

## VOCALIZATION OF RABBIT PUPS IN THE MOTHER-YOUNG RELATIONSHIP

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### ABSTRACT

The vocalization of rabbit pups, within the first two weeks of life, from nine litters kept under various conditions was investigated. A sound recording was made using a condenser microphone with a frequency range from 40 to 20 000 Hz. Additionally all doe-pup contacts were recorded using infrared video technology. In litters with an average of 6.6 pups the mean number of vocalizations was 165 in 24 hours (n = 15 x 24 h). Rabbit pups vocalised in a frequency range from 374 Hz up to 667 Hz with a mean duration of 67 ms. The distribution of the vocalizations in the course of day showed maximum values during the night. During intervals when nursing occurred the mean number of sounds was much higher than in intervals without nursing. The investigation showed a strong rise in the number of sounds during the hourly interval prior to nursing. This implies a connection between the vocalization and the time of nursing. In 6 cases, in which the doe nursed her pups a 2<sup>nd</sup> time in 24 hours a rise in the sounds could not be determined, prior to the 2<sup>nd</sup> nursing. During the nursing, no difference in the number of sounds could be determined between the pups which were nursed once or twice a day. It can be concluded that the vocalization cannot be the only stimulus for time of nursing.

**Key words:** Vocalization, mother-young relationship, communication, nursing.

### INTRODUCTION

In rabbits (*Oryctolagus cuniculus*) the social contact between the doe and her pups is extremely limited within the first weeks of lactation (HUDSON *et al.*, 2000) and is mostly restricted to the few minutes required for nursing. HUDSON *et al.* (2000) describe a synchronisation in the behaviour of the doe and her pups to optimise the energy conservation of the young as they are unable to regulate their body temperature. The influence of housing conditions on the rearing behaviour in domestic rabbits was shown in previous studies (WULLSCHLEGER, 1985, BIGLER, 1986). With a reduced cage size, a rise in the frequency of the nursings and nest visits in the course of a day could be documented (SELZER, 2000). This led to the question which stimuli give rise to the social interactions, including the increased nursing and nest visits of the doe with respect to cage size and structure.

It is so far unclear how exactly acoustic communication correlates with the mother-child relationship. HUDSON and DISTEL (1982) describe a rise in the activity of the young in the time of nursing accompanied by an increasing vocalization. This vocalization can be observed within the first two weeks of life. The increased vocalization correlates with first stage nursing. Does the increased number of vocalizations from the pups indicate their readiness for the immediate suckling, this would permit the doe to spend the shortest possible time in the nest.

The aim of this investigation was to explain the meaning of the pup's vocalization in the mother-child relationship during the first two weeks of lactation.

## **MATERIAL AND METHODS**

The investigation was conducted with rabbits kept under different housing conditions at the research station of the Department of Animal Breeding and Genetics of the Justus-Liebig University, Giessen.

Wild and domestic rabbits (one buck and three does in each group) were kept in two enclosures measuring approximately 150 m<sup>2</sup> (HOY and SELZER, 2002). The enclosures were equipped with artificial nest boxes, which could be monitored via infrared video technique (HOY, 2000). In addition, domestic rabbits were kept in cages of two different sizes - 6 cages (85 x 80 x 50 cm) with straw as bedding and 5 cages (150 x 120 x 150 cm) with plastic slatted floors and observable nest boxes.

The investigation took place between January and December 2003. The vocalizations of the pups were continuously recorded over a 24 hour period with a condenser microphone (ME 64/Sennheiser) with a frequency range of 40 to 20 000 Hz which was suspended over the nest. Additionally, the behaviour was videotaped using an infrared video technique. For the recording, an infrared video camera (WV-CD 810; Panasonic) with an aspheric lens, an infrared emitter (WFL I LED 30 W with 880 nm wavelength) and a time lapse video recorder (AG-TL 30, Panasonic) were used. The video tapes were evaluated with a video recorder with jog/shuttle function. The number of the sounds were registered during the course of day. Additionally, the frequency range and the individual duration of vocalizations were determined using the RTS signal 2.0 (Noldus) software.

## **RESULTS AND DISCUSSION**

Rabbit pups vocalise from the day of birth up to the 14<sup>th</sup> day of life. The sonographic evaluation was conducted with 5 litters over 11 days. The mean litter size was 6 pups. The mean duration of the sounds was 67 ± 43 ms (Table 1). The frequency range varied from 374 Hz to 667 Hz.

