

# SAVE YOUR EARS!



Self-help of Tinnitus, Hyper and  
Dysacusis, Ear Pressure, Loss of  
Hearing, Deafness and Morbus  
Ménière

**Dr. Lutz Wilden**

**Save Your Ears!**  
**and**  
**A Few Remarks Regarding**  
**Tinnitus Retraining Therapy (TRT)**

**By**

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**“One Day Mankind will Battle Noise Just As Has  
Been The Case  
with Cholera and the Plague”**

**Robert Koch \*11.12.1843 †27.05.1910  
Discoverer of the Tuberculosis Bacterium  
(Mycoplasma tuberculosis)**

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## Foreword

In these times in which we have Wellness and a multimedia abundance of counselors with regard to the human body, its organs and our best possible familiarity with it, you will find in this book and its internet presentation [www.dasgesundeohr.de](http://www.dasgesundeohr.de) the first, worldwide explanation, which should make it possible for every reader or internet user to become informed how his organs of hearing( ears and inner ear organs)

- are biologically formed
- how they work
- how you can protect these wonderful, sensual organs from nonsensical stress and what could be the most important for the majority of readers, how you can help your own suffering organs of hearing and balance, and with patience, if these organs are not already too damaged, even cure them.

This succeeds with the knowledge that our organs of hearing and balance possess a similar capability as the pumping of the heart, the detoxification of the liver, the excretory ability of the kidneys, the movement of the extremities, etc. For the majority of people, undisturbed hearing and balance(special orientation) is such a matter of fact, that they only recognize this when something begins to break down within the system.

The fate to suddenly experience a break-down in the ability to hear or maintain one's balance in varying intensity, whether for years or just now, causes a frightening, confusing, and tormenting burden. We are living in an age of evermore increasing demands and stress on our hearing and balance. All people regardless of age, sex, religion or social position are affected. For them it is already an uninterrupted daily tormented reality or a constantly threatening and pressing danger.

The reasons for this grim scenario, as unlikely as it may seem, are quite simple and clear.

Throughout the world it is generally unappreciated how much the noise which is produced in our civilized societies contributes to the suffering and overburdening, indeed brutalizing, of these highly sensitive, wonderfully constructed inner ear organs daily and over the years and decades.

However, that the total loudness of our modern world represents the single most important reason for the billionfold suffering inflicted on the ears of mankind, must

eventually be recognized as the tragedy increases for all people, just as noise becomes more aggressive throughout the world.

With regard to our organs of hearing and balance, we need to distinguish between two types of ignorance.

One, the innocent ignorance of uninformed people, and, two, the informed ignorance of some of the so-called experts in the scientific world.

I am most concerned with those who are innocently uninformed, and that is almost everybody.

"Save Your Ears" is hereby offered to the public in the hope that this basic biologic information will contribute to the understanding necessary to prevent the progressive oversteering of its ears. For the scientific world this publication offers a platform for cooperative work in this field.

## **Don't be afraid of your Ears**

Noise, especially loud noise, is a real danger to your hearing, and therefore it is advantageous to consider these as unpleasant and threatening. This perception is genuine and true and should not be suppressed into the background. However you should not fear the perceptions your ears otherwise bring, even though they might be very scary. Your ears are so strong, that you will not notice them for years and decades.

This is good, for they are healthy, or, at least, so healthy, that they accomplish all you expect of them without complaint. It is more important to understand the signals which your ears send out when overburdened and overstressed. Nothing which your overstressed ear directs toward you is meant personally. Your ear does not wish to torment you or cause anguish. It simply wishes to inform you of its own anguish and torment through the symptoms caused by the stress it is experiencing.

After the lectures in this book you will no longer need to be afraid of or confused by medically false theories, which wish to remove the emergency signals from your organs of hearing and delegate them to other organs or systems, such as the brain, your psyche, or your neck's spinal column.

From the information presented herein and supported by enjoyable experimentation (active hearing protection) you will experience the natural truth about hearing and its relationship to noise and stress, as well as the ability of the ear to work itself out of its difficulties.



## Tasks of the Organs of Hearing and Balance

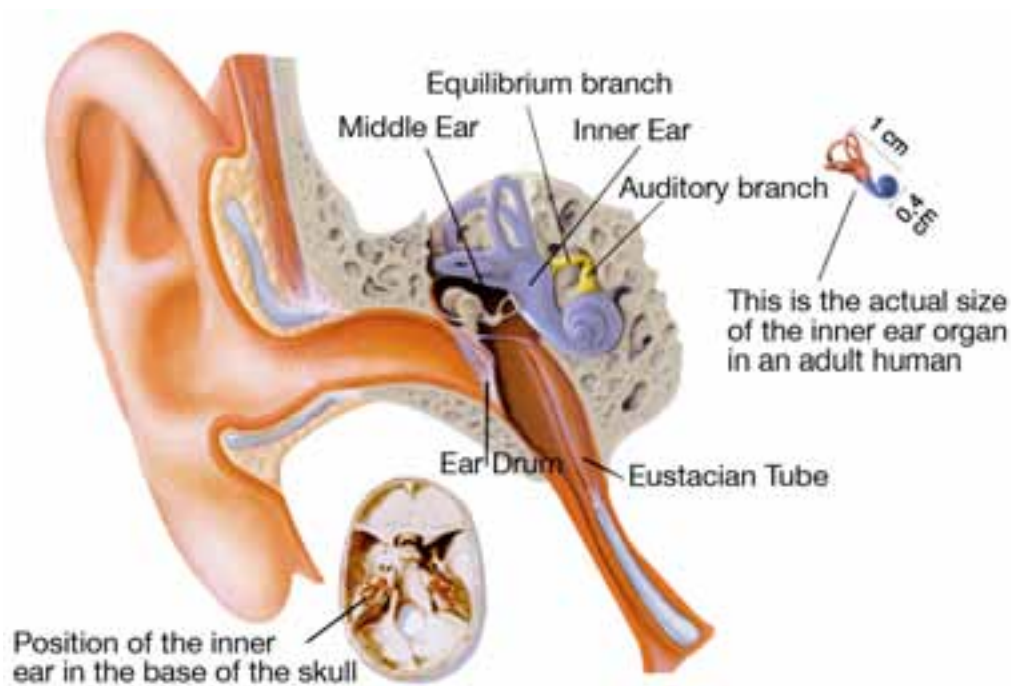


Illustration 1

The basic biologic tasks of the organs of hearing and balance (equilibrium) for both human and animal are:

1. Early warning of danger and
2. Communication to take appropriate action as well as
3. Guarantee of special orientation



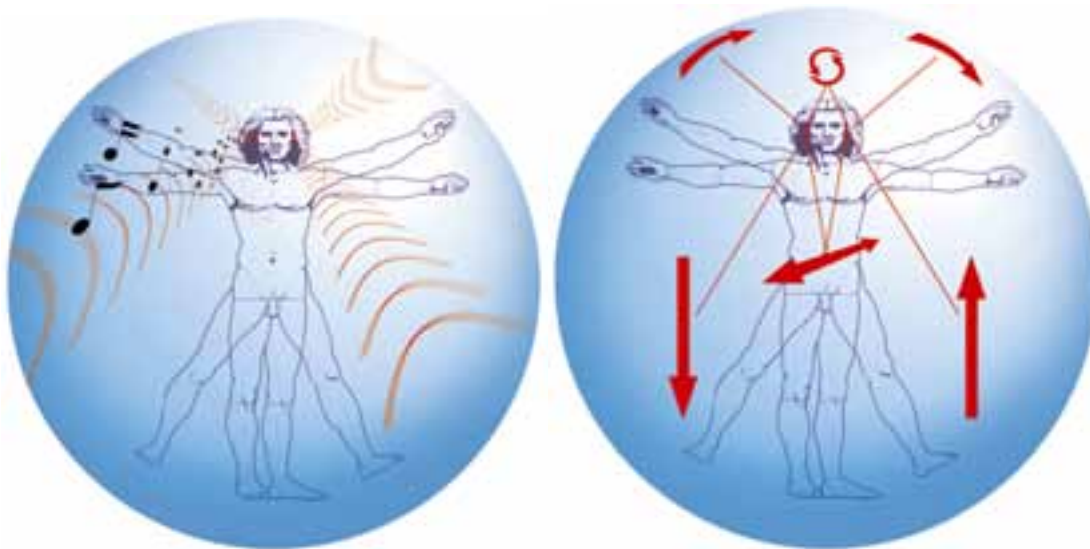


Illustration 2

**Because we have paired organs of hearing, we are able to grasp a three dimensional spacial orientation of our surroundings.**

We hear even though the sound may be behind us to the left, over or under us, beside us, or in front of us.

The same is true for our organ of balance in the inner ear, the labyrinth, which permits a three dimensional orientation in the space around us.

