skin	13-16 September 2011	Barcelona	Scientific Community	50	Europe

19	Presentation	Grage, M. M.-L	The rays of the Sun - good or bad?	23/09/2011	Rostock, Germany	Civil Service	20	Europe
20	Presentation	Grage, M. M.-L	The rays of the Sun - good or bad?	5&8 March 2011	Experimentarium Copenhagen	Civil Service	100	Denmark
21	Presentation	Grage, M. M.-L	The rays of the Sun - good or bad?	28/03/2011	Frederiksberg Gymnasium	Civil Service	25	Europe
22	Conference	Antony R Young	King's Health partners Vitamin D: Health Impacts beyond the bone	22/03/2011	London	Scientific Community	100	UK
23	Conference	Antony R Young	Geneva European Society for Photobiology	4/09/2011	Geneva	Scientific Community	150	Europe Wide
24	Conference	John O'Hagan	Ground UVR Measurements for the ICEPURE Project	25/06/2012	Montreal	Scientific Community	100	US & Canada
25	Conference	Antony R Young	Montreal American Society for Photobiology	25/06/2012	Montreal	Scientific Community	100	US & Canada
26	Presentation	Antony R Young	Gene, Environment, Melanoma meeting		Albuquerque	Scientific Community	35	US, Canada, Europe
27	Presentation	Antony R Young	Gene, Environment, Melanoma meeting		Canada	Scientific Community	35	US, Canada, Europe
28	Conference	Antony R Young	The Seventh Annual University of North Carolina Conference on Melanoma: A Multidisciplinary Perspective	16/04/2012	Chapel Hill, North Carolina, USA	Others/ Medical Community	100	US
29	Conference	Antony R Young	GenoMel Meeting	3-5 May 2011	Tel Avir	Others/ Medical Community	40	US, Europe, Israel
30	Poster	Tove Sandberg	1st International Conference on UV and Skin Cancer	3-5 May 2011	Copenhagen	Scientific Community& Policy Makers	40	Europe
27	Poster	Hans Christian Wulf	Health.Environment.Climate	25/04/2012	Copenhagen	Scientific Community	50	Europe
28	Presentation	Dan Segerbäck	KICancer Retreat	29-30 September 2011	Stockholm	Scientific Community	150	Sweden
29	Presentation	Dan Segerbäck	UV-radiation induced disease-roles of UVA and UVB	24-26 May 2012	Karolinska Institute, Stockholm	Scientific Community& Policy	100	Europe Wide

						Makers		
30	Presentation	Dan Segerbäck	Skin Cancer Network retreat	12-13 June 2012	Stockholm	Scientific Community	50	Sweden
31	Presentation	Antony Young	UV-radiation induced disease-roles of UVA and UVB	24-26 May 2012	Karolinska Institute, Stockholm	Scientific Community& Policy Makers	100	Europe Wide
32	Presentation	Antony R Young	Advisory Group for Non-Ionizing Radiation meeting	21/01/2013	Chilton, UK	Scientific Community & Policy Makers	15	UK
33	Presentation	Antony R Young	Presentation of ICEPURE studies to Scientific Advisory Committee on Nutrition which is advising UK government on vitamin D	7/12/2012	Department of Health, London	Policy Makers	10	UK
34	Conference	Antony R Young	Photodermatology Symposium UpToDate	22/11/2012	University of Graz, Austria	Others/ Medical Community	30	Austria
35	Presentation	Nasufi Aqif	Modelling the biologically effective UV exposure distribution of the human body	1-6 September 2011	Geneva, Switzerland	Scientific Community	100	Europe Wide
36	Presentation	A.W.Schmalwieser	The impact of climatic and environmental factors on personal ultraviolet radiation exposure and human health	6-8 June 2012	Novara, Italia	Scientific Community	150	Italy
37	Poster	J. Heydenreich, P. Philipsen, P. Eriksen, A.W. Schmalwieser	A new instrument to measure UV radiation at inclined planes	6-10 August 2012	International Radiation Symposium, Berlin, Germany	Scientific Community	100	World Wide
38	Poster	A. Young & team (1), H.C. Wulf & team (2), P. Eriksen & team (3), J. O'Hagan & team (4), M. Nieuwenhuijsen & team (5), D. Segerbäck & team	ICEPURE: The impact of climatic and environmental factors on personal ultraviolet radiation exposure and human health	06 – 10 August 2012	International Radiation Symposium, Berlin, Germany	Scientific Community	100	World Wide

