

In radiation protection, many actors..... for protection of the workers



- The qualified expert in health physics
- The occupational doctor

Each of this discipline has its own competence !

- Radiation Protection is a delicate field !
 - Bad knowledge
 - Awareness of the risks
 - Questions more and more from different professional fields

Evolution of the field of radiation protection !!



Good collaboration between health physics (HP) and occupational medicine (OM)



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Medical control of the workers professionnally exposed to radiations



This check should be done by an occupational health doctor who has an certificate delivered by the Federal Agency...

Medical follow-up: classical medical exams, ...
evaluation and interpretation in collaboration with the health physics of the doses received by the workers in routine and accidental situations.

Collaboration in routine

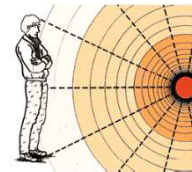
- Visits of working place in departments using ionising radiations
 - Programme received few weeks before;
 - Participation of the HP regarding the radiation protection aspects
 - Dose checking.
- Dosimetry
 - Results of the dosimetry transfered every 3 month
 - when dose > 1 mSv/month : Report to the worker and copy to OM
- Information of the workers by the HP
- Copy if the reports of the health
- Mails or e-mails with some specific demands from OM (advices, not known situation...)
- Protection of the maternity: Evaluation of the working place together to guarantee protection of the foetus

Collaboration in case of interventions

- Contamination of the workers
 - Internal contamination with Tc-99m (Hospital)
 - Internal contamination with P-32 (University)
 - External contamination with C-14 (internal contamination suspected)
 - External contamination with P-32 (eyes)

Good collaboration between the HP and OM !!

- Problems in terms of external exposition
 - Exceeding dose limits
 - Protection of the maternity



Three examples



- Nuclear medicine
 - Dose of 13 mSv/1 month (Effective dose = 9 mSv/12 lm)
 - Exceeding dose limits



- Interventional cardiology
 - Preventive measures
 - Exceeding dose limits



- Scientific Laboratory
 - Protection of the maternity

(Other cases.....)

Example 1: In nuclear medicine...

- Over threshold of the annual effective dose of a technologist of a nuclear medicine department (~22 mSv/12 lm) (july, last year)
- The event...
 - A dose of 13,3 mSv is attributed to a worker of the nuclear medicine service meaning that we are above 20 mSv in total for the year (already at 9 mSv).
 - OSL technology dosimetry : Analysis of the dosimeter 3 times !
 - HP is going to the NM department to make an investigation and to discuss with the concerned person.
 - many exams with « Technegas », 4 to 5 per day.
 - SIR-Spheres with Y-90 - PET/CT.
 - No personal medical examinations



The advantages of the OSL technology

- 2 labs \Rightarrow $Al_2O_3.C$
- 1 lab \Rightarrow BeOx
- Optical Stimulation is non destructive
 - Only one part of the electrons should be stimulated (0,5%) for lecture
 - Keep most of the information \Rightarrow potential other analysis if necessary
 - OM: could ask to keep the information



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Then...

- HP asks for the list of what she did during 6 months to make the comparison between july and the months before.
 - Double of activity ! But not sufficient to explain this high dose
 - Different kind of calculations to find how she could get 13 mSv in one month
- HP asks our dosimeters providers to check again the dosimetry results
 - **Conclusion of all the analyses : dosimeter exposed to photons of energy compatible with Tc-99m !**

Then...

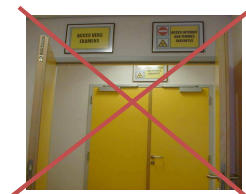
- Phone call to the head of the NM department
- Phone call from HP to OM
 - Long discussion with the doctor to explain the dosimetry results, all the facts and investigations done
 - Phone call between OM and head of the NM department
- The doctor talks to the worker the same day !
 - The doctor asks for urine analysis
 - measurement done by the HP
 - Negative result
 - Long discussion between the worker and the doctor trying to find what happened

Finally...

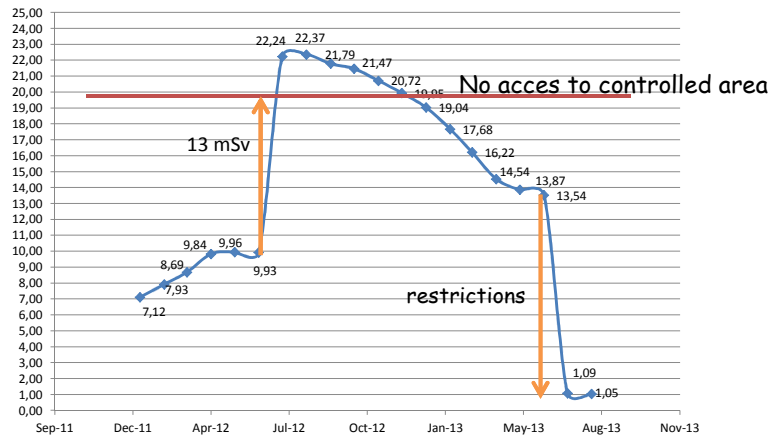
- No explanation at all !!
- No scientific explanation for the HP

We could not find anything that was saying that this dose was not a professional one !

- Conclusion
 - Exceeding dose limits: 22,24 mSv/12 lm
 - No acces any more to controlled area during necessary time (1 year)



Evolution of the dosimetry before and after july....