Working together, the organs of hearing and balance constitute the warning, communication, and navigational system of both humans and animals. So like the navigational system of an airplane, which is influenced by external forces which determine the way it is built and functions, physical forces influence the hearing and balance of the organism, which then determine how its organs are constructed and the biological work to be done. The physical forces, which are brought to bear on the organs of hearing and balance, which then must process these stimuli are:

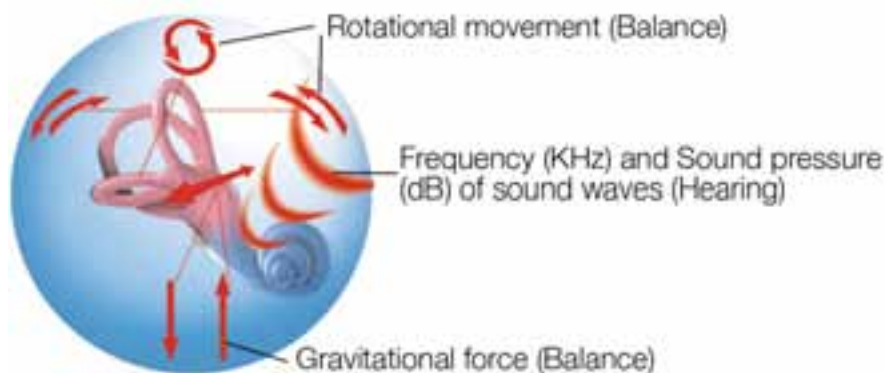


Illustration 3

- a) the sound pressure and the frequency of sound waves for the organs of hearing and

b) the gravitational force and rotational movements for the organs of balance

## The Anatomy of the Organs of Hearing and Balance

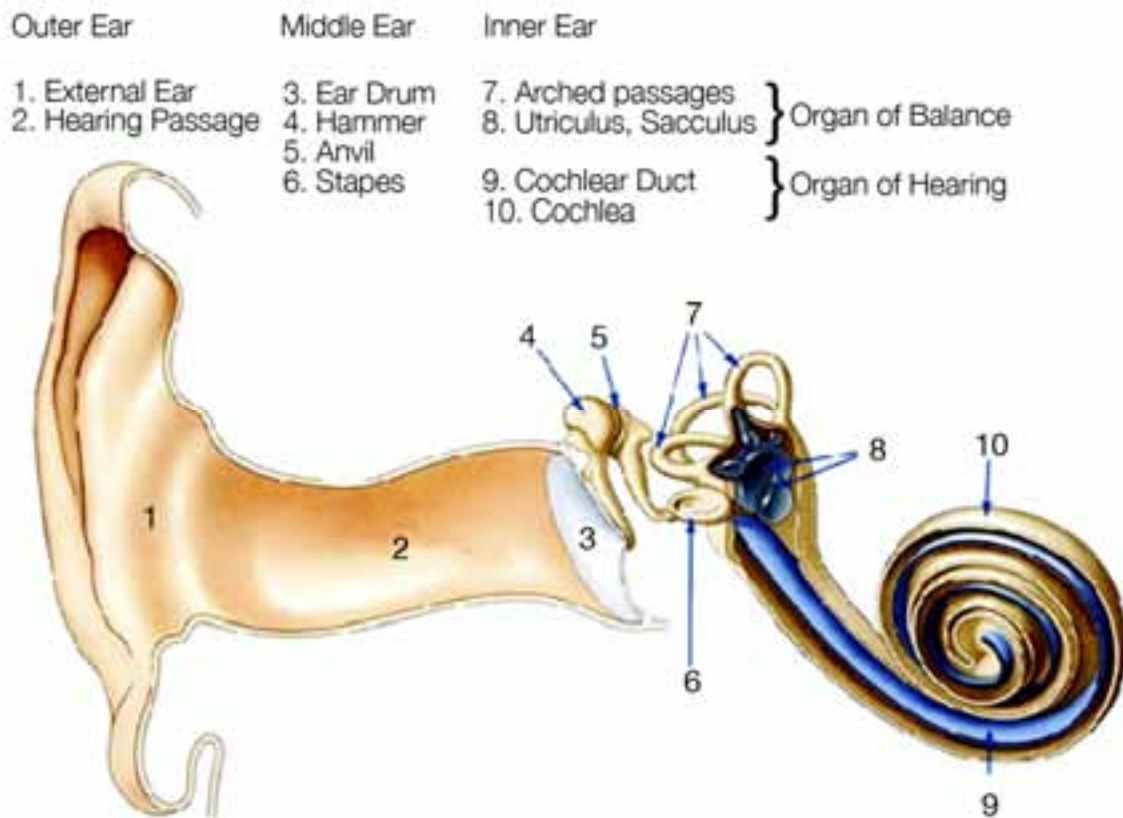


Illustration 4

Sound is captured by the external ear and directed through the outer hearing passage. Sound pressure and the frequency of the sound wave cause the ear drum to vibrate. These are directed onto the hammer. The hammer is connected to the anvil and directs the vibrations onto the anvil, and from there onto the stapes, the third member in the chain of the little hearing bones in the middle ear (or drum cavity). The plate on the stapes lies in the elastic oval window of the inner ear and conveys the vibrations and sound pressure further into the inner ear.

Only in the third section of the organs of hearing and balance do the outside signals convert to biologic signals (nerve impulses). With this the third section of the organs of hearing and balance, the inner ear, accomplishes the greatest and most difficult portion of the work( cellular work).The fourth section of the hearing apparatus, the auditory nerve, then only has to conduct the signals produced above to the corresponding areas of the brain, for hearing, the hearing centre, for balance, the brain stem, in order for us to perceive the experience of hearing and balance.

## The Special Significance of the Inner Ear

As stated above the physical forces work in the inner ear (cochlea). The sound waves as frequencies are measured in Herz (Hz) or kiloHerz (kHz) and sound pressures in decibels(dB).

In the inner ear (labyrinth) the forces of gravity and rotation work.

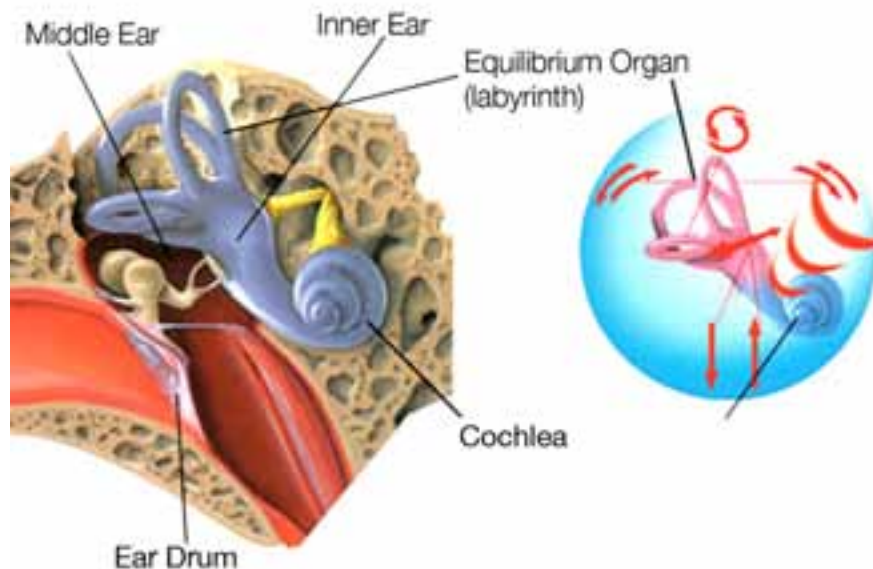


Illustration 5

## The Lymphatic System of the Inner Ear

There is one system filled with fluid through which the cells of perception receive their stimuli. For hearing these are the hearing cells. For balance these are the cells of balance. In detail this fluid system of the inner ear consists of very thin tubules made up of epithelial cells, called endolymphatic and perilymphatic tubules, which lie very close to each other. They are tightly filled with lymphatic fluid.

The perilymphatic tubule lies next to the bone of the inner ear. Within it is contained the endolymphatic tubule, where the perceptive cells of both hearing and balance are located.

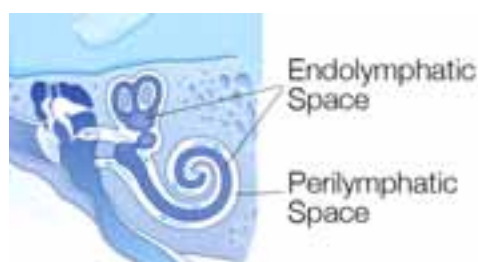


Illustration 6

**Vertical section through the Lymphatic System of the inner ear.**

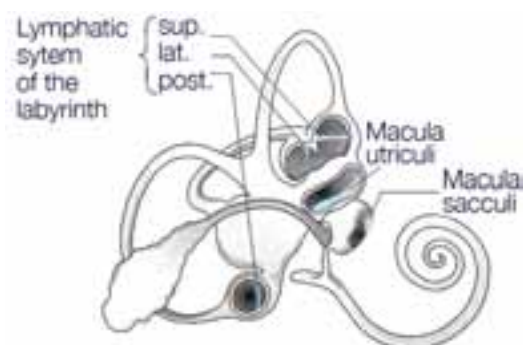


Illustration 7

**Lymph tubule System of the inner ear.**

The lymphatic fluids which tightly fill the endo and perilymphatic systems are rich in salt.

The salt or main electrolyte of the endolymph is potassium( $K^+$ ).

The salt or main electrolyte of the perilymph is sodium( $Na^+$ ).

