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# Sentra PM

## Summary (概要)

Sentra PM is designed to initiate sleep and promote both REM and non-REM sleep. REM sleep is associated with rapid spikes on the EEG in multiple species including man<sup>1-13</sup>. The number and duration of REM episodes is associated with restfulness. Sentra PM contains serotonin and acetylcholine precursors along with the stimulatory agent, glutamate, and adenosine inhibitors. These neurotransmitters carry the important chemical signals involved in initiating sleep, organizing sleep cycles while inducing and sustaining restful sleep.

Sentra PM は眠りに導き、REM 睡眠および non-REM 睡眠を促進するように設計されています。REM 睡眠では人間を始め多くの動物の場合、振幅の狭い細かい脳波を形成します。その REM 期の発生回数や発生期間は心の安らぎに関係します。Sentra PM には神経伝達物質のセロトニンとアセチルコリンに刺激剤のグルタミン酸とアデノシン抑制剤が含まれています。これらの神経伝達物質は、眠りに導き、眠りを整え、そして安眠を維持することに関わる重要な化学信号を運ぶ役割をしています。

## Neurotransmitters and the Normal Sleep Cycle

### 神経伝達物質と正常な睡眠サイクル

In the normal sleep cycle, serotonin is produced in the mid-brain and cerebral cortex<sup>14-40</sup>. This initial boost of serotonin and the associated melatonin molecule initiate sleep by inhibiting norepinephrine related cells in the cortex that function in both active and quiet arousal<sup>41-48</sup>. Following the initial burst of serotonin release that lasts from 30 to 90 minutes, there is a decrease in serotonin release. As the serotonin levels fall in the frontal cortex and the midbrain, there is activation of acetylcholine and glutamate containing cells with release of acetylcholine<sup>1; 12; 13; 20; 27; 28; 49-92</sup>. The release of acetylcholine and glutamate in both the cortex and midbrain initiates REM sleep increasing the frequency of events and prolonging the duration of each REM event. An increase in acetylcholine leads to an increased frequency of REM events while increased glutamate prolongs the duration of each event.

