

*This series of essays explores lessons and observations from fieldwork that might be of interest to the integrative medical community. In this context, the authors discuss "new" or less celebrated botanical medicines and unique healing practices that may contribute to the further development of contemporary integrative medical practices. Perhaps this column can facilitate an appreciation for our own roots and those of other cultures, before such ancient wisdom disappears forever.*

## THE POWER OF SOUND: ETHNOMEDICAL TRADITION AND MODERN SCIENCE

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Indigenous cultures long ago recognized the power of sound on the human psyche. In the same way that they discovered that certain plants of the forest, when properly prepared and ingested, could produce psychoactive effects, they learned that chanting, drumming, and other ways of producing sounds could elicit a similar response. Sound became an important part of daily life, of ritual, and of spiritual belief, and the techniques of producing it were highly valued skills, passed from one generation to another.

Nearly 3 decades ago, I (M.B.) made my way up a small tributary of the Amazon River, in Peru, to visit a group of Bora Indians. I was directed to this place by my teacher, Professor Richard Evans Schultes who had been there the previous year with a team of scientists, to study the chemistry of the plants used by these people. As the river narrowed in its breadth and depth, turning and twisting through the beautiful rainforest, we stepped out of the small canoe and pulled it through the shallow water and rocks that had been worn smooth over time. We had packed enough plant collecting supplies—newspaper, preservatives, plastic bags, and cardboards—to spend 6 weeks with these people—as long as we were able to find a family that would provide us with food and shelter. The goal was to learn about this group's use of palms, in particular one they called *tsitsihu*, the source of an oil made from its fruits that was nearly identical to olive oil. At the same time, we were to observe and collect useful plants, including medicines, fibers, dyes, and foods. It was a most extraordinary way for a young biology student to carry out doctoral research, surrounded by the limitless, unreported phenomena present in an Amazonian forest.

We were graciously taken in by the chief of the small

Peruvian village, who had worked with Schultes and appreciated his love of the forest and its people. During the time we spent in Brillo Nuevo, exploring the plants of the Rio Yaguasyacu and their uses, we were able to make more than a hundred different collections of plants, all new to us. Rain or shine we would be out in the forest with our guides and teachers, making observations and clipping herbs and tree branches, bringing them back to the small thatched house we were provided where they could be preserved for later study. Food was prepared for us by the local people—boiled manioc tubers and flour, fruits from the forest, and whatever game our guides could capture. An occasional handful of lentils or can of fish purchased from a trading post downriver rounded out the meal. We were also privileged to participate in local life, including celebrations and feasts. One such unforgettable event went on for many days and involved members of the neighboring villages as well. A proud possession of this village was a drum, carved long ago from the trunk of a large tree over 6 feet in length and suspended horizontally on a frame mounted on the ground. The tree was hollow, and the stem intact, except for a small opening in the middle. For centuries, this type of drum was used to communicate—to let people know when significant events were taking place, be it the arrival of an important person, an attack by the enemy, or the announcement of a celebration. That day, it was used to proclaim a celebration, with the young men of the village taking turns producing the rhythmic pounding that traveled for many miles through the forest. Each person took a turn at the tree drum, keeping up a special cadence throughout the day and night. The festival went on for several days, and as we did not sleep, the rhythm and beat seemed to enter our minds and our bodies, putting us into a trance state—especially easy given our sleep-deprived condition.

It was then that I realized the full impact of what Schultes had been saying during one of his lectures on psychoactive drugs. He had noted that traditional cultures employed many techniques of entering the other world, a world of spirits and ghosts, psychedelic images and shamans that could direct these forces to carry out good and evil on behalf of a patient.

Among these techniques, the professor noted, were fasting, flagellation, sleep deprivation, and sound—like the drumming that had become a part of us over the past 48 hours. It clearly affected our consciousness and had the power to induce distortions in the perception of space, time, touch, and taste. In fact, drumming is an intrinsic part of the rituals of many traditional cultures—both for everyday activity and special celebration. Drums seem to be a ubiquitous tool of traditional cultures, whether carved out of a tree as in this particular village, or fashioned from an empty turtle shell to be played during a Christmas festival that I observed while walking through a Guatemalan village near Tikal in the Peten. But sound is much more than drumming; it encompasses a wide range of activities, from a monastic chant, to the rush of a river over a waterfall, or the orchestrated resonance of a group of very different musical instruments, as in a symphony. Each of these sounds has the power to affect us in many different ways. Some of these are learned influences—perhaps the sound of a beach brings back nostalgic memories of a blissful childhood experience in some of us.

We are bathed in sound from the time of conception. Even in utero we respond to sound and vibration.