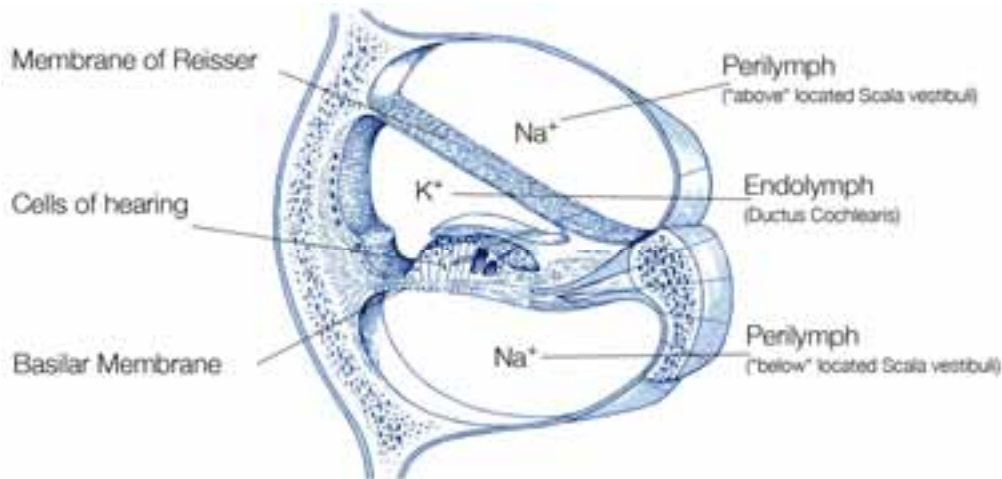


Illustration 8

#### Horizontal section through the Cochlea

The inner ear organ is thereby a “fluid organ” similar to a mussel. Just like this organism is held together and protected by its shell, the inner ear organ is surrounded and formed by an exceptionally graceful, bony shell. Notably here in the smallest space are found two salt solutions of extremely different ionic concentrations lying close together.

The membrane between the potassium rich endolymph in which the cells of hearing are contained, and the sodium rich perilymph, the so-called membrane of Reissner, is extremely thin. It is one of the thinnest membranes in our entire body, and consists of only one layer of cells.

As is generally known, salt solutions of different concentrations, when separated by a permeable membrane, will mix to a uniform solution in the shortest time.

Only when the salt solutions of varying composition are separated by a non-permeable membrane, will they keep their own concentrations stable and “clean”.

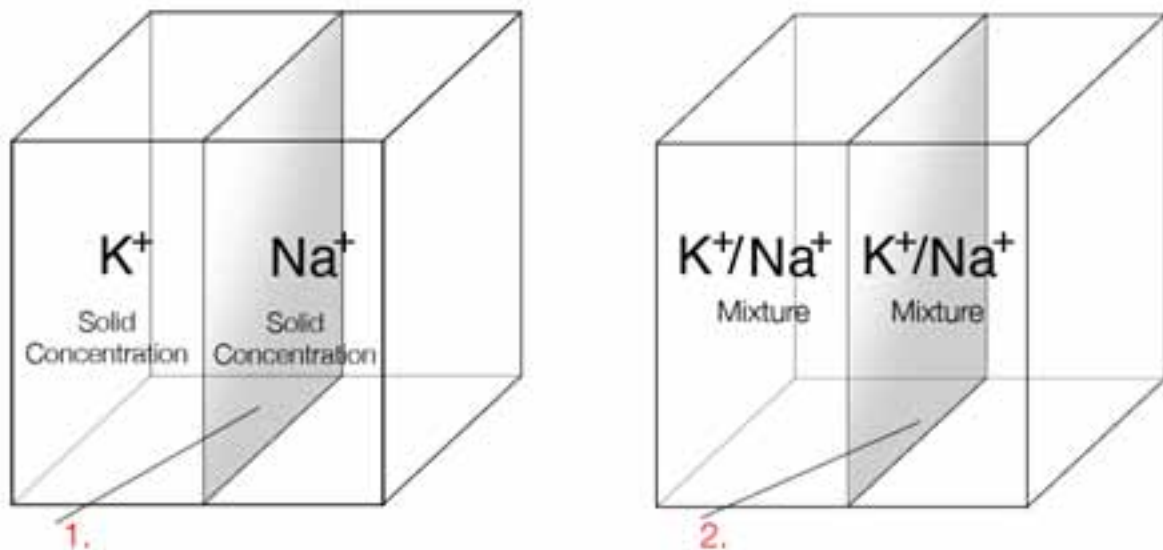


Illustration 9

- 1) Membrane, eg. Glass, non-permeable for sodium ( $\text{Na}^+$ ) and potassium ( $\text{K}^+$ ).
- 2) Membrane, eg. Linen cloth, permeable for sodium ( $\text{Na}^+$ ) and potassium ( $\text{K}^+$ ).

The membrane between the potassium-rich endolymph and the sodium-rich perilymph in the cochlea is, as stated, extremely thin and is equally permeable for  $\text{K}^+$  as for  $\text{Na}^+$ .

At the same time it is extremely important for both hearing and balance that the salt-ion concentration remains constant and stable in the peri- and endolymph even over decades. This is only possible because the inner ear is a living system.

The retention of the ion concentrations in the peri- and endolymph in the living inner ear organ is accomplished by the cells which form and line the lymph tubules. They are the so-called epithelial cells. They are responsible for the constant pumping necessary to retain the extreme variation in the ionic concentrations.

The ion pumps of the epithelial cells are found in their outer membranes. Their work requires very much energy in the form of adenosine triphosphate (ATP). Refer to ATP at [www.dr-wilden.de](http://www.dr-wilden.de).

It has been shown, that many cells expend up to 80% of their entire energy production (ATP production) in operating their ion pumps.



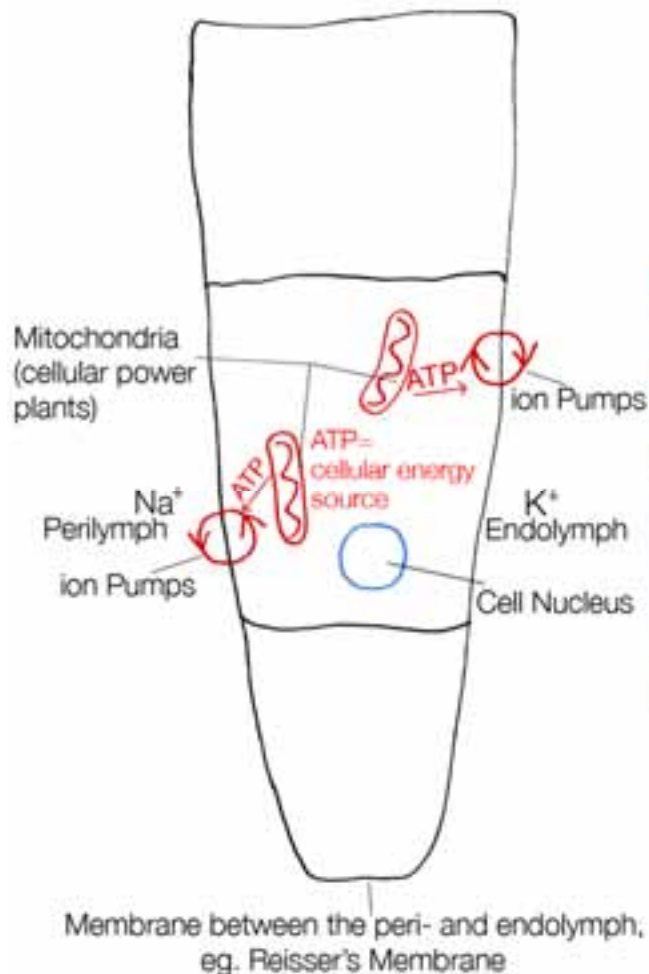


Illustration 10

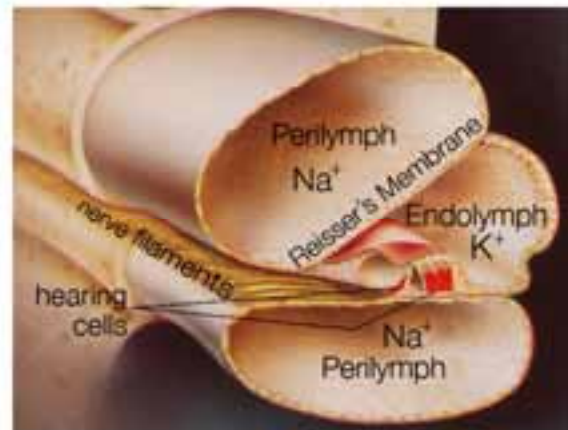


Illustration 11

Just the “normal operation” of the inner ear organ demands an exceptional consumption of ATP to maintain the different concentrations of ions. Then every demand placed on the inner ear organ by increasing auditory pressure and continuing high auditory volume increases the consumption of ATP ([www.dr-wilden.de](http://www.dr-wilden.de)).

The knowledge of these anatomical and physiological properties of the inner ear is very important for the individual.

Thereby it is possible to understand the behavior of the inner ear organ under conditions of acutely or chronically excessive demands on it.

