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# Allergy Pattern in the EEG

Penny S. Montgomery, PhD

**ABSTRACT.** This paper describes an EEG pattern the author has found to be associated with an allergic response. A consistent 22 Hz frequency pattern has now been observed in more than 100 cases in recordings made with a bipolar (sequential) montage at F4-T4. Case illustrations with examples of this EEG pattern are provided. doi:10.1300/J184v10n01\_09

**KEYWORDS.** Allergy, brain, EEG, immune, brainwaves, hyperactivity

The electroencephalogram makes its most useful contribution to clinicians in the patterns observed in real time EEG recordings, either analog or all digital. Patterns in analog sleep study EEGs allow the classification of sleep stages 1, 2, 3, 4 and REM (Rechtschaffen & Kales, 1968). According to Kiloh, McComas, and Osselton (1972) patterns also characterize the presence of autism, dementia, Jacob Creutzfeld's Syndrome, Alzheimer's, Picks, Huntington's chorea, hydrocephalus, epilepsy, coma and anxiety. Gibbs and Gibbs (1952) likewise described patterns seen in analog EEGs consistent with clinical entities. Ayers and Montgomery (2004) have identified patterns correlated with clinical entities in recordings from the all digital real time EEG, invented by Ayers and on which she holds several patents. Undistorted EEG recording such as those only seen in real time EEGs reveal many patterns which allow for the correlation of specific patterns with specific clinical entities. About twenty patterns have been identified to date; among them a pattern found in allergy has been identified.

Using all digital real time EEG recordings in the allergy prone Kansas area it became evident that a specific pattern was present in the frontal lobe of individuals suffering from allergy symptoms. Investigation over several months and including more than 100 individuals repeatedly demonstrated this specific 22 Hz EEG activity present concomitant with allergy symptoms. It was further noticed that this fast, high voltage, 22 Hz activity was present in the frontal lobes of children with a diagnosis of hyperactivity and may be one of several causes of hyperactivity. Figure 1 illustrates the pattern at a frequency of 22 Hz.

The following series of EEGs illustrate changes in the prevalence of the allergy pattern when medication is used to reduce allergy symptoms. The EEGs were recorded in all instances with a bipolar (sequential) montage at F4-T4. This allergy pattern was not seen with a T4-C4 placement, but only when a frontal site was included. Thus, we know that it is a frontal lobe response.

The first example is the EEG of an eight-year-old boy diagnosed with ADHD. His

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allergies have been controlled with injections over the past year. The frontal lobe activity displayed in Figure 2 is on the day prior to receiving an injection.

In Figure 3 we can readily see the change in the EEG in the same boy the day following his injection. Note the decrease in 22 Hz activity.

Figure 4 displays the frontal EEG activity from the same boy several days after his injection. Note the return of the 22 Hz activity.

It can be seen from the series above that brain wave activity responds to the presence or absence of an allergic reaction. The immune system is challenged in an allergic reaction and the frontal lobe is involved in immune system function (Miller & Cummings, 1999). Thus, the

frontal lobe activation is seen during an immune challenge.

The following series demonstrates the effect of ingesting an allergic substance on frontal lobe activity. Figure 5 displays EEG from the frontal lobe of an 11-year-old boy with a diagnosis of ADHD. It contains several episodes of 22 Hz activity.

This boy's parents believed that he might be allergic to chocolate or sugar. Therefore, he was given a chocolate bar and Figure 6 displays his EEG two hours later. The dramatic frontal lobe change seen in Figure 6 was accompanied by hyperactive behavior.

As seen from these examples, the EEG activity associated with an allergic reaction is