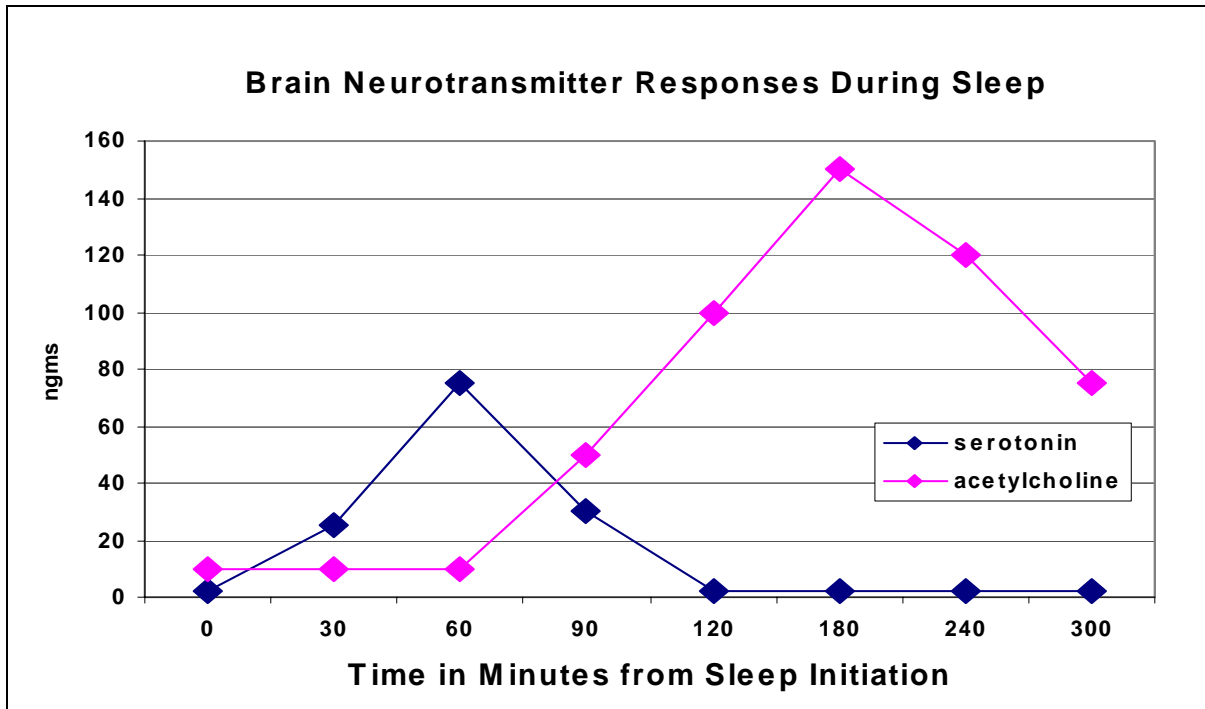
正常な睡眠サイクルの中で、セロトニンは中脳や大脳皮質で作られます。セロトニンの最初の増加とそれに伴ったメラトニン分子が、活動と静寂の両方の覚醒において機能するノルエピネフリン系の皮質内の細胞の働きを抑えることによって、睡眠に導きます。セロトニンの最初の爆発的な放出が30分から90分程度続くと、次第にその放出量は減少します。前皮質と中脳におけるセロトニンのレベルが下がるにつれて、神経伝達物質のアセチルコリンとグルタミン酸を含む細胞が活性化しアセチルコリンを放出します。中脳と皮質においてアセチルコリンとグルタミン酸の放出によって REM 睡眠が始まり、次第に REM 期が多発し REM 期の延長が起こります。グルタミン酸が REM 期の延長をする一方、アセチルコリンの上昇が REM 期の発生の頻度を上げてゆきます。

The sleep cycles are carefully organized. The initial rise in serotonin that initiates sleep leads to the first REM cycle approximately 90 minutes after sleep is initiated. This is termed REM latency. During the first REM cycle, serotonin release is inhibited and acetylcholine release increases. The first REM cycle is relatively short. Following the first REM cycle, serotonin release increases and acetylcholine falls. In normal sleep, this cycle recurs approximately 5 times over the next 4 to 6 hours. Each REM episode progressively increases until the last cycle where the REM episode may last as long as 30 minutes. Each cycle is associated with release of the associated neurotransmitter—REM sleep with acetylcholine and non-REM sleep with serotonin.

睡眠サイクルは次第に整います。眠りに導く最初のセロトニン上昇が、睡眠が始まってから約90分後に最初の REM サイクルをもたらします。これを REM 睡眠潜時と呼びます。最初の REM サイクルの間はセロトニンの放出は抑制され、アセチルコリンの放出が増加します。最初の REM サイクルは比較的短く、その後またセロトニンの放出が増加し、アセチルコリンが減少します。正常の睡眠では、4～6時間の



睡眠の間にこのサイクルを5回前後繰り返し替えます。各 REM 期は最後のサイクルを迎えるまで次第に増加し、最後は30分程度まで続くこともあります。各サイクルは関連する神経伝達物質の放出量に関係します。(REM 睡眠はアセチルコリン、non-REM 睡眠はセロトニン)



Sentra PM を服用後、60分でセロトニンが最高潮に達し、120分でまた抑制され、それに代わってアセチルコリンが60分後から反応を開始し、180分で最高潮を迎える。

Disruption of these normal cycles is associated with a series of disorders including insomnia, sleep apnea, narcolepsy, daytime sleepiness, daytime lack of concentration, loss of memory, depression, and fatigue.