By understanding this the affected individual may possess the ability and readiness to help himself and to avoid future excessive demands on his inner ear organ.

For the protection of the entire inner ear organ (labyrinth and cochlea together) against excessive and harmful demands, it is absolutely important to know, that the degree of burdens to which the lymphatic system of the inner ear is exposed, is directly related to auditory pressure and frequency, thus auditory volume and its time of exposure.

If these are so great, such that the epithelial cells cannot maintain the level of work necessary to keep the ionic salt concentrations intact in the peri- and endolymph, then there will develop changes in these salt concentrations. The consequences of these changes produce volume changes in the lymphatic tubules and therewith also pressure changes. The latter is felt by us as ear pressure.



Pressure in the ear, as though the ear were blocked, or perhaps would feel the way it happens when one lands in an aeroplane, has cotton wool in the ear, or a sensation of numbness around the ear, a short-lived pain in or behind the ear are all unmistakable signs of an acutely excessive demand on the inner ear. These are the symptoms which we experience when the inner ear develops an “dedema” or inner swelling, due to its biologic stress.

Besides this pressure symptom, there can also develop a vertigo or sensation of whirling and unsteadiness.



Illustration 12

**Thus arises the feeling of pressure in the ear, but also vertigo and unsteadiness.**

Auditory pressure (dB), auditory frequency (Hz) and time of exposure determine the burdens in the lymphatic system of the inner ear organ.



Illustration 13

**By using ear protection (ear plugs) the pressure within the inner ear lymphatic system can be reduced.  
This can lead to a considerable relief in the inner ear!**

## The Cochlea, the Organ of Hearing

The organ of hearing is found in the cochlea (snail) of the inner ear.

Schematic of the middle and inner ear:

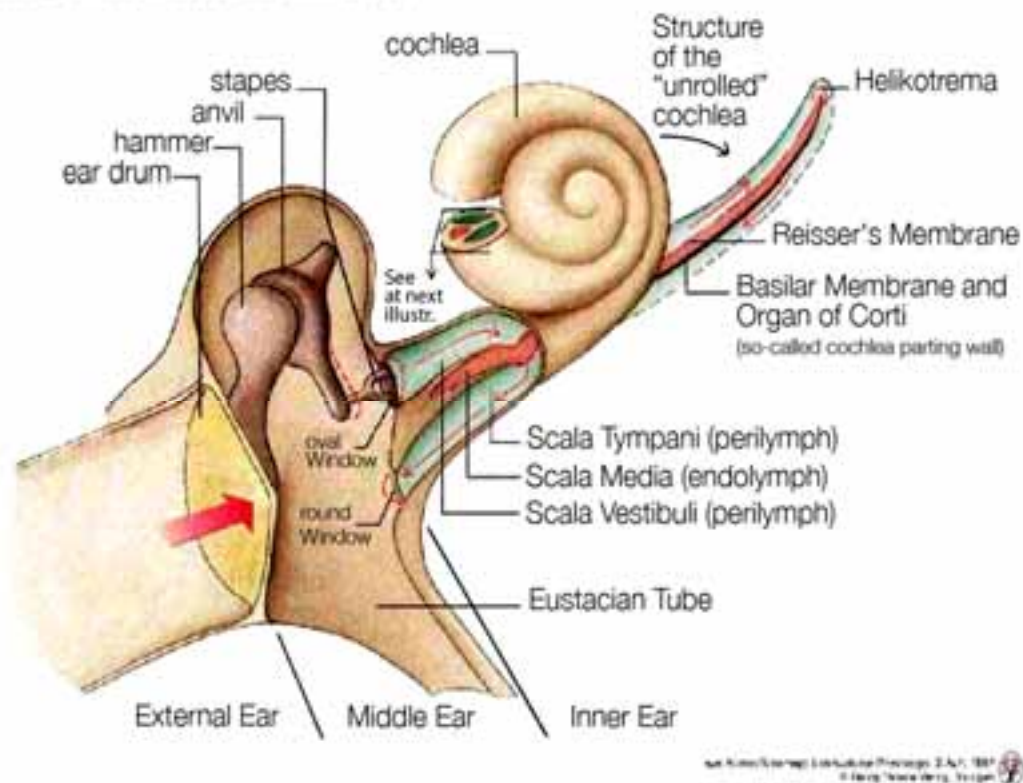


Illustration 14

### Representation of the Inner ear without the Labyrinth (Organ of Balance)

The “heart” of the organ of hearing, the true sense organ, is named after its discoverer, the Italian anatomist, Corti, the organ of Corti.

It is made up collectively of 25000 cells. It rests at the “bottom” of the endolymphatic tubule, the so-called basilar membrane. The endolymphatic tubule lies between the two perilymphatic tubules of the cochlea, the scala vestibuli and the scala tympani.

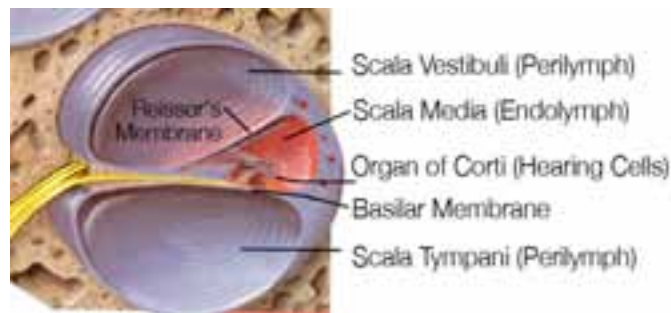


Illustration 15

### Horizontal section through the cochlea

The oscillations (vibrations) and pressures (piston movements) of the stapes are transmitted directly across the elastic oval window of the inner ear onto the perilymphatic tubule scala vestibuli which is situated above.

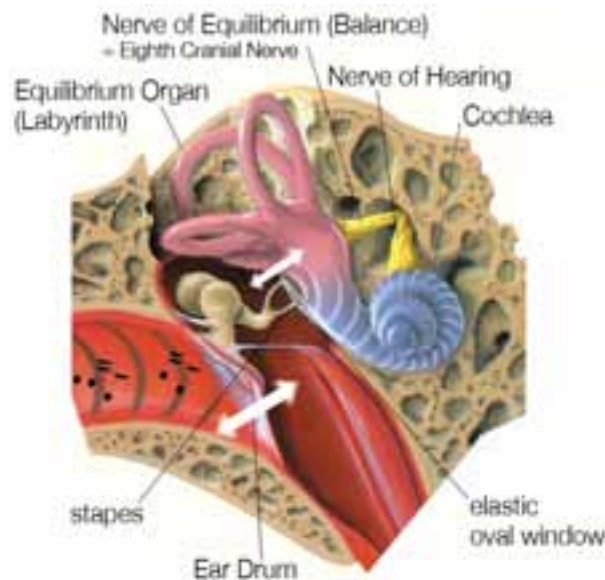


Illustration 16

### Sound produced in the fluid waves of the inner ear

From there the sound pressures and sound frequencies are further directed over the apex of the cochlea (helicotrema) to the perilymphatic tubule (scala tympani) situated below. Thereby all influences operating outside the ear are forced onto the endolymphatic tubule (scala media) and its basilar membrane on which rests the organ of Corti (organ of hearing) containing the 25000 sensory cells.



Illustration 17

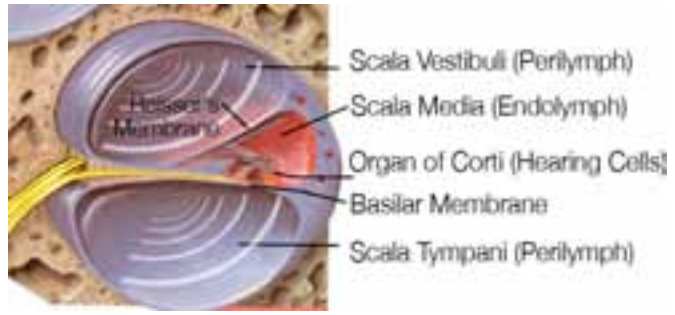


Illustration 18

**17. The stapes conveys the sound pressure through the oval window into the inner ear.**

**18. Cross section through the cochlea which is working with sound.**

The volume displacements in the cochlea caused by the piston movements of the stapes (fluid waves) produce a so-called wandering wave in the endolymphatic tubule (duct) and on the basilar membrane located there. The elasticity of the basilar membrane increases as the apex of the cochlea ( helicotrema ) is approached, allowing the wandering wave to swing farther out, than at the entrance of the cochlea. In the cochlea the high frequency sounds are detected at the entrance, and the low frequency sounds at the apex. High frequency sounds ( frequencies ) are associated with very rapid vibrations in the basilar membrane, which are of lesser amplitude. Deep sounds are associated with slower vibrations in the basilar membrane with correspondingly greater amplitude.