In fact, changes in fetal heart rate have been correlated to external sounds and vibration.<sup>1</sup> Moreover, psychological research has shown that infants prefer the voice of their mother over all other sounds during the first few days following birth. In this study, infants, by suckling on a nonnutritive nipple in different ways could produce either their mother's own voice or that of another woman. Infants learned how to produce their mother's voice and produced it more often than the other voice. The authors concluded that the neonates' preference for the maternal voice shortly after birth may be important for initiating an infant's bonding to its mother.<sup>2</sup>

Several studies also have shown the positive effect of soothing music on postsuctioning agitation, sedative use, and oxygen saturation in neonates receiving care in a hospital newborn nursery.<sup>3,4</sup> In another study, premature infants with low birth weights on formula feeding showed improved feeding, enhanced development, and greater parental bonding with exposure to 30 minutes of music (vocal, lullabies, and children's music), alternating with routine auditory stimulation, 3 times a day during their hospital stay.<sup>5</sup>

In Austin, Tex, music programs have been developed for women to use during childbirth. At the beginning of the third trimester women are enrolled in a service that provides music for listening during labor and delivery. The women selected were expected to have uncomplicated deliveries. Each participant

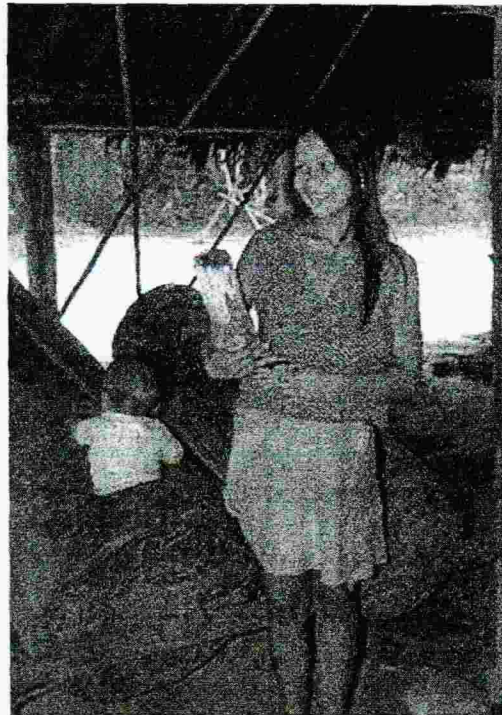
was allowed to choose the kind of music they liked for each stage of labor, and each participant could control the music volume. In the early stages of labor, soothing music was chosen, during the later stages of labor, the music was changed to be more dynamic—generally including a steady beat. After 30 deliveries, it was noted that only half the women who listened to the music required anesthesia.<sup>6</sup> However, an earlier study attempting to assess the effects of music on the use of pain medication during delivery (30 couples) reported a null effect.<sup>7</sup> In this study, the correlation of music choices for different stages of labor were not strictly adhered to, and the majority of the music chosen by the participating couples was "Top 40" or "music of the couples preferences." There is some indication that the couples' selections may have affected the outcome.<sup>8</sup>

A significant portion of cancer patients integrate other therapies as adjuncts to mainstream care.

Music therapy is among these

choices, and a variety of studies have assessed outcomes. One study used music therapy to reduce perceived anxiety in children hospitalized with cancer. The results showed a significant positive effect on well-being of both the child and the parents. Play performance after music therapy was improved in preschoolers and adolescents but not school-aged children. While there was no randomization in this study, the investigators concluded that the pilot was promising and suggested a randomized control.<sup>9</sup> Another study at the Bristol Cancer Help Centre in the United Kingdom, played recorded music for 29 cancer patients aged 21-68 years. Higher levels of salivary immunoglobulin A (IgA) and lower levels of cortisol—measures of positive emotion and immune status respectively—showed improvement, thus linking music heard in a relaxed state to alterations in physiological parameters that may improve outcomes in oncology.<sup>10</sup>

In another study, 47 men receiving radiation therapy were randomized to music of their choice during radiation treatment for pelvic or abdominal malignancies. The State-Trait Anxiety Inventory was administered at the time of evaluation, following



*Maria Criollo demonstrating how children are taught to carry infants in the village of Brillo Nuevo, Amazonian Peru, 1976, using a toy carved from a palm flower. Traditional drums used by the Bora Indians are visible in the background. Photo courtesy of M. J. Balick.*

the initiation of the first treatment, at the end of the first week, the third week, and the fifth week or end of radiation therapy. The results showed that "early intervention with music therapy may be beneficial" for patients with high levels of anxiety.<sup>11</sup>