こうした正常の睡眠サイクルの乱れは、不眠症、睡眠時無呼吸症、居眠り病、日中の睡魔、日中の集中力の欠如、記憶障害、鬱病、慢性疲労等一連の睡眠障害と関連があります。

## Disorders of Sleep

### 睡眠障害

#### Insomnia

#### 不眠症

Insomnia is characterized as inability to fall asleep. Insomnia93-96 is characterized by reduced serotonin levels. There is inadequate serotonin released to initiate sleep. Phase 1 and 2 non-REM sleep is eliminated and patients do not enter any of the REM sleep cycles. This leads to daytime sleepiness, increased anxiety, and increased episodes of depression. The ability to concentrate and perform motor tasks is can be impaired.

睡眠に入れない症状を不眠症といい、不眠症はセロトニンの減少によって特徴づけられます。睡眠に入るためのセロトニンの放出が不十分なのです。睡眠の Phase1、Phase2 が欠如してしまうと、不眠症患者は REM 睡眠サイクルに入れなくなってしまいます。この結果、日中の睡魔、不安の増加、鬱状態の増加をもたらします。また、集中して遂行する運動作業能力をそこなうおそれがあります。



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Stress can reduce the availability of serotonin and reduce serotonin release<sup>97-106</sup>. Moreover, diet that is deficient in serotonin precursors can induce reduced serotonin release. If for example, a serotonin deficiency can be induced with a low tryptophan diet in the morning, and during the next sleep cycle serotonin release is delayed, phase 1 and phase 2 sleep is inhibited, and REM sleep is also inhibited<sup>15; 17; 94; 107-131</sup>. Performance the next day is impaired.

ストレスが放出可能なセロトニンの量を減少させ、その放出自体も減少させてしまいます。更に、セロトニンの前駆物質が十分でない食事でもセロトニン放出の減少を導く恐れがあります。例えば、朝食にトリプトファンが少ない食事をとることによってセロトニン不足を招き、次の睡眠サイクルにおいてセロトニンの放出が遅れ、睡眠の Phase1 と Phase2 が抑制され、REM 睡眠も抑制されます。その結果翌日の行動に支障を来すのです。

## Sleep Apnea 睡眠時無呼吸症

Sleep apnea, both obstructive and central, is associated with reduced function of the ninth cranial nerve<sup>132;132-138</sup>. Sleep apnea is characterized by multiple episodes of cessation of breathing for short periods of time resulting in reduced blood oxygen. Major symptoms of sleep apnea include snoring, daytime fatigue, daytime sleepiness, and memory loss. Sleep apnea is associated with heart failure, cardiac rhythm disturbances, and high blood pressure.

睡眠時無呼吸症には中枢性無呼吸と閉塞性無呼吸があり、両方とも第九脳神経の機能の減少と関連があります。血中酸素の減少が結果としておこり、睡眠中に複数回発生する、短時間の呼吸の停止現象を睡眠時無呼吸症といいます。おもだった徴候としては、いびき、日中のけだるさ、日中の睡魔、記憶障害があげられます。睡眠時無呼吸症は心臓疾患、心拍の乱れ、高血圧と関連があります。

Sleep apnea is associated with reduced function of the autonomic nervous system, particularly the parasympathetic autonomic nervous system<sup>3;4;93;139-152</sup>. Both acetylcholine and serotonin deficiencies occur in syndromes associated with sleep apnea.

睡眠時無呼吸症は自律神経系、特に副交感神経系の機能の衰弱と関連があります。睡眠時無呼吸症に伴う症候群においてアセチルコリン不足とセロトニン不足が発生します。

## Sleep Deprivation 断眠

Sleep deprivation occurs in many occupations where either sleep cycles are altered or insufficient time for sleep is available. Sleep deprivation occurs in pilots, soldiers, shift workers, students, police, firefighters, truck drivers, and nurses. Sleep deprivation is associated with reduced arousal, wake time drowsiness, reduced memory, reduced physical performance, and impaired judgment. Automobile accidents and airplane accidents are associated with sleep deprivation. Poor job performance is associated with sleep deprivation. Reduced eye-hand coordination and physical performance is associated with sleep deprivation.