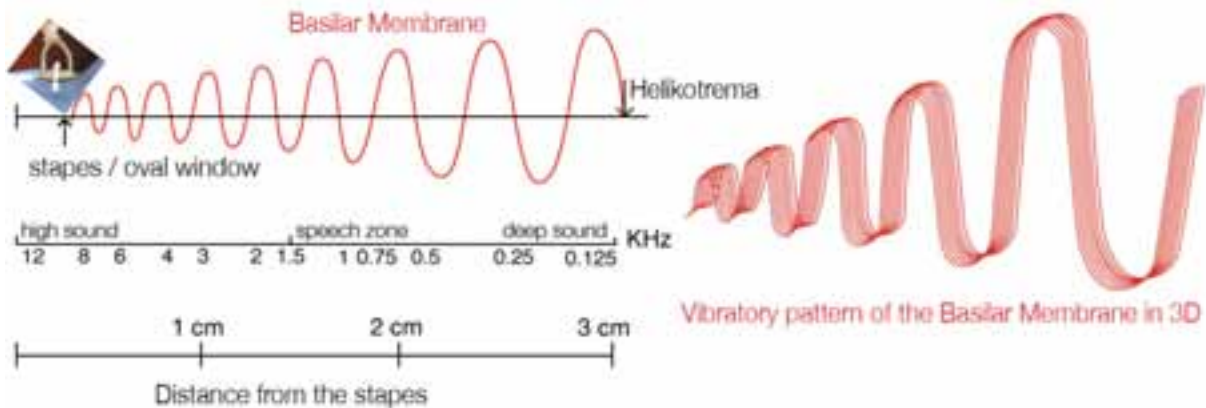


Illustration 19

**Vibratory patterns of the basilar membrane (wandering wave) on which the 25000 hearing cells rest.**

The entire operation resembles the behavior of stringed instruments. For the protection of the ear against overstimulation and harm it is absolutely important to know that it is not only auditory pressure and sound frequency, but also the quality and duration of sounds which determine the mechanical burdens our hearing organ must bear. Naturally high and persistent sound pressures (sound volumes) produce enormous pressure, vibratory and distortional burdens, to which the extremely thin lymphatic tubules, the basilar membrane, and all 25000 hearing cells are arbitrarily exposed.

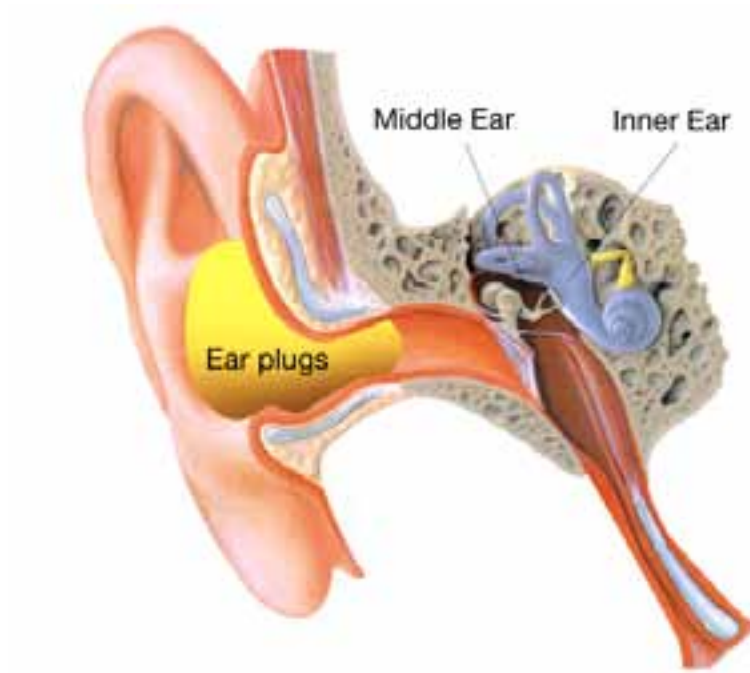


Illustration 20

**By using ear plugs, the pressure on the stapes is reduced. For the basilar membrane and the entire hearing apparatus, this is a meaningful improvement**



## The Organ of Corti in the Cochlea

The true organ of hearing is the collective 25000 hearing cells in its artistic and most graceful architecture.

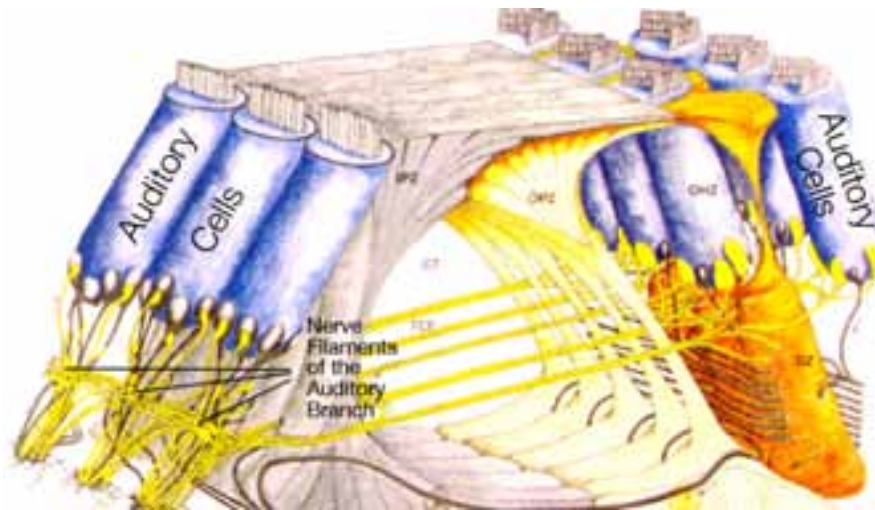


Illustration 21

### Graphic representation of a cut-a-way of the organ of Corti

It traverses the total length of the cochlea, sitting atop the basilar membrane and surrounded by the endolymphatic tubule and follows its convolutions. It begins at the oval window at the entrance to the cochlea and ends at the tip of the cochlea.

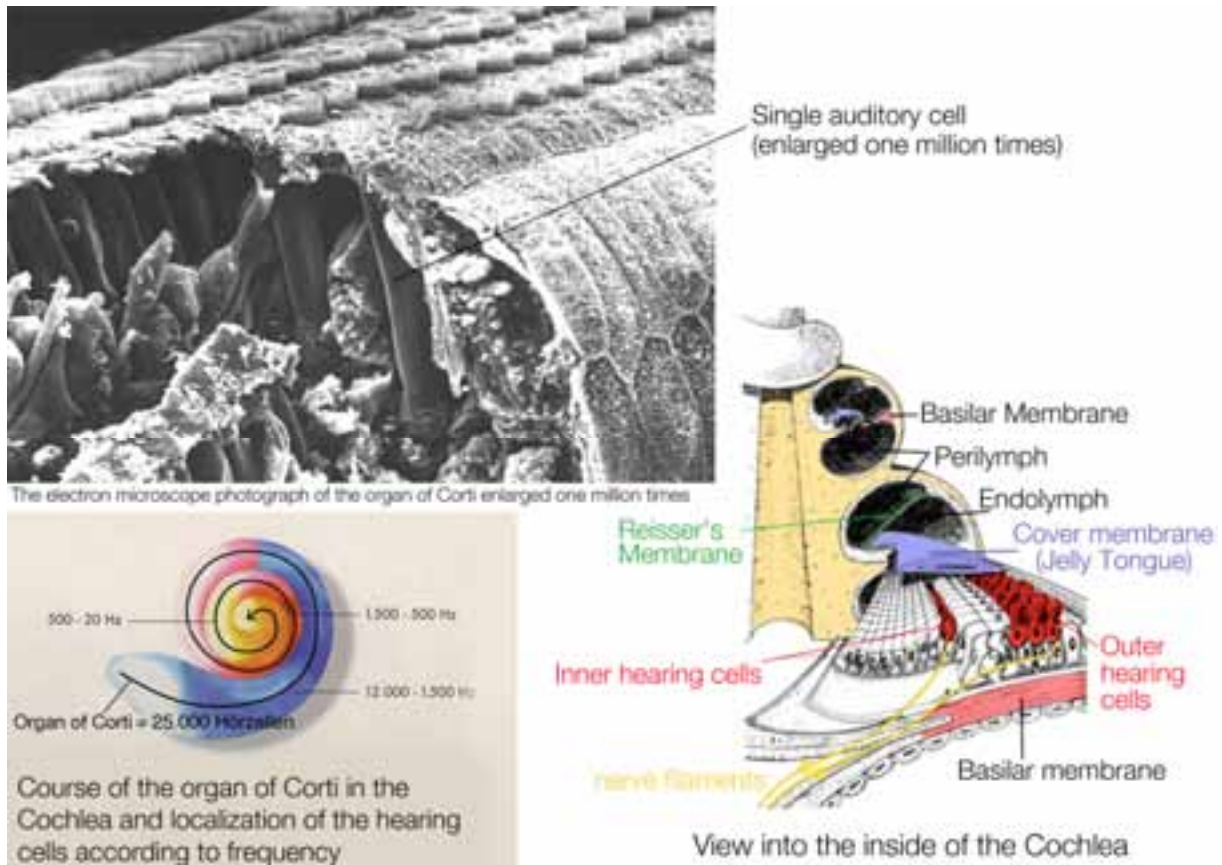
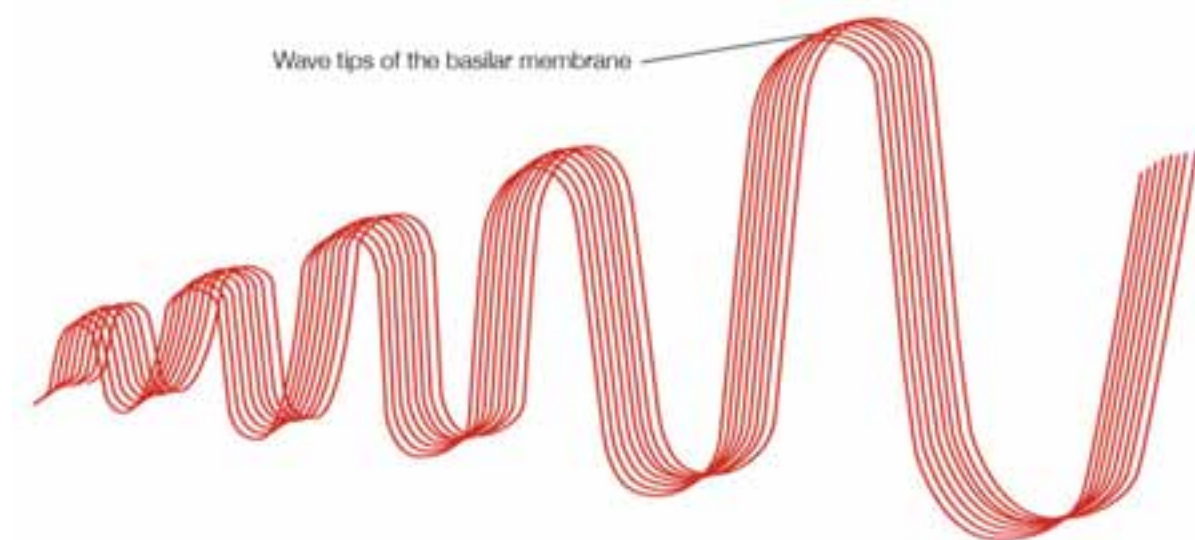


