

论著

## $\beta$ -氯氰菊酯对斑马鱼胚胎的发育毒性

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**摘要** 目的 以斑马鱼胚胎为模型, 探讨一种高效氯氰菊酯 $\beta$ -氯氰菊酯对胚胎发育的影响。方法 丙酮为助溶剂, 配制 $\beta$ -氯氰菊酯0.05, 0.1, 0.15, 0.2, 0.6和1 mg  $\cdot$  L<sup>-1</sup>, 采用换水式每12 h更换一半 $\beta$ -氯氰菊酯溶液, 对斑马鱼胚胎进行96 h暴露处理, 采用显微镜观察 $\beta$ -氯氰菊酯0.05, 0.1, 0.15, 0.2, 0.6和1 mg  $\cdot$  L<sup>-1</sup>对斑马鱼胚胎发育形态, 测定受精后24 h(24 hpf)自主抽动次数、48 hpf心率及孵化率、72和96 hpf体轴弯曲个体比例等。结果 与正常对照组比较,  $\beta$ -氯氰菊酯0.05, 0.1, 0.15, 0.2, 0.6和1 mg  $\cdot$  L<sup>-1</sup>组斑马鱼胚胎在24 hpf前形态上未出现明显异常, 48 hpf以后表现出体轴弯曲、心包囊肿等不同程度的毒性反应症状,  $\beta$ -氯氰菊酯0.2 mg  $\cdot$  L<sup>-1</sup>组幼鱼胸鳍发育即受到严重抑制且黑色素减少体色偏黄; 随着 $\beta$ -氯氰菊酯浓度的增加, 斑马鱼胚胎在24 hpf时每分钟自主抽动次数由正常对照组的(0.72 $\pm$ 0.19)次增加至(3.83 $\pm$ 1.07)次( $P$ <0.05); 48 hpf孵化率由对照组的(15.5 $\pm$ 4.3)%升高至(98.9 $\pm$ 1.2)%( $P$ <0.05)。 $\beta$ -氯氰菊酯0.05 mg  $\cdot$  L<sup>-1</sup>组72 hpf和96 hpf体轴弯曲个体比例分别为6.6%和10%,  $\beta$ -氯氰菊酯1 mg  $\cdot$  L<sup>-1</sup>组分别为97.8%和100%。结论  $\beta$ -氯氰菊酯对斑马鱼胚胎的神经及形态发育均有明显抑制作用, 并且呈现一定的时间剂量依赖性。

**关键词** [拟除虫菊酯类](#)  [\$\beta\$ -氯氰菊酯](#) [斑马鱼](#) [胚胎](#) [发育障碍](#)

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## Developmental toxicity of insecticide beta-cypermethrin on zebrafish embryos

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### Abstract

**OBJECTIVE** To investigate the developmental toxicity of embryos of beta-cypermethrin with zebrafish embryos as a model. **METHODS** Acetone as a solubilizing agent was used to assist in stock solution preparation. The embryos were exposed to beta-cypermethrin 0.05, 0.1, 0.15, 0.2, 0.6 and 1 mg  $\cdot$  L<sup>-1</sup> solutions for 96 h and inspected daily with microscopy for sublethal endpoints. Half of the solution was replaced every 12 h, 24 hours post-fertilization (hpf) spontaneous movements, 48 hpf heart rate, 48 hpf hatching rate, and 72 h pf and 96 hpf spine malformation rate were detected. **RESULTS** Compared with normal control embryos, no abnormalities were observed in beta-cypermethrin groups before 24 hpf, but pericardial edema and abnormal heartbeat were observed after 48 hpf. Besides, the development of pectoral fin and weak pigmentation was severely inhibited in beta-cypermethrin 0.2 mg  $\cdot$  L<sup>-1</sup> group. 24 hpf Spontaneous movements in beta-cypermethrin groups significantly increased from around (0.72 $\pm$ 0.19) to (3.83 $\pm$ 1.07) movements per 60 s ( $P$ <0.05); 48 hpf hatching rate was promoted from (15.5 $\pm$ 4.3)% to (98.9 $\pm$ 1.2)% ( $P$ <0.05); 72 hpf and 96 hpf spine malformations effects were also detected and quantified for exposed embryos, 6.6% and 10% in beta-cypermethrin 0.05 mg  $\cdot$  L<sup>-1</sup> group respectively, but 97.8% and 100% in beta-cypermethrin 1 mg  $\cdot$  L<sup>-1</sup> group respectively. **CONCLUSION** This bioassay offers useful information and sheds light on the embryonic toxicity of beta-cypermethrin on nontarget organisms.

**Key words** [pyrethroids](#) [beta-cypermethrin](#) [zebrafish](#) [embryo](#) [developmental disabilities](#)

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