Sleep deprivation, particularly when related to stress, is associated with reduced serotonin and acetylcholine release.

昼と夜が反転して睡眠サイクルが狂ったり、十分な睡眠時間がとれないような職業(例えば、パイロット、兵士、交代制の労働者、学生、警官、消防士、トラック運転手、看護婦)で断眠は発生します。断眠によって寝覚めの悪さ、目覚めのけだるさ、記憶の減退、体力の減退、判断力の低下を引き起こします。自動車事故や飛行機事故はこの断眠と関わっています。また仕事の効率の低下はやはり断眠と関わっています。目と手の協応運動の低下や身体的活動の低下は断眠と関わっています。

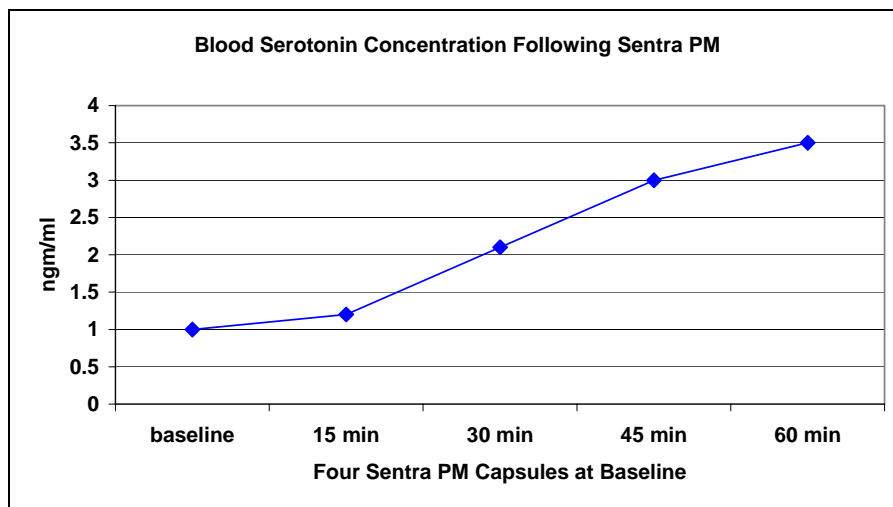
特にストレスに関連した断眠は、セロトニンとアセチルコリン放出の減少に関連しています。



## Sentra PM and Serotonin Sentra PM とセロトニン

Sentra PM provides precursors to serotonin and also provides a mechanism for the uptake of serotonin into nerve roots. This leads to increased serotonin production and activation of the serotonin nerve cells.

Sentra PM はセロトニンにその前駆物質を提供し、神経根にセロトニンが吸収するメカニズムを提供します。これによって、セロトニンの増産とセロトニン神経細胞の活性化をもたらします。