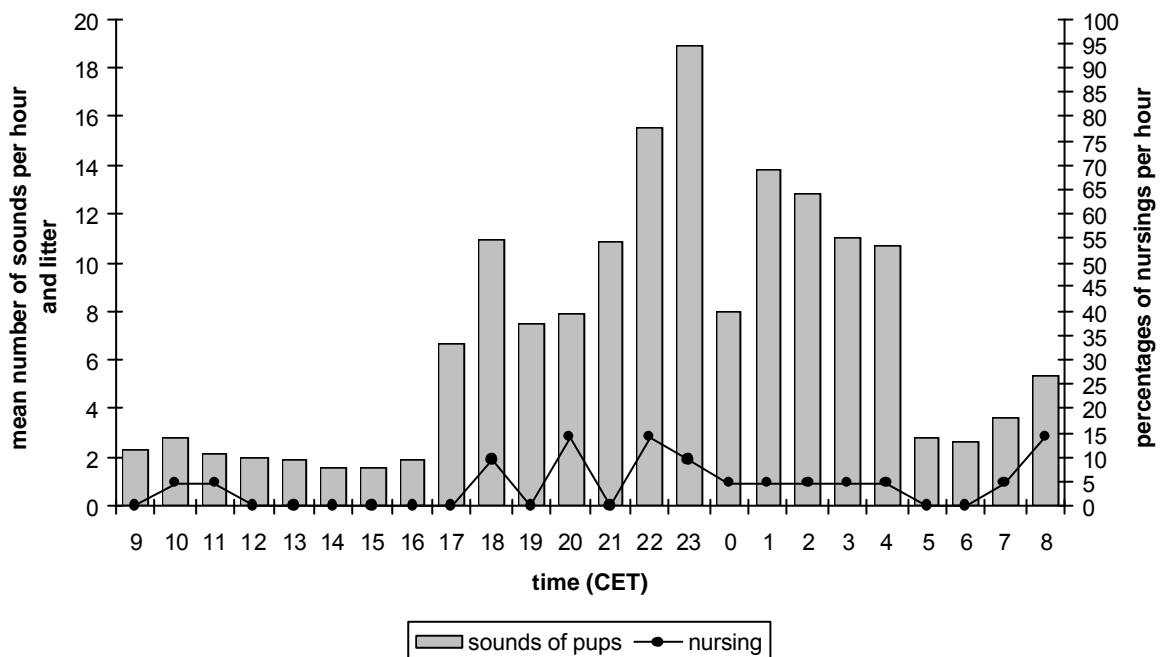
For the quantitative analysis 9 litters were observed over 15 days. The mean number of sounds within 24 hours was 165 per litter based on 15 days observed. Between the

individual litters great differences in the number of vocalizations were observed. The studies were conducted between the 2<sup>nd</sup> and the 11<sup>th</sup> day of pups' life. The sounds could not be assigned to individual pups. The mean litter size was  $6.6 \pm 1.2$  pups.

**Table 1. Mean duration, mean maximal and minimal frequencies of 474 vocalizations of rabbit pups.**

Mean duration [ms]	Mean maximum frequency [Hz]	Mean minimum [Hz]	n
$67 \pm 43$	$667 \pm 248$	$374 \pm 173$	474

