Proposta di un sistema di monitoraggio/sorveglianza(MOSS) e di allerta rapida in sanità animale basato sul controllo veterinario negli impianti di macellazione: analisi dei requisiti

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Introduction and aims. The eradication and control plans (DEP and DCP) of animal infectious diseases and zoonoses in Italy are mainly based on activities carried out on farms. Abbattoirs represent a terminal which can be used for surveillance and monitoring purposes, ensuring the representative sampling of animals from the general population. The possibility of proceeding with the collection of biological samples allows the surveillance not only of zoonosis (TBC) or pathologies subject to DCP or DEP, but also of other diseases, relevant from the health and economic point of view. The study of the slaughtering of dairy cows, associated with an epidemiological evaluation of the situation deriving from the results of active systems in place, could allow the improvement of targeted risk-based surveillance. The objective of the project is to define the potential of an active surveillance system of a selected list of infectious diseases of dairy cows at slaughter facilities, complementary or alternative to active surveillance systems of farms.

Methodology. A structured questionnaire was administered to the official veterinarians operating at the slaughterhouses of Lazio region, in order to collect qualitative information relative to the procedure adopted during ante and post mortem inspection activities. The data from the official livestock registry, both at national (BDN) and regional level (SIEV-BDR), have been downloaded from January 1, 2014 to December 31, 2017, relating to the animals slaughtered in the Lazio Region. The characteristics of the animals coming from Lazio and slaughtered in other regions were also evaluated in order to estimate the potential proportion of loss at the follow-up of one or more categories of risk of the animals (by provenience, age, sex). Finally, the data concerning the health status of cattle population for each Local Health Unit (ASLs) of the Lazio Region have been traced, in relation to the outbreak notifications and the main direct and indirect diagnose available from laboratory databases. Furthermore, for the purpose of defining a predictive framework of the slaughterhouse potentials in the regional surveillance systems of animal infectious diseases, detailed diagnostic data on bovine TB was extracted and used as the initial model of the process analysis.

Results. In Lazio, 79.5% of the slaughtered animals are represented by cattle (204.899 / 257.689). Among the animals slaughtered within the region this proportion is 82.2% (150.140 / 182.573) against 72.9% (54.759 / 75.116) of heads slaughtered outside. The estimated monthly average of slaughtered bovines is 1,450 heads for females and about 2,325 for males over the entire period and the distribution of the animals slaughtered according to age is constant on an annual basis, without evidence of significant changes in the course of the four-year period. A proportion of 73.3% of the slaughtered bovine heads of Lazio (150.140 / 204.899) takes place at regional abbattoirs. About half of the number of cattle slaughtered within the region comes from the provinces of Frosinone (26.8%) and Latina (22.5), which represents the territories with greater number farms and heads at the regional level. The heads slaughtered by Viterbo and Rieti abbattoirs represent respectively 15.3% and 13.6% of the total, while the slaughterhouses from the 6 ASL of the province of Rome, altogether represent 21.8%. There is a clear trend to local slaughtering of animals within the provincial network of abbattoirs. In the provinces of Frosinone, Rieti and Viterbo the proportion of locally slaughtered animals is >94%, while for in province of Latina the proportion of animals slaughtered in the provincial plants is 60%, with a significant number of animals slaughteredd in the neighboring province of Frosinone (19%) and ASL RM2 (17%). In order to assess the potential of slaughterhouses within a regional surveillance system, an initial scenario based on empirical data was set for the theoretical estimation of the sensitivity of the surveillance system of bovine tuberculosis (TBC) then applyed to Brucellosis (BRC) and Bovine Leucosis (LEB). The sensitivity of the TBC system was particularly reduced for the ASLs of Frosinone, Latina and Rieti. The negative predictive value (VPN) of the system, ie the probability that an animal

detected as negative is a true non-infected subject, has resulted with lower values estimated for the ASL of Rieti, Latina and RM4 (<99.9%). At a theoretical level, a 99.89% VPN of the TBC MOSS in a standard reference population of 100,000 heads subjected to the current surveillance structure in Lazio, in which the real animal-level prevalence of the infection is equal to 0.13%, determines on average the "loss" of 110 heads infected by TB/year. Thus, the adoption of a surveillance design at abbattoirs targeted on the inspection of the animals most at risk (> 4 years), coming from areas at risk (infection clusters) and belonging to the categoty of slaughter most at risk (delayed and emergency slaughter), would represent the optimal strategy for increasing the sensitivity of the regional TBC MOSS system. In the case of the brucellosis scenario, the estimated proportion of animals that could be checked annually in abbattoirs, compared to the population to be monitored, is 26%, with higher peaks for bovines coming from Frosinone (48%), RM1 (41%) and RM5 (40%). The slaughterhouses of Frosinone and Viterbo are candidates for a double targeted surveillance of Brucellosis, both at local and extra-territorial basis. Latina, Rieti, RM5 are candidates for the execution of sampling on a local basis. With regard to the LEB the estimated proportion of animals that could be checked annually in abbattoirs, compared to the population to be monitored, is 10% with relatively higher proportions for the subjects coming from RM1 (20%), Rieti and RM5 (18%), Viterbo (16%) and RM6 (14%) followed by Frosinone (12%). Overall, compared to TBC and BRC, the fraction of animals potentially to be sampled at the slaughterhouse is reduced by more than 50% for the LEB. The main sampling activity within the LEB MoSS must remain dependent on the active surveillance on farms in a proportion varying from 80% to 93% depending on the ASL. The scheduling of levies for LEB at the slaughterhouse, however, would find immediate application in the LEB clusters, in which the control of subjects starting from 6 months is foreseen.

Conclusions. The theoretical comparison between sensitivity of the sampling on farms and random sampling at the slaughterhouse highlights the existence of different critical points. In particular, sampling at the slaughterhouse confers a low herd-level sensitivity because the animals are sent to individual slaughter. This element limits the number of samples that can be observed on an annual basis for each farm and makes sampling at slaughterhouses likely to be inappropriate for the purpose of assessing the herd-level prevalence. However, the implementation of surveillance at slaughterhouses is efficient and / or less expensive than on-farm sampling for the purpose of the study of prevalence at an individual level (animal-level) and for monitoring the absence of infection in the general population (freedom from diseaseFurthermore, the MoSS systems based on the slaughterhouse network could be applied for the purposes of monitoring the introduction or re-introduction of infections (early detection).