Sentra PM を服用後の血中のセロトニン濃度の変化

## Sentra PM and Acetylcholine Sentra PM とアセチルコリン

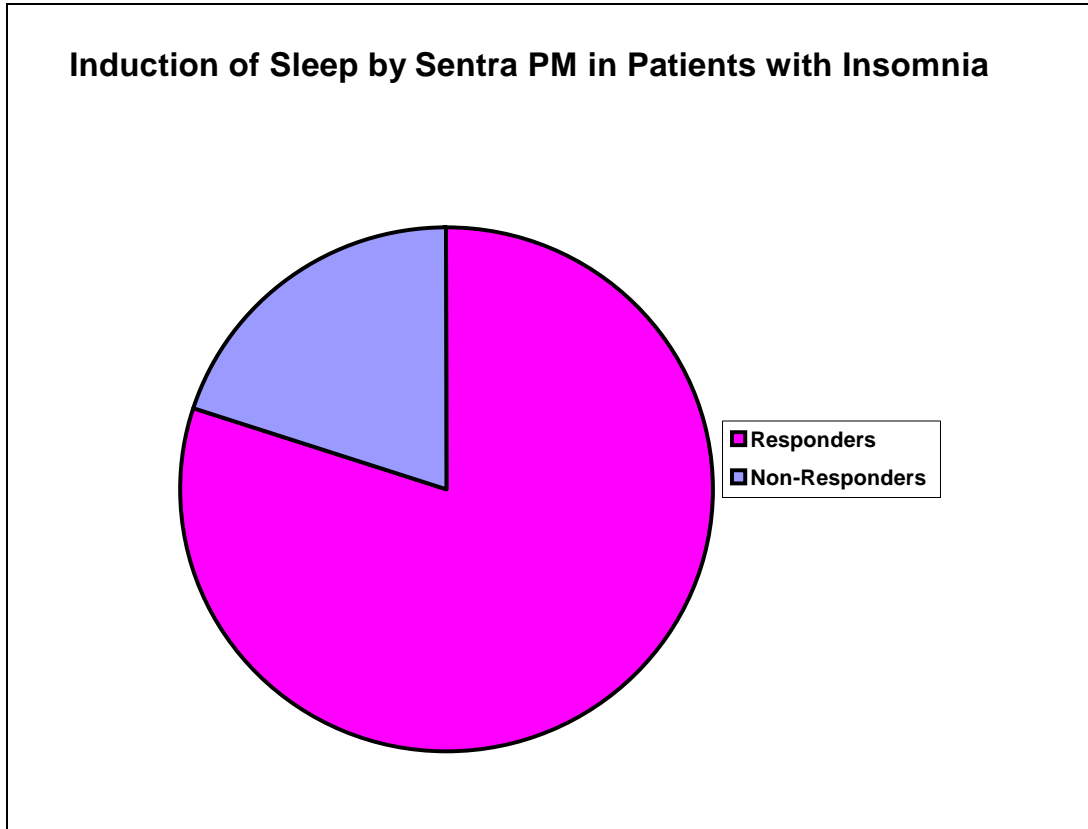
Sentra PM provides precursors to acetylcholine. Sentra PM also provides mechanism for uptake of choline into nerve roots and activation of the acetylcholine producing nerve cells. This leads to increased acetylcholine production. The increased acetylcholine production is measured as increased activity of the parasympathetic nervous system.

Sentra PM はアセチルコリンにその前駆物質を提供します。神経根にコリンが吸収するメカニズムを提供し、アセチルコリンを作る神経細胞の活性化します。これによりアセチルコリンが増産されます。増量されたアセチルコリンは副交感神経系の活動の上昇で計ることができます。



