美洲大蠊下唇须及腹刺的扫描电镜观察

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摘　要　在扫描电镜下观察了美洲大蠊下唇须和腹刺的细微结构,下唇须分四节,每节均分布若干感受器. 这些感受器共有 5种: 刺形感受器 A, 形感受器 B, 带槽锥形感受器, 有孔锥形感受器和钟形感受器. 其分布从基部节段到端部节段在种类和数量上均有增加. 基节 (第 1节) 仅见具有运动感受功能的刺形感受器 A 第二节和第三节上均可见刺形感受器 A 刺形感受器 B和钟形感受器等 3种感受器;而末节 (第 4节) 可见分布于下唇须的所有 5种感受器,且带槽锥形感受器和有局限性锥形感受器仅分布于该节.除毛形感受器缺如以外下唇须上所有感受器及其公布均与下颚须相似,行为和下颚须一样,下唇须也是与摄食有关的重要器官. 腹刺上有许多刺形厂家器 B, 可能有感受雌性激素的作用.

关键词　美洲大蠊, 下唇须, 腹刺, 感受器, 扫描电镜

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Studies on the Labipalpi and Ventral Spines of *Periplaneta americana* by Scanning Electron Microscopy[20]

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Abstract This is the initial study on the fine structure of labipalp and ventral spine of *periplaneta americana*. Each Labipalpus consists of 4 segments where many receptor hairs adhere. From the basal segment to the distal one the sensilla increase gradually. They may be divided into 5 types: Cheatic sensillum A, Cheatic sensillum B, Grooved sensillum. Perforated sensillum and Campaniform sensillum. Only Cheatic s. B can be seen on the basal segment, while the perfoated s. and grooved s. are distributed on the distal one specially. Ventral spines are not segmented. Many Cheatic sensillum B makes an even distribution on the surface of cylindrical spines.

Keywords *Periplaneta americana*, Labipalpus, Ventral spine, sensillum, Scanning elestron microscopy.

Periplaneta america, a worldwide cockroach, can create serious damages in the home and storehouse. Previous research has shown that the antenna and maxillary palpi of the cockroach have many sensory functions[1~4], the author observed the fine structure of the labipalpi of the cockroach by SEM to search for more understanding of its morphology for future biocontrol studies.

1 Materials and Methods

Small pieces of bread were placed in open bottles and vaseline was spread around the inner upper part of the bottles that were placed in places where cockroaches haunt. 14 male and 16 female roaches caught this way were used in observation.

The labipalpi and ventral spines of each cockroach were dissected from the head after it was anesthetized. They were washed in 95% alcohol for at least 3 times and immersed in HMDS (Hexamethydisilazane) for 3 min., and mounted on stainless steel stubs with double sticky tabs. Then they were stored in a desicator over anhydrous drierite and coated with gold in an Eiko ion coater. Then they were examined with Hitachi S-520

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SEM[5].

2 Results

Labipalpi are pairs of attached organs at the labium of the cockroach. 4 segments can be seen and their sizes were measured under the SEM (Tab. 1). The basal segment is shortest and widest while the distal is longest and narrowest. The total length of labipalpus is about 2.94 mm and the maximum width, 0.42 mm.

Tab. 1 The length and width of segments of labipalp /mm

Segment*	1	2	3	4
Length	0.32 (0.08~0.81)	0.51 (0.27~0.73)	0.85 (0.71~1.00)	1.26 (1.17~1.36)
Width	0.42 (0.17~0.67)	0.38 (0.21~0.56)	0.39 (0.32~0.47)	0.32 (0.28~0.36)

* Segments are numbered 1~4 from the basal to the distal consequently

The morphology of the labipalpi is quite similar to that of the maxillary palpi[4]. There are many scale-like structures on the surface of the terminal segment (Fig. 5, 6), and other segments are not smooth either. The base of each segment often covered by the distal part of the basal one.

There are many sensilla on the surface of every segment. The number of sensilla increase from the basal segment to the distal one where all 5 types of sensilla found on labipalpus can be seen while there is only Cheatic s. B distributed on the basal segment and Cheatic s. A, B and companiform s. can be found on the middle 2 segments. The rest 2 sensilla, grooved s. and perforated s., are special to the distal segment (Tab. 2). Of these sensilla Cheatic s. B is special for its receptor hair having a hole in the middle, the hole is the pathway for chemical substances which enter the sensillum (Fig. 6, 7).

On the distal segment most sensilla are gathered at the distal part where some sensilla are even difficult to be identified (Fig. 2), grooved s. and perforated s. (Fig. 3) are only distributed on the distal half of the segment. The grooves and terminal pore can be seen clearly in Fig. 4, they are the characteristics of Grooved sensillum. Sometimes a pit with many sensilla at the top of distal segment can be seen (Fig. 1), the number of sensilla of one pit was 199 totaled by the author.

No difference was found between the labipalpi of male and female cockroaches, *Periplaneta americana*.

Ventral spines are cylindrical ogans with receptor hairs pointing to the ends and having even distributions from bases to terminals (Fig. 8). On the surface of ventral spine many Cheatic sensillum B with clear grooves on the receptor hair distributed irregularly (Fig. 9). ventral spines are pited by the bases of receptor hairs and neither smooth.

