International Agency for Research on Cancer

World Health Organization

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PURCHASE OF SCIENTIFIC EQUIPMENT

1. In line with the IARC Medium-Term Strategy (2010–2014), which highlighted the paramount importance of performing interdisciplinary research, efforts have been made in the last two years to reinforce the interaction between laboratory-based and epidemiology research. Constant upgrade and acquisition of scientific instruments are essential to support this strategy.

2. The establishment of the next-generation sequencing and HPLC/MS/MS platforms were completed in 2011. These platforms will considerably contribute to the centralized laboratory facilities for genetics, biomarkers studies and mechanisms of carcinogenesis and infections. In 2011 the Agency was able to invest in liquid/DNA aliquoting robotic apparatus, robotics to automatically perform solid phase extraction, real-time PCR detection system, DNA-quantification system, a high performance, well calibrated sonicator and an automated ELISA plate reader and washer.

3. To complement these investments, additional support is required to improve and upgrade the nucleic acid extraction facilities and to acquire a digital slide scanner.

4. The DNA extraction facilities provide pre-analytical samples for genetics and molecular research platforms for studies conducted in the Agency and outside IARC through collaborative research projects.

5. IARC is facing an increasing demand for high-quality DNA and RNA from validated tumour material in large-scale studies. For tumour validation, a large number of slides must be reviewed by several pathologists and thus the acquisition of a digital slide scanner is needed. While pathology confirmation of tumour material using a digital scanner is considered good scientific practice, it is also part of the standard protocol for large international genomic efforts such as projects participating in the International Cancer Genome Consortium (ICGC). In particular, IARC scientists are responsible for the recruitment and validation of up to 2000 cases of renal cancer for the CAGEKID project, an ICGC-funded study. In such studies, samples from all cases undergoing whole-genome and whole-exome scanning must be reviewed by two pathologists, both for diagnosis (histological-type classification using formalin-fixed paraffin-embedded section slides) and for analysing tumour cell contents (frozen renal tissue). This strict protocol requires nine slides per case. A representative image must also be selected that will subsequently be made available to the scientific community along with all genomic data. A short-term solution to the lack of a digital slide scanner within IARC has been found by outsourcing this effort, although this is not a feasible medium-term solution.

6. The annual costs of maintenance will be covered by the regular budget of the different Groups involved as well as by collaborative programmes of the same Groups.

7. The Scientific Council is requested to advise the Director and the Governing Council on the proposed request to use funds from the Governing Council Special Fund to purchase the scientific equipment listed below:

a) DNA extractor (QIAGEN) and equipment for DNA QC (electrophoresis and gel documentation system and volume inspection system);

b) EZ1 Advanced XL (QIAGEN) for DNA and RNA extraction;

c) Digital slide scanner (several types from at least three different companies will be tested before decision).

a) Autopure DNA extractor, electrophoresis and gel documentation system & DNA volume inspection system

8. The Biobank provides high through-put DNA extraction services to internal and external collaborators and is the main source of supply of DNA samples to collaborators in the EPIC study. Over 20 000 extractions are performed each year in the Biobank which currently has two Qiagen autopure instruments purchased in 2000 and 2008. The output for each instrument when running at full capacity is 60 DNA extractions per day, which adequately caters for the level of workload in the Biobank.

9. However, one instrument is over 10 years old and its replacement is necessary as it will become obsolete at the end of 2012. This situation creates the opportunity to replace the existing equipment with the latest technology for nucleic acid extraction from a broad range of sample types and volume (whole blood, buffy coat, packed cells, cultured cells, cell lysates, tissues, blood spots) and more efficient purification of DNA from large scale studies with a capacity of up to 90 samples/day. Strategically, this purchase will cater for the expected increase in the capacity of the DNA extraction to complement the increase in the level of IARC's participation in large scale projects.

10. DNA samples, including samples for EPIC studies are used for multiple projects and remaining sample is kept for long-term storage at IARC for future use. This requires well-controlled processing procedures, optimal storage condition and reliable quality control system for monitoring DNA purity. The quality control procedures will be complemented with the purchase of electrophoresis, gel documentation and volume inspection equipment.

b) EZ1, DNA/RNA extractor

11. The Luminex platform within the Infections and Cancer Biology Group (ICB) provides the facilities to detect a large number of infectious agents using extracted DNA from a very small amount of specimen from different anatomical sites. DNA extraction is currently performed by an EZ1 robot from QIAGEN that was purchased in 2004. Due to its low throughput (only six samples can be processed per run), this machine is no longer adequate to efficiently process the increasing number of specimens. Over 5000 Luminex assays are performed yearly and due

to a significant increase in internal and external collaborations, this number will rapidly increase to reach 10 000 in the next years. Thus, a high throughput robot for DNA/RNA extraction from specimens of limited size is required.

12. We propose to purchase, the EZ1 Advanced XL robotic for automated DNA/RNA extraction from small volumes of samples, from a wide range of sample types relevant for molecular diagnoses, genetic identity testing, forensics, biomedical research, and gene expression analysis for the Luminex platform at IARC. The EZ1 Advanced XL provides all the advantages of the EZ1 Advanced, and increases the throughput to 14 samples per run.

c) Digital slide scanner

13. Parallel to significant advances in genomics, bioinformatics and molecular technology, the demand for high-quality DNA and RNA from validated tumour material is increasing. Multiple studies are underway within the Agency that aim to characterize the genetic or infectious architecture of large series of tumours (e.g. via sequencing or immunohistochemistry). Current study protocols require that the tumour content of tissue samples be confirmed by at least one, and usually multiple pathologists. Without a digital scanner, this usually means collecting all slides in one place to enable a physical meeting of pathologists, or consecutively sending slides from one pathology laboratory to another, a procedure that is both time-consuming and not without risk given the fragile nature of pathology slides.

14. The proposed technology offers a number of key advantages:

- digital storage of slide information, allowing for secure storage of the images without the deterioration or damage that can affect glass slides;
- images can be incorporated into a laboratory information system, and hence be directly linked with clinical and other relevant data;
- the pathology data can be directly entered within the viewer software;
- images can be viewed by pathologists who are at any location, enabling IARC scientists to collaborate with internationally recognized, highly specialized pathologists worldwide;
- teleconference features allow multiple simultaneous viewers to discuss images, which is particularly useful when it is necessary to reach a rapid consensus on cases that are difficult to classify.

15. The equipment will be situated in the Section of Molecular Pathology (MPA) and used by trained staff from several other Groups including the Section of Genetics and the Infections and Cancer Biology Group (ICB) to provide pathological evaluation in large scale projects such as CAGEKID, HPV-AHEAD (two FP7-funded projects), the early-stage non-small-cell lung-cancer project and a population-based study on gliomas in the Canton of Zurich, Switzerland.

Requested budget

	Quantity	Approximate price (€)	Annual maintenance costs (€)
Autopure DNA extractor	1	231 000	15 000
Electrophoresis and gel doc system & DNA volume inspection system	1	41 000	nil
EZ1 Advanced XL DNA/RNA extractor	1	50 000	2 869
Digital slide-Scanner	1	172 000	7 500
Total		**494 000**	