

## RINGKASAN

### PENGARUH LOGAM MERKURI TERHADAP KECERDASAN EMOSIONAL PADA SISWA SLTA

Merkuri banyak dijumpai pada limbah industri, limbah domestik, poliklinik gigi, dll. Merkuri yang berasal dari limbah industri sering dibuang pada perairan tanpa pengolahan yang memadai terlebih dahulu, sehingga dapat mencemari lingkungan perairan, ikan, dan masyarakat yang mengkonsumsi ikan hasil tangkapan di daerah tersebut menjadi terpapar.

Merkuri merupakan logam yang berbahaya pada manusia karena sifat toksiknya. Efek toksik merkuri pada manusia bermacam-macam tergantung dari jenis senyawa yang masuk, dosis, dan lama paparan. Efek toksik merkuri pada manusia antara lain sebagai berikut: kerusakan pada ginjal, menyebabkan alergi, mutagenesis, teratogenesis, onkogenesis, kerusakan kulit, gangguan kesuburan, gangguan pada sistem saraf. (Castoldi, 2003). Merkuri yang masuk ke dalam tubuh terakumulasi dalam amigdala (Bernard et al., 2000). Amigdala diketahui sebagai organ vital yang bertanggungjawab terhadap masalah emosi (Haryono, 2002). Menurut Gardner (1993), kerusakan yang terjadi pada areal tertentu di otak manusia akan menurunkan salah satu jenis kecerdasannya.

Kenjeran merupakan salah satu pantai nelayan yang terletak di pantai timur Surabaya. Pantai ini sering dijadikan tempat penelitian oleh beberapa peneliti dan hasilnya menunjukkan bahwa pantai tersebut telah tercemar merkuri dengan kadar yang tinggi, sebagaimana data berikut: lumpur 1,485 ppm, dan kerang 0,518 ppm (Pikir, 1993); ikan 0,2397 ppm, kerang 0,22114 ppm, darah penduduk 0,00248 ppm (Daud, 1996); darah bayi berkisar 1,5 – 199,2 ug/L, dan ASI antara 0,5–92,7 ug/L (Vera, 1998); ASI berkisar antara 65 – 282,2 ug/L (Rahem, 2000); ikan berkisar antara 0,032 - 0,898 ppm, kuku siswa SD Romli Tamim berkisar antara 0,4417 - 15,0101 ppm (Sjarkawi, 2001). Sebagaimana dijelaskan bahwa merkuri yang masuk ke dalam tubuh terakumulasi di amigdala, sementara amigdala merupakan organ vital yang bertanggungjawab terhadap emosi, maka penelitian yang terkait dengan pengaruh merkuri terhadap kecerdasan emosional amatlah penting apalagi sebelumnya belum pernah dilakukan dengan pertimbangan ini maka penelitian itu dilakukan.

Penelitian bersifat observasional dilakukan kepada tiga kelompok siswa SLTA yaitu: siswa SMA YAPITA Keputih untuk terpapar I (paling tinggi), siswa Madrasah Aliyah YASI Kecamatan Labang Bangkalan untuk terpapar II (kelompok paparan sedang), dan siswa SMA Muhammadiyah Sumenep sebagai kelompok kontrol (tidak terpapar). Hipotesis penelitian ini adalah terdapat perbedaan kadar merkuri dalam kuku antara siswa SMA YAPITA di Keputih, siswa Madrasah Aliyah YASI Labang Bangkalan, dan siswa SMA Muhammadiyah Sumenep; terdapat perbedaan kecerdasan emosional antara ketiga kelompok responden tersebut; dan merkuri yang masuk ke dalam tubuh berpengaruh terhadap kecerdasan emosional siswa tersebut.

Sampel diambil secara random masing-masing 27 siswa setiap sekolah sehingga total responden 81 siswa, kemudian diambil kuku dan darahnya. Kuku

ditimbang secara seksama 2 gram dari sampel yang telah memenuhi syarat yang diambil dari jari tangan kiri responden, kemudian kuku tersebut dianalisis dengan menggunakan metode APN di Badan Tenaga Nuklir Nasional (BATAN) Kartini Yogyakarta. Kecerdasan emosional diukur dengan menggunakan instrumen kecerdasan emosional yang berupa kuesioner dan diukur melalui kadar serotonin dalam serum responden. Data dianalisis dengan “Chi-square for trend”, untuk mengetahui perbedaan sekaligus kecenderungan kadar merkuri, kecerdasan emosional antara ketiga kelompok responden. Regresi logistik berganda digunakan untuk mengetahui pengaruh merkuri secara bersama-sama dengan variabel lain terhadap kecerdasan emosional.

