

Changes in the diffraction patterns of hair samples resulting from increased airport and postal security checks post September 11, 2001.

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Abstract

A subset of the samples examined at the Advanced Photon Source, Chicago, in late 2001 yielded unusual changes in the fibre diffraction patterns. This report confirms that these changes were not related to the BioCAT Facility at the APS but were directly related to either the changes in the radiation of hand-luggage resulting from the increased security measures at the airport in Los Angeles or to the irradiation of mail within the United States.

Introduction

In a double blind study of 160 hair samples at the BioCAT Facility, Advanced Photon Source, Argonne National Laboratory, Chicago,(APS) the fibre diffraction patterns obtained for all samples, that had been transported from Australia or had been sent by post within the USA, were different from the pattern for normal hair. Figure 1.

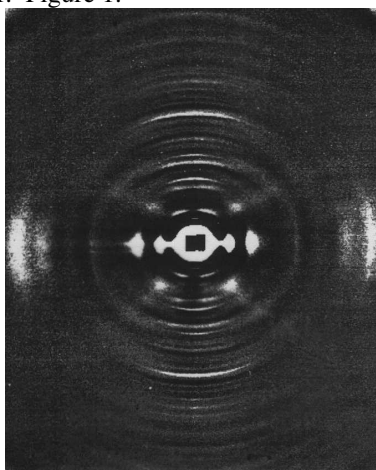


Figure 1. Fibre diffraction pattern for human controls.

This change was not the same as that already reported for hair of persons known to have breast cancer or insulin dependent diabetes, [1][2][3]. After the double blind was revealed for the Australian samples, the majority of these samples were revealed to be normal and not abnormal. In addition it was revealed that hair from a number of these samples had been examined on at least one previous occasion and had yielded the expected normal patterns. Either the problem had occurred in transit or at the BioCAT facility. The latter was unlikely as the samples that were couriered from within the USA to APS appeared to be unaffected. It had been observed that notices at the hand luggage radiation check points in Los Angeles stated that this radiation would affect all film in contrast to the regular signs in Sydney and other airports that state that only film with ASA values greater than 1000 will be affected. This

study was designed to establish the origin of these changes.

Materials and Method

Further hairs were taken from all samples that had exhibited the change at APS. In this case, however, multiple samples were used. Ten to twenty hairs were used dependent on the number of hairs available. These samples were examined on beam-line BL15A using the method reported for earlier experiments using multiple samples[4]. Some new samples known to be normal were taken from Australia and were also examined..

Results

All new normal samples gave the same patterns as Figure 1. However those that had been carried through the Los Angeles airport or sent through the USmail showed similar changes to those observed at BioCAT.. Figure 2.

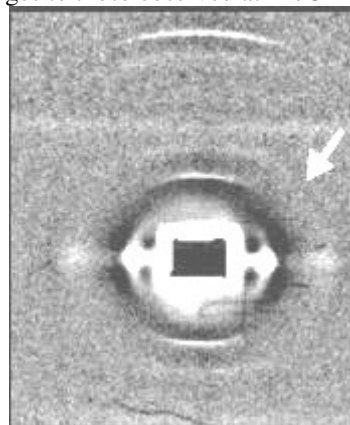


Figure 2. Normal hair after irradiation at Los Angeles airport, the arrow indicates the wide fuzzy arcs that appeared on all the diffraction patterns

Conclusion

Whilst this eliminated BioCAT as the source of the problem and confirms that some damage to the samples has occurred, a further study is needed to verify that the increased radiation measures are the direct cause. From other studies, it is known that both gamma rays and microwaves will affect hair.

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