### Sentra PM and Sleep

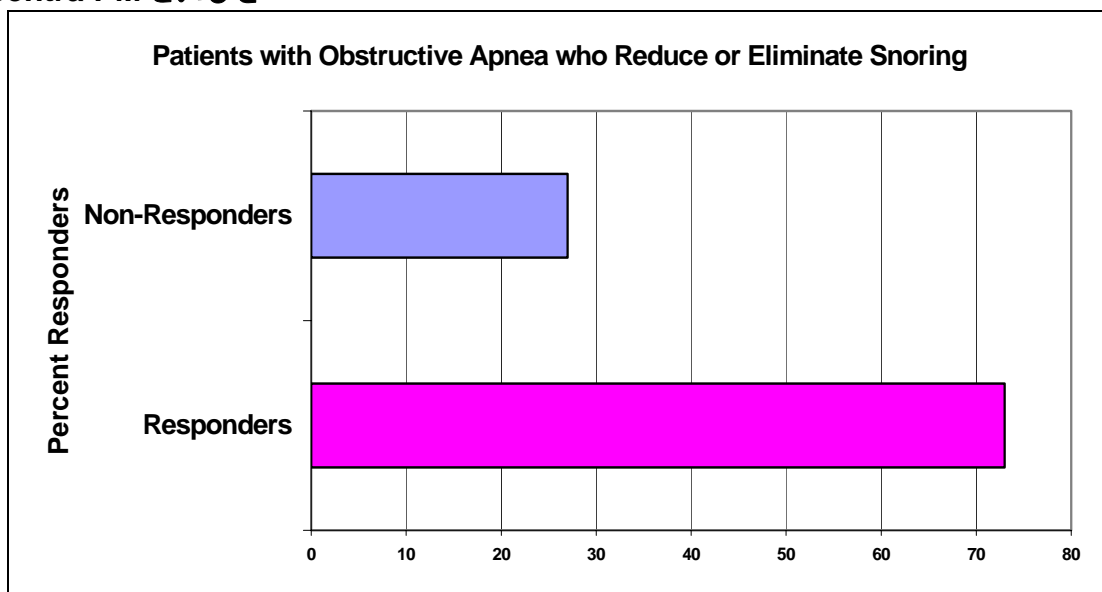
#### Sentra PM と睡眠



80%近くの不眠症患者が Sentra PM の睡眠導入効果を認めています。

### Sentra PM and Snoring

#### Sentra PM といびき



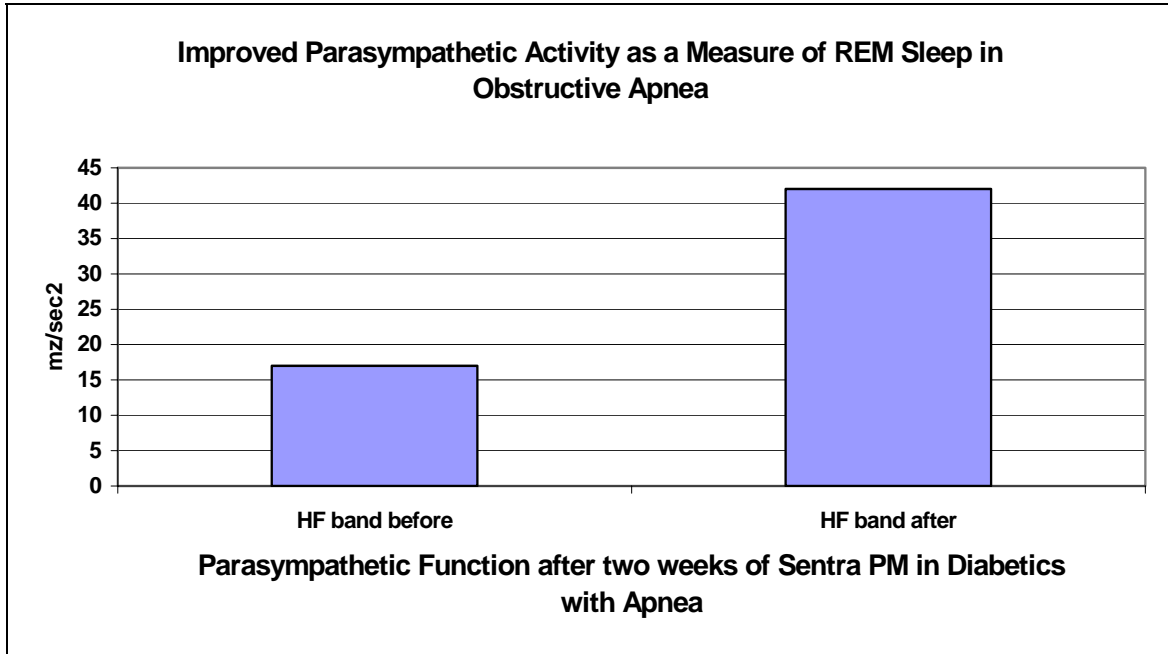
Sentra PM を服用した70%以上の閉塞性無呼吸症の患者が、いびきが減少もしくは無くなったと答えている。



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## Sentra PM and REM Sleep Sentra PM と REM 睡眠



閉塞性無呼吸症の患者が Sentra PM を2週間服用した後に副交感神経の活動が活性化した



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