Hasil penelitian ini menunjukkan bahwa kadar merkuri pada ketiga kelompok responden menunjukkan kecenderungan yang menurun secara berurutan dari kelompok I (SMA YAPITA Surabaya), kelompok II (MA YASI Bangkalan) dan kelompok III (SMA Muhammadiyah Sumenep) dengan nilai  $p = 0,000$ . Kecerdasan emosional menunjukkan kecenderungan meningkat secara berurutan dari kelompok I, II, dan III dengan nilai  $p = 0,01364$ . Merkuri yang masuk ke dalam tubuh responden dengan kadar di atas normal, berpengaruh terhadap kecerdasan emosionalnya dengan nilai  $p$  hasil analisis regresi logistik sebesar 0,000.

Kesimpulan dari penelitian ini menunjukkan bahwa kadar merkuri yang masuk ke dalam tubuh responden dengan kadar di atas normal menurunkan kecerdasan emosionalnya. Pengaruh itu secara kuantitatif sebesar 42.33%.

Penelitian ini menyarankan kepada peneliti yang akan melakukan penelitian tentang kecerdasan emosional atau kemampuan keagamaan, agar menggunakan instrumen yang telah dikembangkan pada penelitian ini; perlu dilakukan penelitian lebih lanjut pada pantai Labang Bangkalan untuk mengetahui sumber merkuri yang telah mencemari masyarakat setempat; penyelesaian pencemaran merkuri secara komprehensif di pantai Kenjeran harus segera dilakukan dengan memberi sanksi pada siapa saja yang terbukti mencemari lingkungan; pemilik dan pengelola industri harus mengolah limbahnya secara memadai terlebih dahulu sebelum membuangnya.

## SUMMARY

### THE EFFECT OF MERCURY ON EMOTIONAL INTELLIGENCE IN SENIOR HIGH SCHOOL STUDENTS

Mercury is commonly found in industrial waste, domestic waste, dental clinic, etc. Mercury from industrial waste is often disposed in waters without adequate processing, resulting in pollution to water environment and fish. Individuals who consume these polluted fish become exposed to mercury.

Mercury is hazardous due to its toxicity. Its toxic effects to human are various, depending on the digested compound, dose, and length of exposure. The effects of mercury toxicity are, for example, renal damage, allergy, mutagenesis, teratogenesis, oncogenesis, dermatologic disorder, problems in fertility, and neural damage (Castoldi, 2003). Mercury taken into the body is accumulated in amygdala (Bernard et al, 2000). It is the vital organ that is responsible to emotional problems (Haryono, 2002). According to Gardner, damage in certain area of human brain may reduce one of his type of intelligences.

Kenjeran is one of fishery coast in East Surabaya. This location has been used as site of research by several researchers, and the result showed that the coast has been contaminated with mercury at highest level, as seen in the following data: mud 1.485 ppm, and shell 0.518 ppm (Pikir, 1993), fish 0.2397 ppm and shell 0.22114 ppm, population's blood 0.00248 ppm (Daud, 1996); infant blood 1.5 - 199.2 ug/L, and breastmilk 0.5-92.7 ug/L (Vera, 1998); breastmilk ranging from 65 - 282.2 ug/L (Rahem, 2000); fish, ranging from 0.032 - 0.898 ppm, nail of students at SD Romli Tamim 0.4417 - 15.0101 ppm (Sjarkawi, 2001). As mentioned, in the body the digested mercury is accumulated in amygdala, while amygdala is a vital organ responsible to emotion. Therefore, research regarding the effect of mercury on emotional intelligence is important. Moreover, such research has never been conducted before.

This observational study is carried out to three groups of high school children, i.e., students of SMA YAPITA Keputih as exposed I (highest exposure), students of Madrasah Aliyah YASI, Subdistrict Labang, Bangkalan as exposed II (moderate exposure), and students of SMA Muhammadiyah Sumenep as control group (unexposed). The hypothesis of this study was that there was different mercury level in nails of students of SMA YAPITA Keputih, Madrasah Aliyah YASI, Subdistrict Labang, Bangkalan, and SMA Muhammadiyah Sumenep; there was different emotional intelligence between the three respondent groups; and digested mercury has effect on the students' emotional intelligence.

