S16-3
Symbiotic gut bacteria confer insecticide resistance
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腸内共生細菌による害虫の農薬抵抗性
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Key word : insecticide resistance, insecticide degradation, stinkbug, Burkholderia, Gut symbiosis
Although chemical insecticides are powerful and useful, their abuse has frequently resulted in the development of insecticide resistance in pest insects. Insecticide resistance has been thought evolutionary changes occurring in the pest insect genomes, including alteration of drug target sites, up-regulation of degrading enzymes, enhancement of drug excretion, etc. Here we report a novel mechanism of insecticide resistance: infection with insecticide-degrading bacterial symbiont immediately establishes insecticide resistance in pest insects. A number of pest insects harbor symbiotic bacteria inside their body, wherein symbionts play pivotal biological roles for their insect hosts, such as provisioning of essential nutrients in aphids and taetse flies. The bean bug Riptortus pedestris and allied stinkbugs are in mutualistic association with Burkholderia gut symbionts, which are acquired by nymphal insects from environment every generation. In agricultural fields, fenitrothion-degrading Burkholderia strains are present. We demonstrated that the fenitrothion-degrading Burkholderia strains are able to establish a specific and beneficial symbiosis with the stinkbugs and confer a resistance of the host insects to fenitrothion. These results suggest that the symbiont-mediated insecticide resistance can establish much more quickly than we thought, even in a single insect generation.

S16-4
Establishment of artificial symbiotic system between Escherichia coli and an insect
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Key word : artificial symbiotic system, brown-winged green bug, Escherichia coli
The brown-winged green bug, Plautia stali (Hemiptera: Pentatomidae), is a well-known insect pest that attacks fruit trees in Japan. The mother insects vertically transmit a midgut bacterial symbiont to their offspring by egg surface contamination during oviposition. Therefore, the symbiont can easily be eliminated by egg surface sterilization, and can be experimentally replaced by other bacteria. Using this technique, we attempted to replace the symbiont of P. stali with Escherichia coli K-12. We surface-sterilized the egg masses, and provided the hatchlings with cultivated E. coli. The nymphs established infection with E. coli, and, strikingly, the E. coli-infected insects exhibited significantly improved survival in comparison with uninfected insects, although the survival was drastically lower than the insects infected with the original symbiont. The adult emergence rate of the E. coli-infected group (-30%) was significantly higher than that of the sterilized group (0%) but lower than that of the control group (-90%). Our findings suggest that E. coli is able to partially complement the biological function of the original symbiont in P. stali. The artificial symbiotic system consisting of an insect and E. coli provides an unprecedentedly useful model symbiosis, which will uncover the molecular mechanisms underlying insect-microbe interactions.