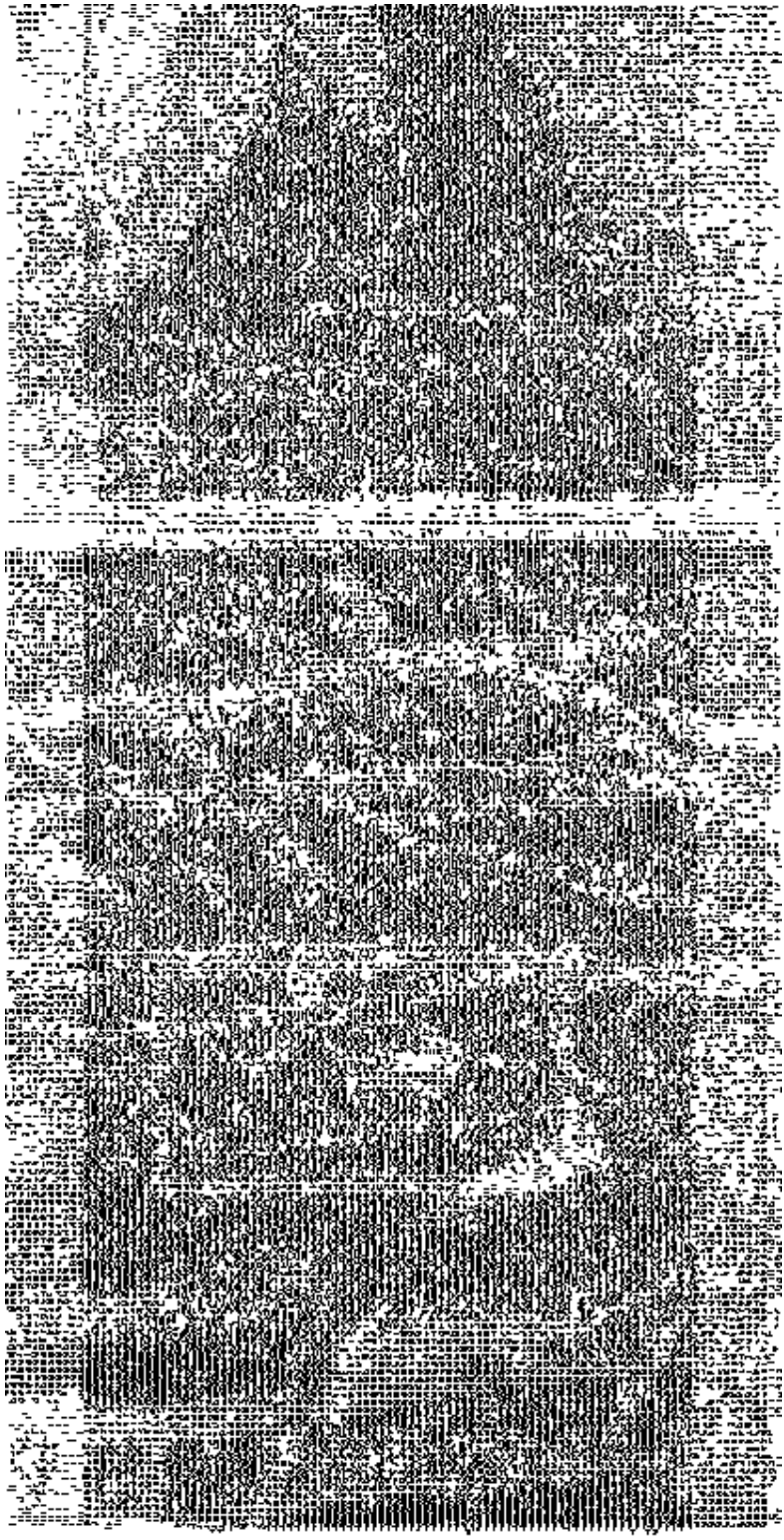

Fig. 1　All 4 segments of a labipalpus× 55

Fig. 2　A part of the distal segment where sensilla gathered× 2 000

Fig. 3　A portion on the distal segment showing Grooved s., Perforated s., and Cheatic s. B(namely G, P and B)× 2 000

Fig. 4　Grooved sensillum on the distal segment showing the grooves and the terminal pore × 15 000

Fig. 5　Scale－structures and Cheatic s. A on basal part of terminal segment of labipalp × 2 500

Fig. 6　Campaniform s. and scales with a root of Cheatic s. B. × 1 000

Fig. 7　A root of Cheatic s. B, showing the hole which is the path of chemical substance in the middle of the root× 5 000

Fig. 8　The whole sight of a ventral spine, no receptor gathering in the terminal× 30

Fig. 9　An amplified part of ventral spine where grooves on Cheatic s. B can be seen very clearly× 150

Tab. 2 The amount of sensilla on segments of labipalpus

Sensilla	1	2	3	4
Cheatic s. A	0	12(9~ 15)	0~ 9	0~ 10
Cheatic s. B	0~ 8	35(30~ 40)	68(32~ 103)	223(101~ 845)
Grooved s.	0	0	0	14(7~ 21)
Perforated s.	0	0	0	15(6~ 24)
Campaniform s.	0	5(1~ 8)	1(0~ 2)	4(2~ 6)

3 Discussion

The morphology and sensilla on the labipalpus of the cockroach are quite similar as those of maxillary palpus reported by Cheng[4] except both the number of segments and type of sensilla of later are more, i. e. maxillary palpus has 5 segments and 6 types of sensilla which include another sensillum called Trichoid sensillum. Therefore, the labipalpus of *Periplaneta americana* may be another important organ in the cockroach feeding.

Because ventral spines are special organs for male cockroach their receptor hairs may have the ability to receive hormones from female one.

Because all sensilla described here are similar to that on the antenna reported by Toh[1,2] and Cheng et. al.[6]. they may have similar functions as those on the antenna.

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