		(6), J. Narbutt & team (7), and A.W. Schmalwieser & team (8)						
39	Scientific talk	Mette M-L Grage	The ICEPURE-project	15/04/2010	IMWM/IMGW, Warsaw, Poland	Scientific Community	30	Europe
40	Presentation	Mette M-L Grage	The rays of the Sun - good or bad?	22/04/2010	Pharmacy, Roskilde	Others/ Pharmacists	15	Denmark
41	Presentation	Mette M-L Grage	The rays of the Sun - good or bad?	22/04/2010	School of optometry, Frederiksberg	Others/ students of optometry	100	Denmark
42	Poster	Mette M-L Grage	A UV radiation model for personal behaviour	10/01/2012	Technical University of Denmark, DTU	Scientific community/ business enterprise	300	Denmark
43	Poster	Jakob Heydenreich	Personal electronic UV radiation and corresponding ground station for sun behaviour field studies	10/01/2012	Technical University of Denmark, DTU	Scientific community/ business enterprise	300	Denmark
44	Presentation	Mette M-L Grage	UV measurements and modelling in the ICEPURE project	09/02/2012	FMI, Helsinki	Scientific community	40	Europe
45	Poster	Mette M-L Grage	A UV radiation model for personal behaviour	25/04/2012	Open Event on: Human Health and the Impact of Environmental and Climatic Factors, Copenhagen	Civil service	400	Denmark
46	Poster	Graham Harrison	The impact of climatic and environmental factors on personal ultraviolet radiation exposure and human health	25/04/2012	Open Event on: Human Health and the Impact of Environmental and Climatic Factors, Copenhagen	Civil service	400	Denmark
47	Presentation	Mette M-L Grage	UV measurements and modelling in the ICEPURE project	18/06/2012	Annual meeting for Network for Women in	Scientific community	20	Denmark

					Physics, Nyborg			
48	Presentation	Mette M-L Grage	The rays of the Sun - good or bad?	06/12/2012	Frederiksberg	Civil service	14	Denmark
49	Presentation	Mette M-L Grage	The rays of the Sun - good or bad?	07/01/2013	Frederiksberg	Civil service	12	Denmark
50	Presentation	Mette M-L Grage	Future Ambient UV dose levels in Europe, as modelled for the ICEPURE project	14/03/2013	Norwegian Radiation Protection Authority, Norway	Scientific community	30	Europe
51	Poster	Mette M-L Grage	A UV radiation model for personal behaiviour	14/03/2013	Norwegian Radiation Protection Authority, Norway	Scientific community	30	Europe
52	Poster	Jakob Heydenreich	Personal electronic UV radiation and corresponding ground station for sun behaviour field studies	14/03/2013	Norwegian Radiation Protection Authority, Norway	Scientific community	30	Europe
53	Presentation	Elisabeth Thieden	UV Population studies in the ICEPURE Project	23-27 June 2012	Montreal, Canada	Scientific community	400	World wide
54	Presentation	Elisabeth Thieden	Sun exposure patterns; lesson learnt using time-resolved personal UV dosimetry.	25-27 April 2012	Nis, Serbia	Scientific community		World wide
55	Presentation	Elisabeth Thieden	People stick to their sun exposure behaviour	September 2011	Geneva, Switzerland	Scientific community	150	Europe wide
56	Presentation	Elisabeth Thieden	The greatest part of the annual personal UVR dose among indoor workers is obtained during risk behaviour on holidays and days off	May 2011	Seoul, Korea	Scientific community.	200	World wide
57	Presentation	Elisabeth Thieden	People stick to their sun exposure behaviour	2-5 May 2011	Copenhagen, Denmark	Scientific community	150	World wide
58	Presentation	Elisabeth Thieden	The sun habits of the Danes and the relation to vitamin D	Nov 2010	Copenhagen	Scientific community	50	Denmark

			status					
59	Presentation	Elisabeth Thieden	Personal, times-stamped dosimeter readings reveal that high UVR exposure doses are correlated to sun risk behaviour in non-outdoor workers.	Nov. 2010	Sydney, Australia	Scientific community	300	World wide
60	Presentation	Elisabeth Thieden	The sun habits of the Danes and the relation to vitamin D status.	March 2010	Copenhagen, Denmark	Scientific community	150	World wide
61	Presentation	Elisabeth Thieden	Lifetime UV exposure dose at skin cancer diagnoses	July 2009	Toronto, Canada	Scientific community	25	America/ European
62	Presentation	Elisabeth Thieden	Sun exposure patterns; lessons learnt using time-resolved personal electronic dosimetry	July 2009	Glasgow, UK	Scientific community	300	UK
63	Poster	Bibi Petersen	PhD Day	10 May 2012	Copenhagen University, Copenhagen	Scientific community	150	World wide
64	Poster	Bibi Petersen	European Academy of Dermatology and Venereology	September 2012	Prague	Scientific community	50	Europe
65	Poster	Bibi Petersen	Health. Environment. Climate The European policy center, and LEO-Pharma)	April 2012	The Royal Danish Opera, Copenhagen	Scientific community	400	Denmark
66	Presentation	Bibi Petersen	The American Society for Photobiology	June 2012	Montreal Canada	Scientific community	100	US and Canada
67	Presentation	Bibi Petersen	The European Society for Photobiology	September 2011	Geneva, Switzerland	Scientific community	150	Europe Wide