Illustration 22

The higher the sound frequency, the nearer the position of maximum amplitude at the entrance to the cochlea, and with it the position of excitement of the sensory cells of the organ of Corti.

The hearing cells, which are sitting at the wave tips on the basilar membrane, are simultaneously being stimulated. The number of excited hearing cells is thereby very small, since the tips of the wandering wave are very narrow.



Through this mechanism hearing becomes specific to frequency (thus very exact and discriminating ).

This allows the comparison to a fine and narrowly meshed plucking of a guitar string.

Evolution has given us the very broad spectrum of frequency in the human organ of hearing as well as the necessary delicate splitting of frequencies made possible with the help of mechanical characteristics of a tightly filled system of tubules ( endo-and perilymphatic spaces ). Every act of hearing, each sound causes the entire system, the entire organ of Corti to come under more or less vigorous movements. Only quiet brings relief to the system and the opportunity to recover!



## The Cells of Hearing

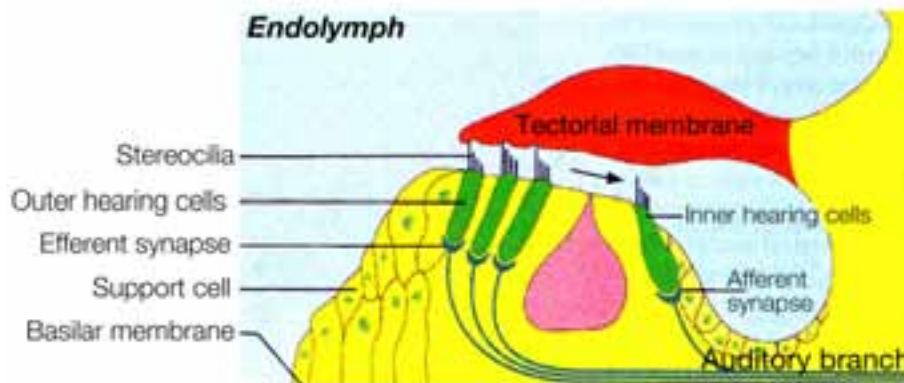


Illustration 23

### Cross-section through the organ of Corti

The conversion of mechanical sound stimuli into recognizable sound has to be effected solely by the cells of hearing. This biologic work is accomplished by raising a mechanical stimulus (inorganic) to that of an electro-physiologic (organic, perceptible) stimulus (electro-mechanical transduction). These cells first have to strengthen the mechanical vibratory properties of the basilar membrane.

To hear very specific sounds only cells which are frequency-specific may be exclusively stimulated. For this the wave tips on which the hearing cells are resting, have to be very sharp-edged.

To make this possible the involved cells of the organ of Corti must strengthen additionally the vibrations of the basilar membrane with each act of hearing.

For this the hearing cells have to shorten and lengthen themselves up to 20000 times per second under their own power.

They operate thereby like accessory motors, which raise up the wander-wave and strengthen its vibrations up to 1000 times at the site where it gives up its stimulus. But only a few of the 25000 hearing cells in the organ of Corti are elevated up in order to become excited at the tip of the wave at any one time.

This process is an outspoken energy requiring cellular process (ATP) for the participating cells. ([www.dr-wilden.de](http://www.dr-wilden.de)).

Through this so-called cochlear amplification, which is accomplished by the active hearing cells, working under considerable consumption of energy (ATP), healthy hearing organs are able to reach high selectivity of frequency.

For the understanding of speech and appreciation of music this is required.

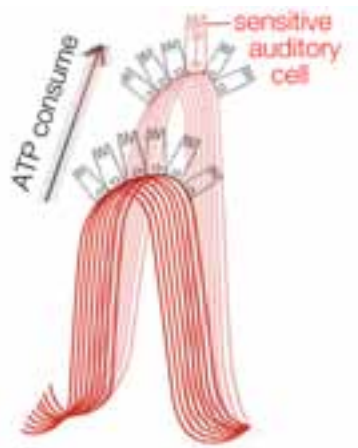


Illustration 24

**With every act of hearing, hearing cells have to strengthen the vibrations of the basilar membrane up to 1000 times according to specific frequencies and under high consumption of energy (ATP)**

At the same time the hearing cells must accomplish the biologic work of converting mechanical stimuli under the most difficult conditions. For one, as mentioned above, they are continuously thrown up and down at every sound event together with the basilar membrane on which they rest and the entire organ of Corti. For another their sensory hairs are more or less continuously moved back and forth violently.

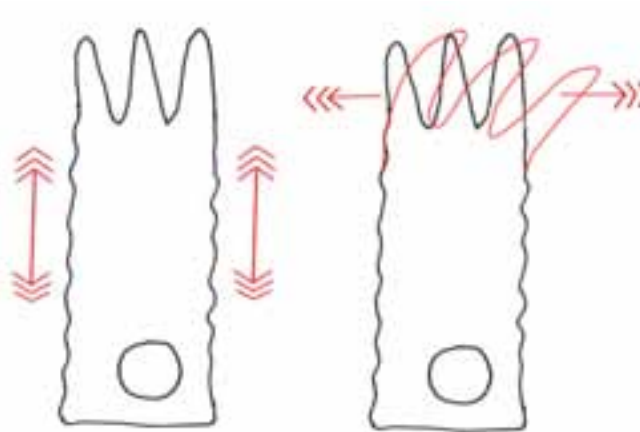


Illustration 25

**Thus are the hearing cells mechanically stressed with each hearing event**

The sensory hairs on the hearing cells are most artistic membrane protrusions of the hearing cell and a part of the cell itself.

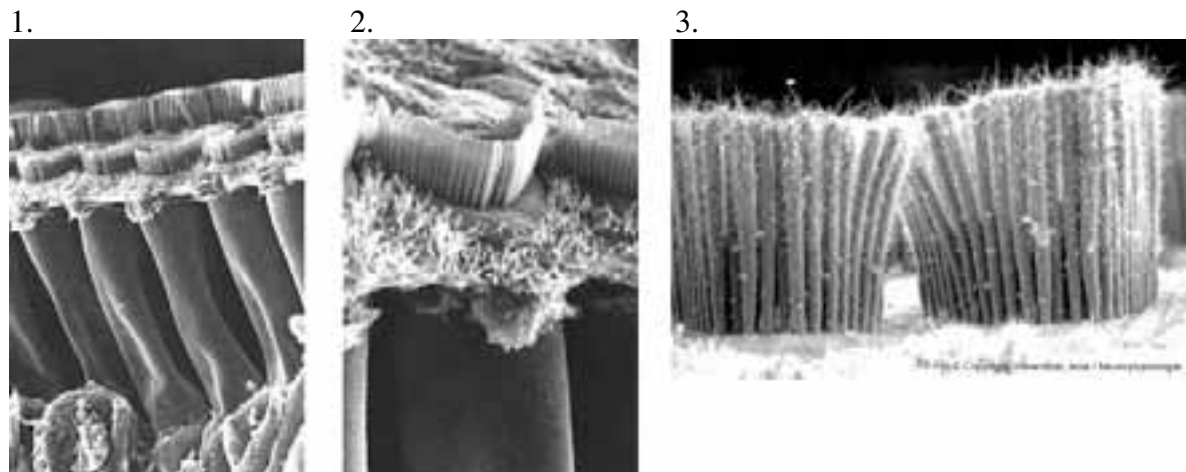


Illustration 26

**Electron microscopy of the hearing cells, zooming in on the hair cells. Enlargement times one million**

They tower up into the endolymphatic space of the endolymphatic tubule and thereby protrude with their tips into a gelatinous tongue, which hangs over them like a moveable ceiling and which is a part of the total fluid and covering of the vibratory system. This fills out the cochlea and comes into more or less vigorous motion at each hearing event.

