

## INTISARI

**Latar belakang:** Fluorida adalah salah satu senyawa kimia yang terbukti dapat menyebabkan masalah kesehatan yang disebut *fluorosis*. *Fluorosis* merupakan gangguan degeneratif yang diakibatkan oleh paparan fluorida konsentrasi tinggi, baik yang diperoleh secara alami dari air minum atau bahan lain yang mendapat penambahan fluorida. Fluorida dapat menyebabkan kerusakan pada otak dan sel-sel saraf karena mampu menginduksi eksitotoksisitas dan stres oksidatif. Kerusakan pada sel pyramidal cortex prefrontalis dapat mengakibatkan gangguan fungsi kognitif dan pengaturan memori kerja.

**Tujuan:** Mengkaji perubahan jumlah sel pyramidal cortex prefrontalis dan memori kerja tikus Wistar (*Rattus novergicus*) jantan dewasa yang terpapar natrium fluorida dengan dosis 5, 10, 20 mg/Kg BB.

**Metode:** Tiga puluh dua ekor tikus Wistar (*Rattus novergicus*) jantan dewasa berumur 12-16 minggu, berat 150-200 gr dibagi menjadi 4 kelompok. Kelompok kontrol (C) mendapat 2,5 ml air suling *Reverse Osmosis* (RO). Kelompok perlakuan 1 ( $F_5$ ) mendapat NaF 5 mg/kgBB yang dilarutkan dalam 2,5 ml air suling RO. Kelompok perlakuan 2 ( $F_{10}$ ) mendapat NaF 10 mg/kgBB yang dilarutkan dalam 2,5 ml air suling RO. Kelompok perlakuan 3 ( $F_{20}$ ) mendapat NaF 20 mg/kgBB yang dilarutkan dalam 2,5 ml air suling RO. Hewan coba diadaptasi selama 5 hari dan ditempatkan dalam kandang pemeliharaan dengan intensitas cahaya 12 jam terang dan 12 jam gelap. Pakan diberikan secara *ad libitum* dikontrol setiap hari untuk memastikan kebersihan dan kecukupan pakannya. Penimbangan berat badan tikus dan pembuatan sediaan NaF dilakukan 2 kali seminggu. Air minum diberikan secara *ad libitum* dari kran Laboratorium Hewan Coba Ilmu Faal FK-UGM dengan kadar fluorida 0,351 ppm yang telah diperiksa di Laboratorium Penguji Balai Laboratorium Kesehatan Yogyakarta Nomor: 019973 s/d 019976/LHU/BLK-Y/09/2014. Pemberian NaF per-oral menggunakan sonde selama 30 hari. Pada hari ke-38 dilakukan uji memori kerja dengan menggunakan *Y-maze*. Pada hari ke-61 dilakukan perfusi dan pengambilan cortex prefrontalis. Penghitungan jumlah sel pyramidal cortex prefrontalis menggunakan metode  $N_v \times V(\text{ref})$ . Data dianalisis dengan uji parametrik yaitu *one-way* ANOVA SPSS 19. Perbedaan dinilai bermakna apabila nilai  $p < 0,05$ . Prosedur penelitian telah disetujui komisi etik Fakultas Kedokteran Universitas Gadjah Mada Yogyakarta dengan nomor KE/FK/224/EC.

**Hasil:** Tidak ada perbedaan bermakna dalam penurunan jumlah sel pyramidal cortex prefrontalis medial antara kelompok C,  $F_5$ ,  $F_{10}$ , dan  $F_{20}$  dengan nilai  $p = 0,944$ . Tidak ada perbedaan bermakna penurunan memori kerja antara kelompok C,  $F_5$ ,  $F_{10}$ , dan  $F_{20}$  dengan nilai  $p = 0,405$ .

**Kesimpulan:** Pemberian natrium fluorida dengan dosis 5, 10, 20 mg/kgBB tidak menunjukkan penurunan jumlah sel pyramidal cortex prefrontalis medial dan memori kerja tikus Wistar (*Rattus norvegicus*) jantan dewasa.

**Kata kunci :** Natrium fluorida, stereologi, memori kerja, sel pyramidal, cortex prefrontalis.

## ABSTRACT

**Background:** Fluoride was one of chemical compounds that proved to be the causal factor of health problem referred to as fluorosis. The fluorosis represented degenerative disorder resulting from exposure to highly concentrated fluoride both naturally contained in drinking water and in other fluoride-added substances. It could cause damage to brain and nervous cells because it was able to induce excitotoxicity and oxidative stress. The damage of pyramidal cells prefrontal cortex could result in cognitive function and working memory regulation disorders.

**Objective:** The study aimed at investigating the number of the pyramidal cells prefrontal cortex and the working memory of adult male Wistar rat (*Rattus norvegicus*) exposed to sodium fluoride at doses 5, 10, 20 mg/kg bw.

**Methods:** Thirty two adult male Wistar rat (*Rattus norvegicus*) of 12-16 weeks of age, 150-200 gr of body weight were assigned to 4 groups. Control group (C) was given 2.5 ml reverse osmosis (RO) distillation water. Treatment group 1 (F<sub>5</sub>) was given NaF at 5 mg/kg bw dissolved in 2.5 ml RO distillation water. Treatment group 2 (F<sub>10</sub>) was given NaF at 10 mg/kg bw dissolved in 2.5 ml RO distillation water. Treatment group 3 (F<sub>20</sub>) was given NaF at 20 mg/kg bw dissolved in 2.5 ml RO distillation water. The experiment animals were adapted for 5 days and put in maintenance cages with light intensities of 12 hours light and 12 hours dark. Fodder was given ad libitum and controlled daily to ensure cleanliness and sufficiency. The weight of the rats was weighted and the NaF preparation was made twice a week. The drinking water was given ad libitum from the tap water of the Experiment Animal Laboratory of Physiology of the Faculty of Veterinary of Gadjah Mada University with the fluoride content of 0.351 ppm and has been examined in the Examination Laboratory of Health Laboratory Office Yogyakarta (number 019973 to 019975/LHU/BLK-Y/2014). The NaF was orally given using sonde for 30 days. Working memory test was carried out in the day 38 using Y-maze. Perfusion and prefrontal cortex removal were conducted in the day 61. The number of the pyramidal cells prefrontal cortex was calculated using  $N_v \times V(\text{ref})$ . Data was analyzed using parametric test one-way ANOVA SPSS 19. The values differed significantly  $p < 0.05$ . The procedure of the study has been approved by the ethic committee of the Faculty of Medicine of Gadjah Mada University Yogyakarta (number KE/FK/224/EC).

**Results:** There was not any significant decrease in the number of the pyramidal prefrontal medial cortex cells among the treatment groups of C, F<sub>5</sub>, F<sub>10</sub>, and F<sub>20</sub> at  $p = 0.944$ . There was not any significant decrease in the working memory among the treatment groups of C, F<sub>5</sub>, F<sub>10</sub>, and F<sub>20</sub> at  $p = 0.405$ .

**Conclusion:** Sodium fluoride does not cause a decrease in the number of pyramidal cells of the medial prefrontal cortex and working memory Wistar rats (*Rattus norvegicus*) adult males at doses of 5, 10, 20 mg/kg bw.

**Key Words:** sodium fluoride, stereology, working memory, pyramidal cells, prefrontal cortex.