A General Information *(completed automatically when **Grant Agreement number** is entered.*

Grant Agreement Number:	227020
Title of Project:	ICEPURE
Name and Title of Coordinator:	Professor Antony Young

B Ethics

1. Did your project undergo an Ethics Review (and/or Screening)? • If Yes: have you described the progress of compliance with the relevant Ethics Review/Screening Requirements in the frame of the periodic/final project reports? Special Reminder: the progress of compliance with the Ethics Review/Screening Requirements should be described in the Period/Final Project Reports under the Section 3.2.2 *'Work Progress and Achievements'*	***Yes***
2. Please indicate whether your project involved any of the following issues (tick box) :	***YES***
RESEARCH ON HUMANS	
• Did the project involve children?	Yes
• Did the project involve patients?	No
• Did the project involve persons not able to give consent?	No
• Did the project involve adult healthy volunteers?	Yes
• Did the project involve Human genetic material?	No
• Did the project involve Human biological samples?	Yes
• Did the project involve Human data collection?	Yes
RESEARCH ON HUMAN EMBRYO/FOETUS	
• Did the project involve Human Embryos?	No
• Did the project involve Human Foetal Tissue / Cells?	No
• Did the project involve Human Embryonic Stem Cells (hESCs)?	No
• Did the project on human Embryonic Stem Cells involve cells in culture?	No
• Did the project on human Embryonic Stem Cells involve the derivation of cells from Embryos?	No
PRIVACY	
• Did the project involve processing of genetic information or personal data (eg. health, sexual lifestyle, ethnicity, political opinion, religious or philosophical conviction)?	Yes
• Did the project involve tracking the location or observation of people?	No
RESEARCH ON ANIMALS	
• Did the project involve research on animals?	No
• Were those animals transgenic small laboratory animals?	
• Were those animals transgenic farm animals?	
• Were those animals cloned farm animals?	
• Were those animals non-human primates?	
RESEARCH INVOLVING DEVELOPING COUNTRIES	
• Did the project involve the use of local resources (genetic, animal, plant etc)?	No
• Was the project of benefit to local community (capacity building, access to healthcare, education etc)?	No
DUAL USE	
• Research having direct military use	No
• Research having the potential for terrorist abuse	No

C Workforce Statistics

3. Workforce statistics for the project: Please indicate in the table below the number of people who worked on the project (on a headcount basis).

Type of Position	Number of Women	Number of Men
Scientific Coordinator	0	1
Work package leaders	1	4
Experienced researchers (i.e. PhD holders)	5	17
PhD Students	5	0
Other	6	3

4. How many additional researchers (in companies and universities) were recruited specifically for this project?	**1**
Of which, indicate the number of men:	1

D Gender Aspects

5. Did you carry out specific Gender Equality Actions under the project? No

6. Which of the following actions did you carry out and how effective were they?

	Not at all effective				Very effective
❑ Design and implement an equal opportunity policy	○	○	○	○	○
❑ Set targets to achieve a gender balance in the workforce	○	○	○	○	○
❑ Organise conferences and workshops on gender	○	○	○	○	○
❑ Actions to improve work-life balance	○	○	○	○	○

○ Other:

7. Was there a gender dimension associated with the research content – i.e. wherever people were the focus of the research as, for example, consumers, users, patients or in trials, was the issue of gender considered and addressed?

✓ Yes- please specify Gender was used as a criterion in analysis within population studies.

○ No

E Synergies with Science Education

8. Did your project involve working with students and/or school pupils (e.g. open days, participation in science festivals and events, prizes/competitions or joint projects)?

✓ Yes- please specify Presentation to Danish and German students and also at several science festivals.