Samples were taken in random, 27 students from each school, so that there were 81 students, from whom nail and blood was taken. Two grams of nail was taken from the left-hand finger of sample who met the inclusion criteria. Nail was analyzed using APN method at Badan Tenaga Nuklir Nasional (BATAN), Kartini, Yogyakarta. Emotional intelligence was measured using emotional intelligence instrument, consisting of questionnaire and the measurement of serotonin level in respondents' serum. Data were analyzed using Chi-square for trend test to identify the difference as well as the trend of mercury level, and emotional intelligence in

three groups. Multiple logistic regression test was used to identify the effect of mercury together with other variables on emotional intelligence.

The result showed that mercury level in three group of respondents had a declining trend, consecutively from group I (SMA YAPITA Surabaya), group II (MA YASI Bangkalan), and group III (SMA Muhammadiyah Sumenep) with  $p = 0.000$ . Emotional intelligence showed an increase, consecutively from group I, II, and III, with  $p = 0.01364$ . Mercury digested by the respondents had effect on emotional intelligence, with  $p$  value from logistic regression analysis was 0.000. The result of this study supported the theory from Barnard (2000) and Haryono (2002) that damaged amygdala may result in emotional disorder.

In conclusion, digested mercury level in the respondents can reduce emotional intelligence. The influence is quantitatively showed that if other factors are controlled, the increase of mercury level more than normal may result in an increase of emotional intelligence disorder as much as 42.33%.

This study suggested to researcher to conduct related study on emotional intelligence or religiosity by using the instruments, which have been developed in this research. Further studies should also be conducted at Labang beach, Bangkalan, to identify the source of mercury that contaminates local population. Mercury contamination in Kenjeran should be overcome by giving sanction to anyone who found to have contaminated the environment. The owner and managers of the industry should adequately process the waste before being disposed.



**ABSTRACT****THE EFFECT OF MERCURY ON EMOTIONAL INTELLIGENCE  
IN SENIOR HIGH SCHOOL STUDENTS**

Kenjeran is one of fishery coast in East Surabaya. This location has been contaminated with mercury at dangerous level, as seen in the following data: infant blood 1.5 - 199.2 ug/L, and breastmilk 0.5-92.7 ug/L (Vera, 1998); breastmilk ranging from 65 - 282.2 ug/L (Rahem, 2000); fish, ranging from 0.032 - 0.898 ppm, nail of students at SD Romli Tamim 0.4417 - 15.0101 ppm (Sjarkawi, 2001).

Mercury is a hazardous heavy metal for human, due to its toxicity. Its toxic effects to human are various, depending on the digested compound, dose, and length of exposure. The effects of mercury toxicity are, for example, renal damage, allergy, mutagenesis, teratogenesis, oncogenesis, dermatologic disorder, problems in fertility, and central nervous system damage. Mercury taken into the body is accumulated in amygdala (Bernard et al, 2000). It is the vital organ that is responsible to emotional problems (Haryono, 2002). According to Gardner, damage in certain area of human brain may reduce one of his type of intelligences. Therefore, research regarding the effect of mercury on emotional intelligence is important. Moreover, such research has never been conducted before.

This observational study is carried out to three groups of high school children, i.e., students of SMA YAPITA Keputih as exposed I (highest exposure), students of Madrasah Aliyah YASI, Subdistrict Labang, Bangkalan as exposed II (moderate exposure), and students of SMA Muhammadiyah Sumenep as control group (unexposed). The hypothesis of this study was that there was different mercury level in nails of students of those schools; there was different emotional intelligence between the three respondent groups; and digested mercury has effect on the students' emotional intelligence.

Samples were taken in random, 27 students from each school, so that there were 81 students, from whom nail and blood was taken. Two grams of nail was taken from the left-hand finger of sample who met the inclusion criteria. Nail was analyzed using APN method. Emotional intelligence was measured using emotional intelligence instrument, consisting of questionnaire.

In conclusion, digested mercury level in the respondents can reduce emotional intelligence. The influence is quantitatively showed that if other factors are controlled, the increase of mercury level more than normal may result in an increase of emotional intelligence disorder as much as 42.33%.

This study suggested to researcher to conduct related study on emotional intelligence or religiosity by using the instruments, which have been developed in this research. Further studies should also be conducted at Labang beach, Bangkalan, to identify the source of mercury that contaminates local population. Mercury contamination in Kenjeran should be overcome by giving sanction to anyone who found to have contaminated the environment. The owner and managers of the industry should adequately process the waste before being disposed.

**Keywords:** Mercury, amygdala, emotional intelligence