Follow-up

- Determination of the time she had to stay away from the controlled area in collaboration with the HP (july to april)
- At a certain level of dose, acces to the controlled area with some restrictions of the work that could be done (april to july)
 - Medical examination
- Then, in july, she could work again....(dose to 0 mSv)

Example 2: Interventional cardiology

- Over threshold of the annual effective dose of a physician at the cardiology department ($\sim 20,12$ mSv/12 lm)
- Constraint dose of 17 mSv/12 lm
 - In January 2010
 - Mail to the boss of the cardiology department with copy to the occupational doctor
 - The doses of one physician increase quite rapidly

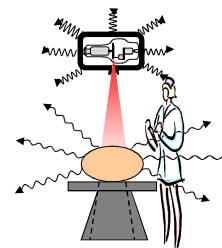
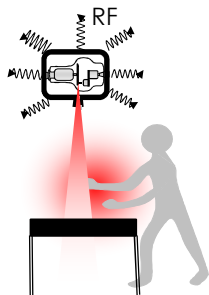
Dose 12 mois au	30/09/2009	12,96 mSv
	31/10/2009	14,48 mSv
	30/11/2009	15,01 mSv
	31/12/2009	16,36 mSv



Interventional radiology : a special practice.....meaning high doses !

The physician asks for the images from the X-ray device,
when he needs, for some time.
He is very close to the table and the X-ray tube.

This technique can deliver very high doses, not only to the patient but also to the practitioner by external exposition



Then...

– In march 2010....

- Mail to the medical director of the hospital to indicate that
 - a physician had overpassed the constraint dose (17,12 mSv)
 - The HP has already met the boss of the cardiology department to speak about this case.
 - Working place studies were done.

	Intervention n°1	Intervention n°2
Scopy time	11,39	10,03
Number of sequences of images taken	17	24
Number of images	511	885
PDS	52,318 Gy.cm ²	111,641 Gy.cm ²

- all the dosimetry results are given to the OM
 - » They are responsible to interpret the doses and to make anything they would judge as necessary
- Copy to the mail to the occupational doctor responsible for this area

Then...

– Conclusions

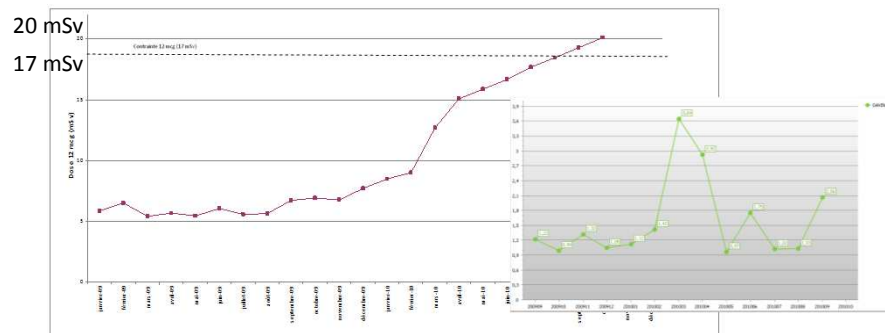
- No lead protection around the table (table itself - lead window) in some angiography rooms.
 - We asked to add protections means....
- When they have protections on the table, they do not want to use them !
- We insist on information/formations of the physicians in interventional cardiology.
- We ask for a reflexion about the organisation in the department which was no optimal.

- Copy of the report to the OM



Finally....

- In october 2010...
 - Mail to the medical director of the hospital because few physicians were close to exceed the dose limits (copy to the OM)
- In november 2010
 - One of the cardiologist overpassed the dose limit (report to FANC).
 - OM wrote a mail to the FANC as well.



Collaboration between HP and OM

- Working place studies were done by the HP
- Working places visits were done by the OM
- Phone calls between HP and OM
- It was mentioned by the HP and the Occupational doctor that the radiation protection means could be improved by using lead protections on tables.
 - Reports, mails....
- Meetings were organised with the cardiology department trying to understand why the physicians do not want to use lead protections

Good collaboration between the HP and OM !!

Example 3: In a laboratory at the university...

- The event...
 - Phone call of a pregnant woman who points out the presence of radioactive waste 3 meters from her working place
 - Radioactive waste in the hall outside the controlled area without any survey !
 - Measurement of HP (bags with H-3, S-35, P-32)
 - Dose rate in contact (β): 250 $\mu\text{Sv/h}$
 - Dose rate at 1 m (β): 4,5 $\mu\text{Sv/h}$
 - Exposition time of the pregnant woman : 5 min
- She was completely upset...!
- Phone call to the occupational doctor to see this worker
 - She needed to be reassured !
 - Responsibility : to evaluate in terms of health, if there is a problem or not...



Example 4: Acces to controlled area denied to 2 workers before exceeding the dose limits

- The event...
 - More and more interventions onto the cyclotron for 2 workers
 - Doses were increasing dramatically !
 - Mail written to the head of the cyclotron to ask for a meeting
 - A few days after, dose measurements indicate dose close to 20 mSv
 - Phone call to the occupational doctor responsible for this installation
 - In collaboration between the OM - HP - AVN, decision was taken to pull out the 2 workers from the controlled area during 6 months...
 - 2 workers had to go the OM
 - Meetings with the Head of the cyclotron....Study of the working place
 - Establishment of the dose constraint in our institution

In conclusion...the field of radiation protection asks for competence and motivation

- The royal decree (RD of 20/07/2001) asks for a real implication of the occupational doctor → not enough investment of the certified occupational doctor
 - Be pro-active and try to take initiative
 - communication with the HP is essential and should be developed
 - concertation of the stake holders for transparency and credibility

The goal of the certificate for the occupational doctor on ionising radiations is to try to guarantee quality in a field more and more complex and constraining for all the stake holders !