○ No

9. Did the project generate any science education material (e.g. kits, websites, explanatory booklets, DVDs)?

○ Yes- please specify

✓ No

F Interdisciplinarity

10. Which disciplines (see list below) are involved in your project?

○ Main discipline[5]: 1.2, 1.2, 1.4, 1.5, 2.2, 3.1, 3.2, 3.3

○ Associated discipline5: ○ Associated discipline5:

G Engaging with Civil society and policy makers

11a Did your project engage with societal actors beyond the research community? *(if 'No', go to Question 14)* ✓ Yes ○ No

11b If yes, did you engage with citizens (citizens' panels / juries) or organised civil society (NGOs, patients' groups etc.)?

○ No

○ Yes- in determining what research should be performed

✓ Yes - in implementing the research

✓ Yes, in communicating /disseminating / using the results of the project

[5] Insert number from list below (Frascati Manual).

11c In doing so, did your project involve actors whose role is mainly to organise the dialogue with citizens and organised civil society (e.g. professional mediator; communication company, science museums)?	○ ✓	Yes No

12. Did you engage with government / public bodies or policy makers (including international organisations)

○	No
○	Yes- in framing the research agenda
○	Yes - in implementing the research agenda
✓	Yes, in communicating /disseminating / using the results of the project

13a Will the project generate outputs (expertise or scientific advice) which could be used by policy makers?

- ✓ Yes – as a **primary** objective (please indicate areas below- multiple answers possible)
- ✓ Yes – as a **secondary** objective (please indicate areas below - multiple answer possible)
- ○ No

13b If Yes, in which fields?

Agriculture Audiovisual and Media Budget Competition Consumers Culture Customs Development Economic and Monetary Affairs Education, Training, Youth Employment and Social Affairs		Energy Enlargement Enterprise Environment ✓ External Relations External Trade Fisheries and Maritime Affairs Food Safety Foreign and Security Policy Fraud Humanitarian aid		Human rights Information Society Institutional affairs Internal Market Justice, freedom and security Public Health ✓ Regional Policy Research and Innovation ✓ Space Taxation Transport	

13c If Yes, at which level?

- ✓ Local / regional levels
- ✓ National level
- ✓ European level
- ✓ International level

H Use and dissemination

14. How many Articles were published/accepted for publication in peer-reviewed journals?	**9**
To how many of these is open access[6] provided?	**0**
How many of these are published in open access journals?	**0**
How many of these are published in open repositories?	**0**
To how many of these is open access not provided?	**9**
Please check all applicable reasons for not providing open access:	
✓ publisher's licensing agreement would not permit publishing in a repository ❑ no suitable repository available ❑ no suitable open access journal available ❑ no funds available to publish in an open access journal ❑ lack of time and resources ❑ lack of information on open access ❑ other[7]: ……	

15. How many new patent applications ('priority filings') have been made? *("Technologically unique": multiple applications for the same invention in different jurisdictions should be counted as just one application of grant).*		**0**
16. Indicate how many of the following Intellectual Property Rights were applied for (give number in each box).	Trademark	**0**
	Registered design	**0**
	Other	**0**
17. How many spin-off companies were created / are planned as a direct result of the project?		**0**
Indicate the approximate number of additional jobs in these companies:		

18. Please indicate whether your project has a potential impact on employment, in comparison with the situation before your project:

❑	Increase in employment, or	❑	In small & medium-sized enterprises
❑	Safeguard employment, or	❑	In large companies
❑	Decrease in employment,	✓	None of the above / not relevant to the project
❑	Difficult to estimate / not possible to quantify		

19. For your project partnership please estimate the employment effect resulting directly from your participation in Full Time Equivalent (*FTE = one person working fulltime for a year*) jobs:	*Indicate figure:* *60*

[6] Open Access is defined as free of charge access for anyone via Internet.
[7] For instance: classification for security project.

Difficult to estimate / not possible to quantify	❑

I Media and Communication to the general public

20. As part of the project, were any of the beneficiaries professionals in communication or media relations?

○ Yes ✓ No

21. As part of the project, have any beneficiaries received professional media / communication training / advice to improve communication with the general public?

○ Yes ✓ No

22 Which of the following have been used to communicate information about your project to the general public, or have resulted from your project?

✓	Press Release	✓	Coverage in specialist press
❑	Media briefing	✓	Coverage in general (non-specialist) press
✓	TV coverage / report	❑	Coverage in national press
❑	Radio coverage / report	❑	Coverage in international press
✓	Brochures /posters / flyers	✓	Website for the general public / internet
❑	DVD /Film /Multimedia	✓	Event targeting general public (festival, conference, exhibition, science café)

23 In which languages are the information products for the general public produced?

❑	Language of the coordinator	✓	English
✓	Other language(s)		