exopodites of the pleopods. There are large numbers of pores on the sterna of the abdomen, particularly around the bases of the pleopods and uropods. It is interesting to note that all the pores face anteriorly – facing the openings of the two oviducts. This siting of the pores is particularly significant when considering the arched condition of the abdomen during spawning – forming the egg chamber. The openings of the glair glands are quite characteristic and differ from the pores of the integumental glands, which never occur as groups. A hand section through a pore region, viewed under the scanner, shows clearly, well developed ducts leading into the glair glands (Figure 1g). Transverse sections through the pore region (Figure 2a) shows that the ducts emerging from the glair glands merge to form a roughly spherical chamber within the integument and it is in these chambers that glair is stored until exuded. The ducts ramify through the entire gland (Figure 2b), leading finally into the integumentary chambers. It is this mass of glair, in the large numbers of chambers within the ventral integument, that gives the creamy colour to the female abdomen in September. Glair glands and pores first appear in the females of *A. pallipes* in the second September of their lives. Pores appear in the integument after the final moult before spawning. So these pores and glands could be looked upon as belatedly appearing secondary sexual characteristics. Also developed early in the life of the female are the oosetae, setae specialized for egg attachment. These oosetae (Figures 2c and d) are found on the pleopods and sterna of females near the glair glands and their openings, increasing in number as the crayfishes grow larger.

Proximally, the oosetae are smooth (Figure 2e), with a pronounced groove in the shaft; it may be that part of the glair moves up the shaft to play some role in the attachment of the eggs. Distally the oosetae are flat in section, bearing very fine setules (Figure 2d) and it is these setules which become intimately attached to the eggs. After egg laying, the glands persist until late July becoming inconspicuous following an early August moult, which takes place when the hatchlings have become totally independent. Soon after the glands start developing again in preparation for another spawning.

Zusammenfassung. In der Deckhaut des sexuell gereiften Weibchens von *A. pallipes* treten Porengruppen auf. Diese Poren überlagern die Schleimdrüsen, die während des Laichens grosse Mengen Schleim produzieren. Die Poren und Drüsen befinden sich auf dem Unterleib und den Pleopoden; die Oosetae, die zur Eiablagerung dienen, befinden sich ebenfalls an diesen Stellen. Dies sind sekundäre sexuelle Charakteristika, die eng mit dem Legen und der Ablage der Eier verbunden sind.

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The Effect of Kryptopyrrole on the Porphyrin Auxotrophic Strains of *Bacillus subtilis*

Kryptopyrrole (2,4-dimethyl-3-ethylpyrrole) increases the level of porphyrin synthesis of *Bacillus subtilis* strain 168, and significantly increases the quantity of coproporphyrin III excreted by the bacterium[1]. The stimulating effect of exogenous delta-aminolaevulinic acid (ALA) on the haem synthesis of several bacteria is well known[2], and the enhanced amount of coproporphyrin III excreted by *B. subtilis*, in addition to the accumulation of uroporphyrin III, is also significant. With regard to the metabolism of kryptopyrrole by *B. subtilis*, some porphyrin auxotrophic strains with an enzymatic block in the first 2 steps of the porphyrin biosynthetic pathway were tested as to their growth on solid medium containing kryptopyrrole.

Bacteria: *Bacillus subtilis* strain 168 trpC2 and hemA1 (lacking ALA-synthetase)[3] and hemB1 (lacking ALA-dehydrase)[4] were used as test microorganisms. Media: YP (yeast extract peptone) medium[5], GGM as a minimal medium[6], supplemented with tryptophan (50 µg/ml) and different concentrations (1, 5, 10 µg/ml) of kryptopyrrole. In some experiments the GGM medium was also supplemented with cysteine (50 µg/ml) and bovine albumin (0.5 mg/ml). Both freshly-prepared and 2-day-old kryptopyrrole solutions were used. The inoculated plates were incubated at 37 °C for 48 h.

Our experiments made so far indicate that neither freshly-prepared nor old kryptopyrrole solution can support the growth of strains hemA1 and hemB1. The question arises whether these bacteria are unable to utilize kryptopyrrole as pyrrole source or whether the kryptopyrrole is unable to penetrate into the cells, similarly to porphobilinogen[4]. The fact that kryptopyrrole increases the haem synthesis of prototrophic *Bacillus subtilis*[1] may be explained in that kryptopyrrole disturbs the bioregulation of the haem synthesis pathway, perhaps via complex formation[7]. binding the iron necessary for haem synthesis.

Zusammenfassung. Nachweis, dass Kryptopyrrol zwar die Porphyrinsynthese in *Bacillus subtilis* Wildtyp stimuliert, nicht aber das Wachstum von Porphyrin-Mangelmutanten dieses Bakteriums ermöglichen kann.

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