Women (n=20) awaiting breast biopsy were randomized to music or placebo for 20 minutes before the procedure. The State-Trait Anxiety Inventory was used to measure anxiety, and vital signs before and after the procedure were used to assess differences between the groups. Anxiety and respiratory rates were significantly lower in the experimental group.<sup>12</sup> Similarly for patients undergoing colonoscopy, 32 subjects were randomly assigned to groups hearing music or no music during the procedure. The State-Trait Anxiety Inventory was used to assess mood. Diastolic and systolic blood pressure and heart rate also were measured. The experimental group required less sedation than the control. Furthermore, blood pressure and heart rate was much lower in the intervention group; significantly, there was no change in the anxiety between groups.<sup>13</sup> Music also has been used to reduce anxiety during transurethral resection of the prostate,<sup>14</sup> bronchoscopy,<sup>15</sup> spinal anesthesia,<sup>16</sup> and even flexible sigmoidoscopy.<sup>17</sup> Another study evaluated the efficacy of music among ventilator-dependent patients, whose anxiety can be as high as 70-80%. Among a general population of ventilator-dependent patients, music was played for 30 minutes versus placebo, which consisted of uninterrupted rest for 30 minutes. The State-Trait Anxiety Inventory was administered. After 25 minutes of music, the experimental group showed reduction in blood pressure, no change in respiratory rate and, reduced anxiety.<sup>18</sup>

At the level of immunity, sound in the form of music has interesting and varied results. In one noncontrolled study conducted at the Nagoya City Koseiin Geriatric Hospital, the effects of music therapy on natural killer (NK) cell count and activity (NKCA) were studied in 19 persons with Alzheimer's disease, Parkinson's disease, and cerebrovascular disease. The subjects were assigned to music therapy, and NK cell activity, CD4, CD8, cortisol, and adrenaline levels were measured. The results showed that the subjects had elevated NK cell counts and adrenaline levels 1 hour after the music, but noradrenalin, cortisol, CD 4 and CD8 levels were unchanged. These changes were independent of the neurodegenerative diseases.<sup>19</sup>

In another study evaluating drumming, which has been part of healing rituals in many cultures, 111 volunteers were evaluated for neuroendocrine changes while assigned to 4 possible drumming models (basic, impact, shamanic, and composite) or 1 of 2 control groups (resting and listening). Preintervention and postintervention levels of plasma cortisol, dehydroepiandrosterone, plasma dehydroepiandrosterone to cortisol ratios, NK cell activity, lymphokine-activated killer cell activity, plasma interleukin-2, and plasma interferon gamma were measured. The results showed that drumming increased the dihydroepiandrosterone to cortisol ratios, increased NK cell activity and lymphokine-activated killer activity without alteration in plasma interleukin-2 or interferon-gamma levels.

Additionally, standardized measurements of anxiety and depression (Beck Anxiety Inventory and Beck Depression scale) did not change.<sup>20</sup>

Sounds also can have deleterious effects on our health. A case report described a 23 year old woman admitted to the hospital for generalized seizures. She had a brain magnetic resonance imaging and interictal single photon emission computed tomography (SPECT) with 99m Tc-hexyl methylpropylene-amineoxine (99mTc HMPAO-SPECT), which is a special imaging technique (radiological) that can highlight epileptiform activity anatomically, which showed no abnormalities on admission. Her history revealed that she had 4 generalized (tonic-clonic) seizures at age 18 and 19 years. On this admission her history revealed that following a few minutes of listening to an American pop song, "Dreamlover," recorded by Mariah Carey, she would suffer a complex partial seizure. Sure enough, EEG recordings made while she listened to this song showed 11 Hz rhythmic epileptiform activity in the right temporal lobe.<sup>21</sup> Rats exposed to 80 dB of "rock" music for 24 hours versus controls, which remained in their usual lab environments, were measured for changes in cellular activity. Neutrophils and macrophages from noise-exposed animals were depressed but lymphocyte activity was not affected.<sup>22</sup>

Noise pollution in hospitals has long been acknowledged. At the Rusk Institute in New York, the establishment of a department assigned to control the amount of noise in the hospital was proposed—a "Department of Sound." Also recommended was the judicious use of music therapy for stress reduction as a way to combat hospital noise pollution.<sup>23</sup> Another study evaluated the relationship of job complexity and noise exposure level to changes in blood pressure and job satisfaction over 2-4 years of follow-up. Results showed that among workers exposed to high noise levels, those with complex jobs showed increases in blood pressure (BP) that were more than double the increase in blood pressure for workers with simple jobs. Under low noise exposure, there was a small increase in BP for those with complex jobs but about a 3-fold increase in those with simple jobs. Job satisfaction increased among workers with complex jobs who had much less with exposure to high noise. The authors concluded that exposure to occupational noise had a greater impact on changes in blood pressure and job satisfaction over time among those performing complex jobs.<sup>24</sup>

There is little doubt that sound dramatically affects our psyche and our health—positively and negatively. We can ignore its effects as an aid to reducing stress, or even forget how it can disturb our environment by disrupting sleep and perhaps even healing. We can also reach back into the past, seeking the wisdom of traditional knowledge by finding simple ways of surrounding ourselves with pleasing sounds more consciously in our daily lives. After thinking about the dimensions of this subject, we now realize there is new meaning to the axiom "silence is golden."

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