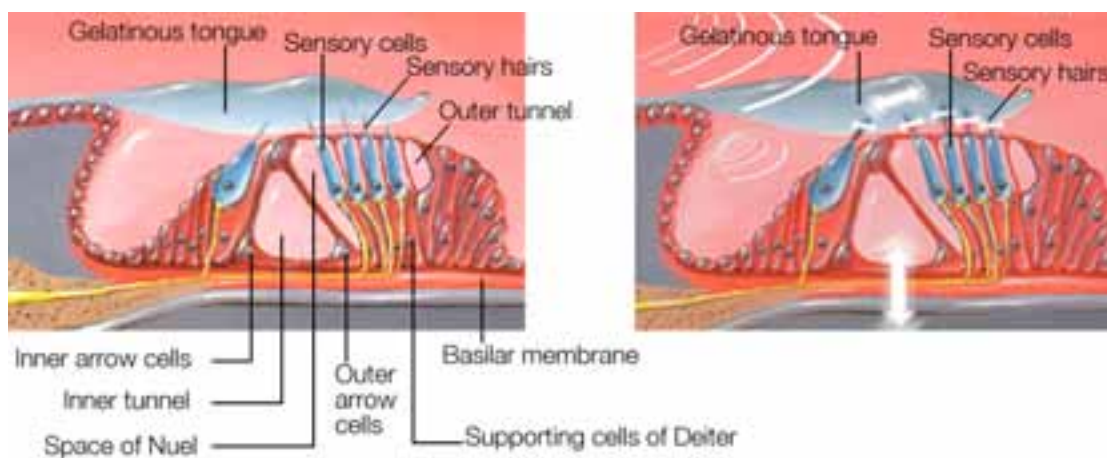


Illustration 27

**Organ of Corti at rest**

**Organ of Corti in motion**

As mentioned above, the movements produced by sound are forced upon the highly sensitive hearing cells including the vigor as well as the rate and length of occurrence. But not only this.

Whether they like it or not, they have to accomplish their entire sensory work load.

This means, they must respond to these compulsory movements of their membrane protrusions ( sensory hairs) by sending out nerve signals uninterruptedly. Since we really never hear only single frequencies, but rather uninterrupted sounds of all kinds, the entire 25000 hearing cells, indeed the entire organ of Corti, have to work almost always and almost uninterruptedly, at every hearing event.

When one considers the number of hours each day involved in hearing, or else, how limited the time is in which our ears have rest, then one may estimate how severely day by day our ears are burdened. Simultaneously one has to recognize the considerable accomplishments they and the entire hearing apparatus perform for us.



Illustration 28

**By using ear plugs the pressure on the stapes is reduced. This allows considerable relief to the hearing cells and the entire inner ear organ**

If one wishes to really understand his organ of hearing, especially when it emits the first signals of its biological distress, or if one has to live years, even decades, with the symptoms of severe inner ear distress, it is necessary to delve a bit deeper into the biologic realities of the hearing cells.

## Each Cell of Hearing and Balance is an Individual in Itself

As we all know, humans, animals and plants consist of cells. That is, they and we consist of a mosaic of individual, autonomic, living entities.

An adult human consists of about five trillion individual cells. All of these must work together closely, and are directed in the collective organism to work together for their own individual life and survival, but nevertheless each of the five trillion cells is in itself a separate cellular being. It is surrounded by a covering ( the cellular membrane ) and has its own cellular organs.

Notably all our bodily cells possess the same cellular organs. Of course there are various cell-types in the body, eg., skin cells, fat cells, cartilage cells, bone cells, muscle cells, nerve cells, and the cells of hearing and balance as well.

Each cell type has its own appearance and its own special functions:



Illustration 29

The basic cellular structure and the cellular internal organs necessary for life are, however, the same for all cells.

Just as we humans are all different, but yet possess the identical organs, eg, liver, lungs, heart, stomach, intestines, kidneys, etc., this is also true for each of the five trillion cells which make up our bodies, and, of course, for the cells of hearing and balance.



Illustration 30

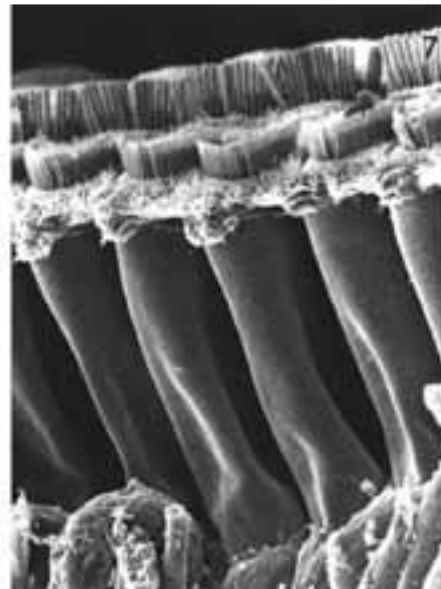


Illustration 31

**Schematic representation of a cell**

**and electron microscopic photograph of hearing cells, enlarged times one million.**

- 1) Cell nucleus 2) Mitochondria (cellular power plants) 3) Golgi apparatus (The “intestine” of the cell) 4) Endoplasmic reticulum (“liver” of the cell) 5) Communications organ (sensory organ of the cell) 6) Cellular membrane (“skin” of the cell) 7) Membrane projections (=hairs)**





Illustration 32

**Hearing cell**

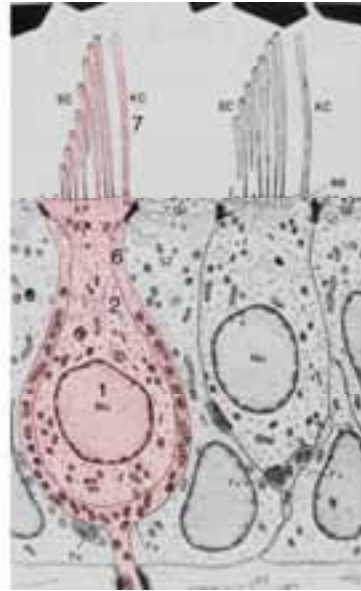


Illustration 33

**Balance cell**

At the same time every bodily cell possesses the same cellular exchange processes. Above all they work according to the same basic principles involved in the exchange of energy (ATP gain)  
([www.dr-wilden.de](http://www.dr-wilden.de)).

## The Special Significance of the Sensory Cells in the Inner Ear

Hearing is a compulsory work process for the body. By itself the ear would not hear (work), but rather would convey to us quietness as a condition of not working. From the point of view of the organ of hearing, this would be its preferred, that is, unburdened condition

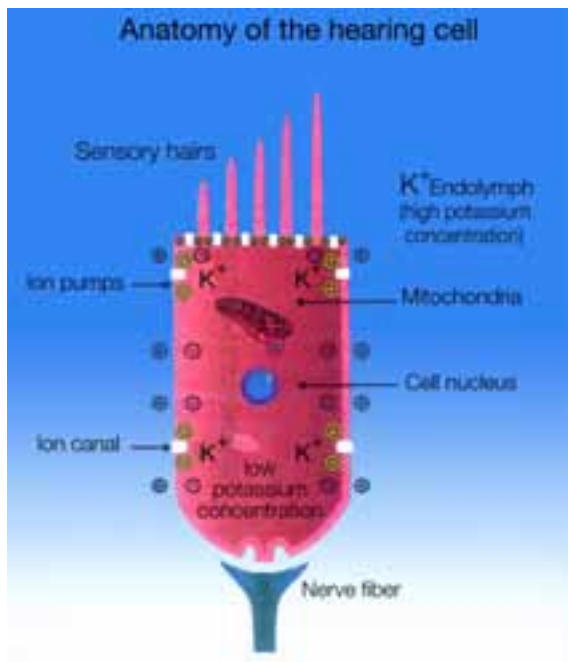
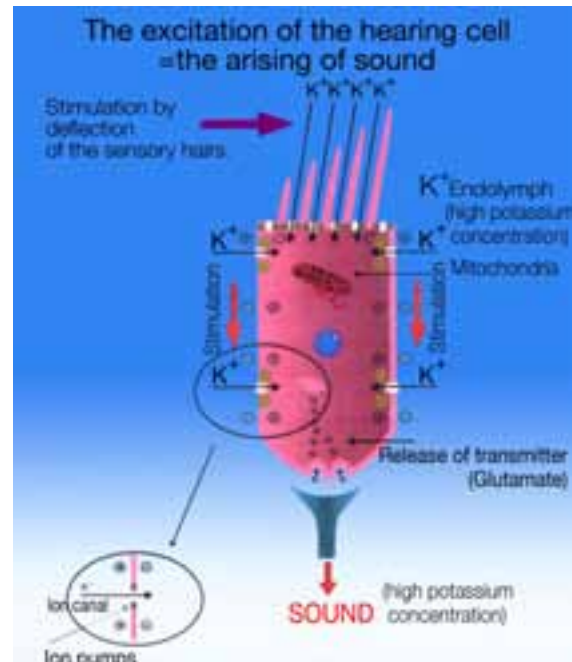


Illustration 34



The stimulation (depolarization) occurs through the passive inflow of potassium ions caused by the deflection of the sensory hairs

Illustration 35

### Thus works the Hearing Cell

The compulsory movement of the hearing cell's hairs leads to an influx of positively charged salts (Potassium = K<sup>+</sup>) from the potassium-rich surrounding endolymph.