FIGURE 1. The Allergy Pattern

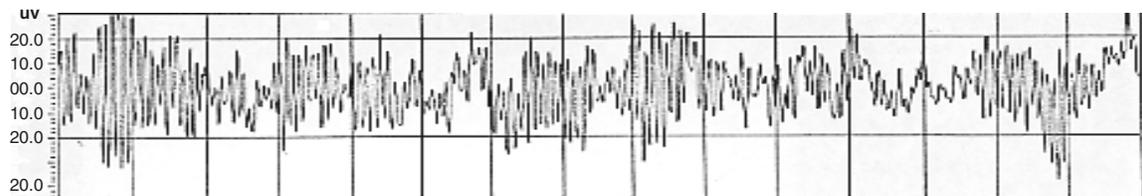


FIGURE 2. Frontal Lobe Activity Prior to an Injection for Allergies

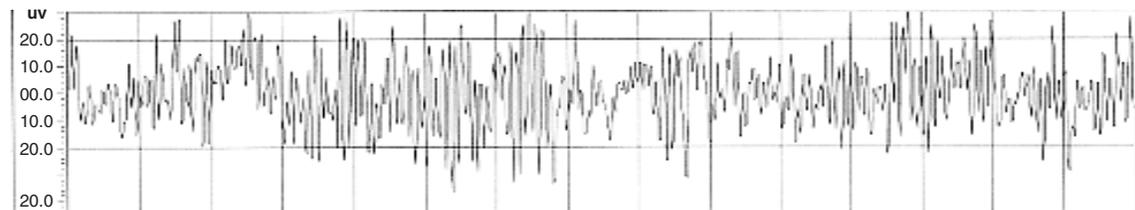


FIGURE 3. EEG Activity Following an Injection for Allergies

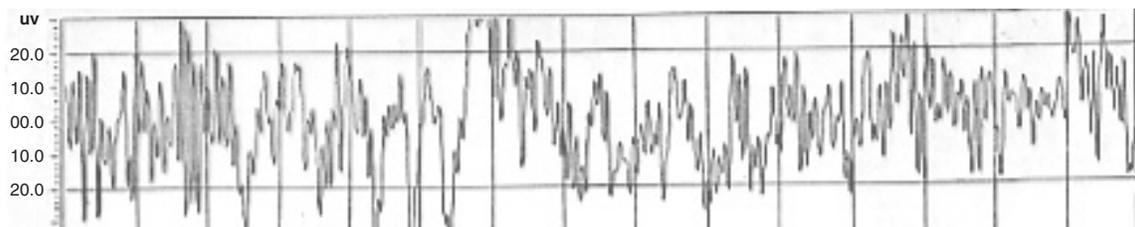


FIGURE 4. Return of the Allergy Pattern

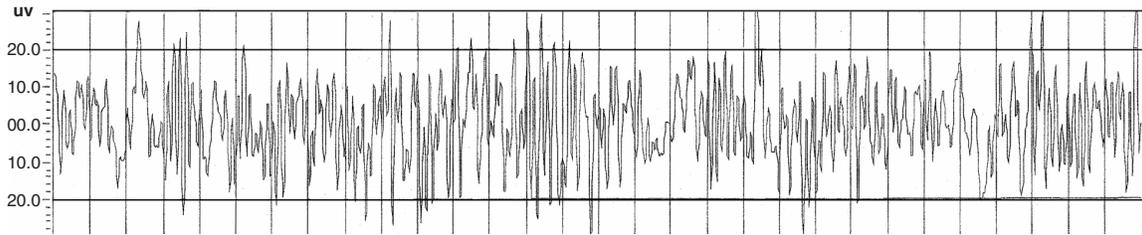


FIGURE 5. EEG Prior to Exposure to an Allergen

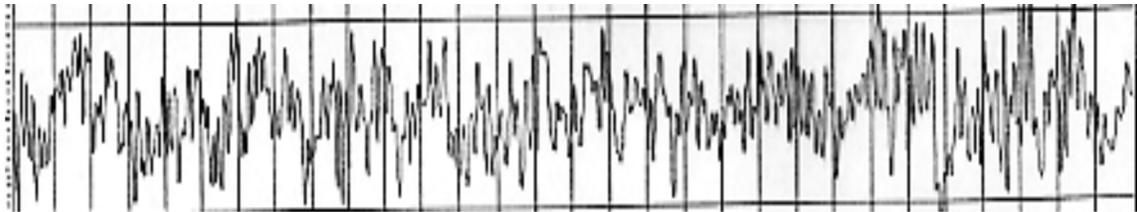
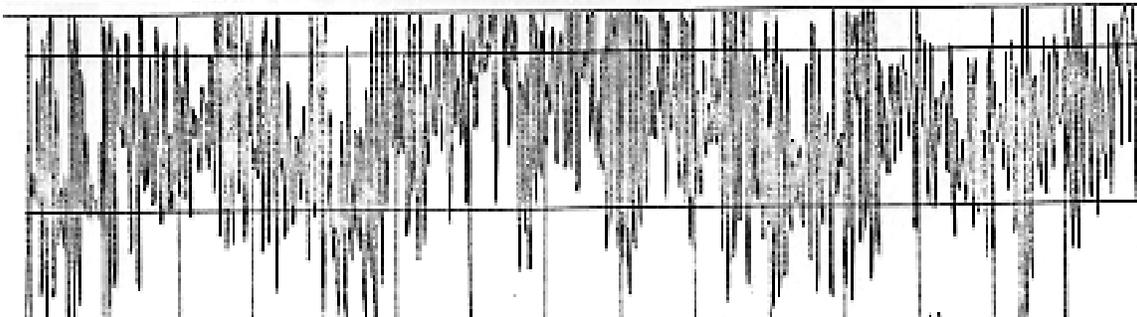


FIGURE 6. EEG Pattern Two Hours Following Exposure to an Allergen



unique. It is a frequency, not a rhythm, and it can easily be distinguished from muscle tension artifact. An EEG rhythm is described as spindle (Kiloh et al., 1972). It resembles a slinky on its side and the waveforms are equal in amplitude and occur as a specific frequency. A frequency, on the other hand, appears as a series of waves of the same frequency but at various amplitudes. The allergy pattern is 22 Hz and varies in amplitude but not in frequency. Thus it may not be called a rhythm, but

rather a frequency. Muscle tension, by contrast is seen as high voltage, fast activity and varies both in amplitude and frequency. This comparison distinguishes the allergy pattern from muscle tension.

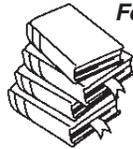
The ability to see patterns in the EEG is essential for precise clinical judgments. It should be emphasized that such patterns are only seen in real time EEG recordings. QEEGs or other Fast Fourier EEG recordings do not reveal such patterns due to destruction of primary EEG data.

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