Revista da Sociedade Brasileira de Medicina Tropical
35(5): 541-542, set-out, 2002.

Overdose of yellow fever vaccine: a preventable error?

Superdosagem de vacina contra a febre amarela: um erro evitável?

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Editor:

Dr. Rabello and colleagues[2] recently reported their investigation of 14 patients who were unintentionally given a dose of yellow fever vaccine (YFV) that was 25-fold as high as that recommended. Their findings are very important to reassure health professionals who may come across a similar situation. This incident from Contagem is the only one that we have seen reported in the literature. We would like to report a similar case, concentrating our discussion on the identification of the causes for error and on suggesting preventive measures.

A young woman in her twenties received a dose of YFV during a vaccine campaign in an university campus. The vaccine, manufactured by Biomanguinhos, was administered subcutaneously by a nursing technician trainee and prepared by a classmate of his. Both had previous working experience in hospital wards and had attended lectures and practicals during their course where they were taught about vaccines in general and YFV in particular. These students belonged to a group of 10 who were supervised by a registered nurse. The supervisor was busy with other students when the vaccine, which was the first of the day, was administered. When the student was preparing the syringe with the vaccine to be administered to the following person her supervisor noticed that she had aspirated the vaccine directly from its vial. She immediately noticed that this procedure was incorrect given that the reconstitution of the YFV that was used required a 2-step procedure. Firstly the Biomanguinhos YFV preparation, which comes lyophilised in 50-dose vials, needs rehydration with 2ml taken from a 25-ml vaccine diluent vial. After being gently shaken this fluid is diluted in the remaining 23ml of the diluent. The vaccine is then ready for administration, which should be done within 4 hours. In this case a 12.5-fold concentrated YFV was administered to the young woman, a dose that was half as high as the one administered in the cases reported by Rabello and colleagues. The difference is due to the fact that rehydration in their cases was carried out with 1ml of the diluent instead of 2ml.

The supervisor avoided the second overdose vaccination to be performed, but by the time the error was detected the vaccinee had already left and could not be found. The current (recently introduced) recommendation of the local health authorities was to fill in the vaccine cards that are kept by the vaccinees but only to keep records of their ages and the number of doses administered. Thus the young woman who had received an overdose of YFV could not be traced without unnecessarily alarming a large number of individuals who were vaccinated that day.

A young woman received an overdose of a live attenuated vaccine. The potential consequences of this fact were unknown at the time, although Dr. Rabello's article has now somewhat reassured us of the safety of YFV even at a higher dose. An error in this case was that the nurse technician trainee forgot the second step of the vaccine reconstitution. A possible explanation for that is the fact that the preparation of all the other vaccines of the Expanded Programme of Immunisation that are used in that setting requires a single step. (Biomanguinhos YFV is now also available in 5-dose vials that need a single step for reconstitution). The registered nurse did not detect the error until late because she had many students under her supervision and was busy with others at that moment. Although the students were supposedly experienced and had previous training they should have been reminded of the two-step reconstitution procedure before the vaccination was initiated, particularly because it was

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Recebido para publicação em 17/9/2002.

unusual. The trainee who administered the vaccine did not check whether what he was administering, and that had been prepared by a fellow student, was correct. Nurse students are taught that before administering any drug they should be certain that they are giving the right dose of the right drug, by the right route, at the right time, to the right patient. Had they checked all the steps the reconstitution mistake would have been recognised and the overdose error would have been prevented.

Another issue that complicated this incident and can be thought of as an error was the local policy of not registering the names of the persons who are vaccinated. Although popular among health personnel for saving time, this procedure is clearly insufficient when a problem occurs and the vaccinated individuals need to be contacted. Particularly in this case, when a single individual received the vaccine overdose, the attempt to contact an unknown person of whom one only knew the sex and age created a dilemma: the need to contact this individual was contrasted with the potential panic that could occur among the other vaccinees.

Writing about medical errors Millenson states that until recently the revelation about patient treatment-related deaths and injuries was discouraged in part because inadvertent patient harm was accepted as unavoidable, and in part because the alternative was to blame the physician as negligent or incompetent[1]. Overdose of YFV is possibly more common than one would expect. Information on the clinical outcome of persons who received overdoses of drugs and vaccines should be registered and become available to health professionals, exactly as done by Dr. Rabello's team. Reporting errors and identifying their causes can teach others to avoid repeating them.

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