

鳥類の視覚性弁別学習におけるビスフェノール A の影響

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ビスフェノール A (BPA: 5ng/g egg weight)をインキュベート前の鶏卵の卵黄内に投与すると、孵化率の低下だけでなく、初生ヒナにおける記憶力の低下がみられる(村岡・竹内 2000)。この学習・記憶に対する BPA の作用機序を調べるために、比較的短時間で成立する下記のような二種類の視覚性弁別学習を用いて影響を比較した。(1)負の強化学習課題：赤色のビーズをつつくと苦味(罰)が与えられ、白色ビーズでは罰も報酬も与えられない。(2)正の強化学習課題：黄色のビーズをつつくと水(報酬)が与えられ、緑色ビーズと青色ビーズでは罰も報酬も与えられない。負の強化学習では、BPA 処理群の 24 時間後の記憶保持率が対照群より低くなり、視覚記憶に関わる脳領域 LPO のシナプス膜タンパク(VAMP)量も対照群より少なくなることがわかった。しかし、正の強化学習では BPA 処理群も対照群とほぼ同様に弁別課題を修得し、24 時間後の記憶保持も対照群と差がなかった。従って、BPA の記憶保持抑制作用は、学習課題の種類によって異なり、正強化学習よりも負強化学習で大きな効果を発現するのかもしれない。

Effects of bisphenol A on the visual discrimination learning in the chick

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In ovo treatment of bisphenol A (BPA, 5ng/g egg weight) was reported to decrease the hatchability of eggs as well as the memory retention level of newly hatched chicks in one trial passive avoidance leaning (Muraoka & Takeuchi 2000). In the present study, we studied the effects of BPA on the two different types of visual discrimination learning in chicks: (1) negative reinforcement learning, chick was punished by bitter stimuli after pecking at a red not white colored bead; (2) positive reinforcement learning, chick was reward by a drop of water after pecking at a yellow not green or blue colored bead. In the negative reinforcement, the memory retention level of chicks from BPA-injected eggs tended to be low, and the amount of synaptic vesicle protein (VAMP) in the brain area LPO was significantly fewer than that of controls. On the other hand, no significant differences were found between BPA-groups and control in the positive reinforcement learning. The present results suggested that the BPA treatment could interfere with memory formation by inhibiting the synapse formation in the brain, only when the training was accompanied by a negative reinforcement such as aversion, but not so when the training was positively reinforced.