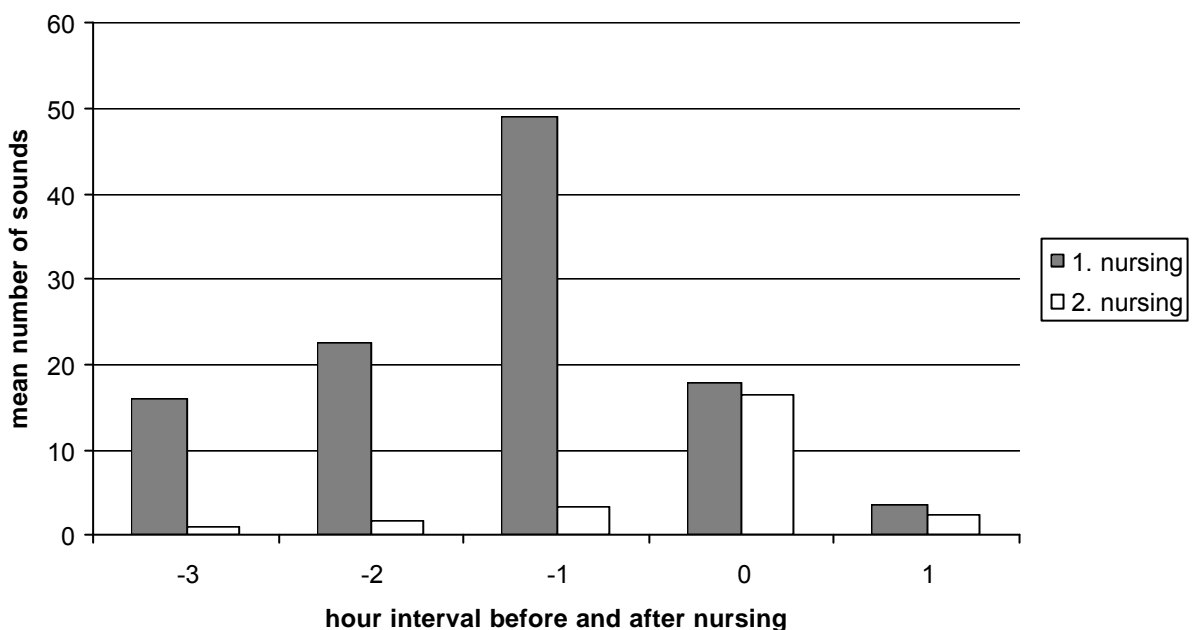
A minimum value of 51 sounds per 24 hours and litter could be determined at the end of the 2<sup>nd</sup> week of lactation. The mean number of sounds decreased from 172 (n = 11 x 24 hours) in the first week of life to 145 (n = 4 x 24 hours) sounds in the 2<sup>nd</sup> week of life.



**Figure 1. Distribution of the number of sounds per litter an hour and the percentage of nursings per hour during 24 hours with respect to the total number of nursings**

The analysis of the audiotapes showed that the number of pup vocalizations depended on the time of day. An increased number of sounds was found during the dark periods of the day (Figure 1). Maximum values were observed between 22:00 and 24:00. In order to demonstrate a possible connection between the vocalization and the mother-child behaviour the percentages of nursing and the mean number of vocalizations per hour and litter were calculated in one-hour intervals over 24 hours. It was shown that in the hourly intervals in which nursing took place as well as during the preceding hour, the mean number of vocalizations was much higher than in the hourly intervals without

nursing. At the beginning of the nursing, pups vocalize intensively as soon as the doe positioned herself over the nest. A higher number of vocalizations was noticed when disturbances occurred at the nest, e.g. a visit of the doe. The vocalizations during the nursing itself were evaluated separately. Figure 2 shows the mean frequency of the sounds 3 hours before, during (0) and 1 hour after the nursing. Here we differentiated between the first nursing and the second nursing in 24 hours in the cases where this occurred. Because the nursing occurs mainly at dusk (HOY and SELZER, 2002) the nursing after the start of the videotape (between 12:00 and 16:00) was called the 1<sup>st</sup> nursing and the following the 2<sup>nd</sup> nursing. In 6 cases the doe nursed her pups twice in 24 hours. The mean time period between the first and the second nursing was 588 minutes. The nursing lasted on the average  $196 \pm 35$  s (n = 21).



**Figure 2. Mean number of sounds per litter in the hours before, during and after nursing in dependence on first or second nursing during 24 hours**

An obvious increase in the number of vocalizations could be determined in the three hours before the first nursing of the evening. No increase in the number of vocalizations per litter was found during the hours before 2<sup>nd</sup> nursing when two nursing events occurred at one day. The mean number of sounds during nursing (hour 0) had slightly lower values at the second nursing compared to the first nursing in 24 hours.

An intensive vocalization before nursing could indicate a readiness of the pups. Since under natural conditions the doe closes the entry of the burrow, it remains to analyse whether the sounds permeates the soil, thereby enabling the doe to receive information about the condition of the pups before opening the burrow. It seems possible that the doe is the initiator of the mother-child interactions which led to a 2<sup>nd</sup> nursing within 24 hours. A possible reason could be the increasing intramammaric pressure causing the

mother to nurse her pups twice in 24 hours. Conversely, the first (the main?) nursing event per day is obviously initiated by the pups starting to cry up to three hours before nursing. The vocalization of the pups cannot be the exclusive trigger that animates the doe to nurse.

With regard to the so-called biostimulation, which contains a separation from doe and pups up to 48 hours (THEAU-CLÉMENT *et al.* 1998, MAERTENS 1998), the question has to be asked whether these initiating vocalizations can cause a change in the behaviour of doe separated from the pups. The current research aims at examining the vocalization and the behaviour of the doe during separation from her litter.

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