Through this influx of positively charged K<sup>+</sup> ions the existing membrane potential of the hearing cell collapses.

The membrane potential of the hearing cell arises, because in its resting condition, there are fewer K<sup>+</sup> ions inside the cell, than outside in the surrounding fluid (endolymph). This results in a difference of electrical charge between the inside and the outside across the cell membrane, thereby producing a so-called membrane potential.

The influx of positive potassium ions, caused by the deflection of the membrane projections of the sensory cells leads thus to a change in the existing membrane potential, which then propagates itself as a nerve impulse along the nerve fibre all the way to the higher centers of hearing.

This process, which we experience as a hearing impression, is designated



as a **depolarization** of the cell.

The depolarization of the hearing cell causes only a slight work requirement and only a very small need for energy consumption, aside from the necessary work associated with the so-called cochlea strengthening. The biological processes involving energy, which are set in motion and sustained by a sound wave from outside, proceed without expenditure of energy due to the natural laws on the behavior of salt concentrations of varying strengths. These allow the influx of positively charged potassium ions across a concentrations gradient (from a higher concentration outside the cell into a lower concentration inside the cell) without expenditure of energy.

However, to allow for uninterrupted hearing, it is necessary for the cell to reverse depolarization unbelievably fast ( nanoseconds ). This biologic process involving sensory cells (hearing, nerve) is called repolarization and means that the hearing cell is brought from the condition of excitation or depolarization to the resting state or repolarization such that it is ready to process a new stimulus.

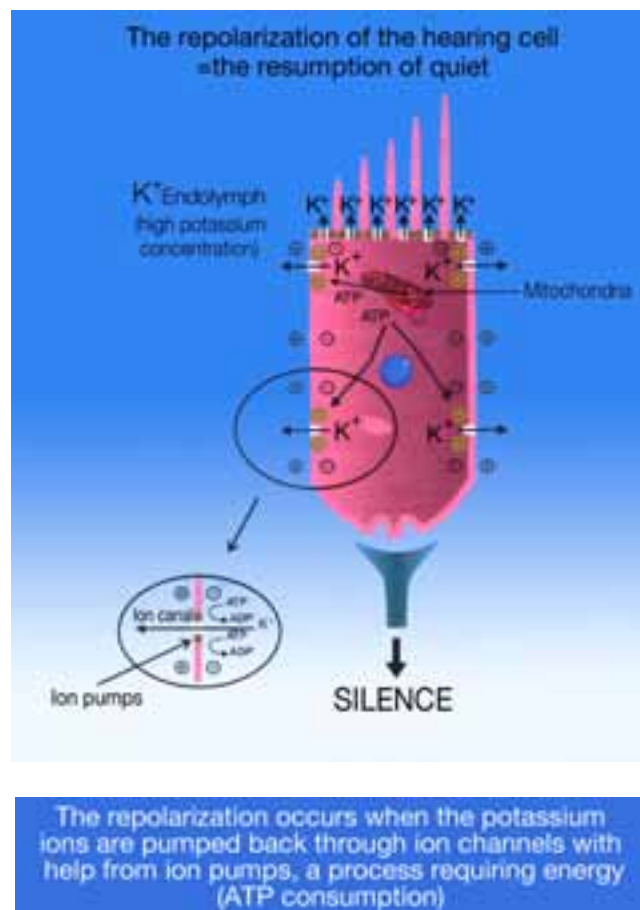


Illustration 36

The repolarization of the hearing cell (resumption of the resting state) is thereby the most energy expensive partial process of the entire act of hearing! The uninterrupted “back pumping” of potassium against the existing concentration gradient (differential) or the creation of quiet, consumes vast amounts of cellular energy (ATP).

[www.dr-wilden.de](http://www.dr-wilden.de)



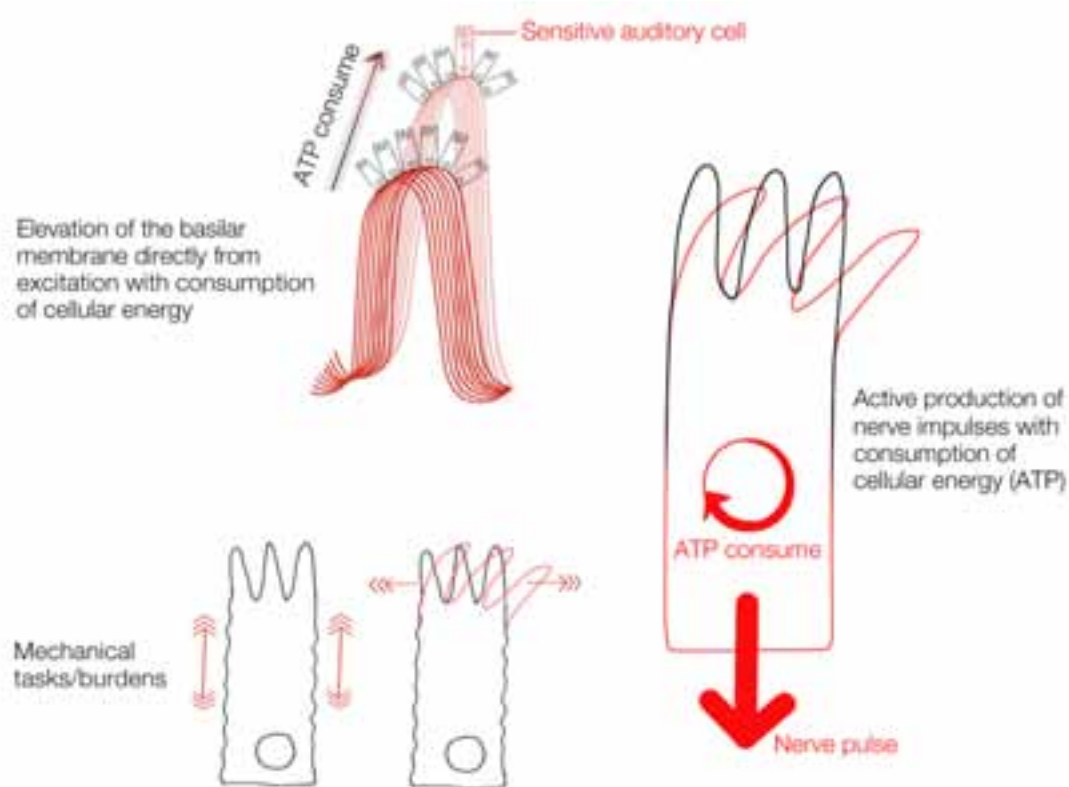


Illustration 37

**The mechanical tasks and energy consuming work processes which occur with each hearing stimulus for the hearing cells**

## **Nature has equipped the Hearing Cells with a High Degree of Resilience**

Because of the varied and continuing burdens to which the hearing cells are subjected their entire lives, nature has equipped them with a very high biologic quality of resilience (see [www.dr-wilden.de](http://www.dr-wilden.de)). In a destroying way however this biologic resilience determines the fate of our hearing organs.

Why?

It is quite simple. Over the years and despite the continuous burdens, our ears perceive nothing.

They are so good that they appear to be able to withstand everything.

Indeed they are so good that we currently have a general world culture which silently expects our ears to withstand everything!

No one really worries currently that people should consider their organs of hearing and balance just as worthy of protection as certain threatened animal species. That means for the moment at least, only the individual may care enough to provide himself with protection for his ears.

If we do not learn how to protect our ears, then the continuously increasing general loudness of our civilization, which unavoidably stresses the hearing organs of all people for years and decades on end, will unavoidably lead to a progressive, biologic exhaustion of the hearing cells of all of us.

## The Warning Signal of the Hearing Cells

As a matter of fact when a certain threshold has been reached or exceeded, this progressive or acute biologic exhaustion of the hearing cells gives rise to a cascade of organ-specific warning signals, just as would any other organ system in our body, which seek to inform the owner of this acute or progressive condition. With regards to the hearing cells these are the warning signs:

- increasing sensitivity to sound or hyperacusis.
- increasing inability to discern sound correctly or dysacusis.
- increasing fatigue or difficult hearing.
- the emission of distress signals or the noises of tinnitus.

The occurrence of tinnitus is equivalent to the occurrence of pain

Because of their exceptional specialization on the production of acoustic signals, the hearing cells are only able to express their biological distress by means of acoustic signals.

Then, when the collective excessive demands on the inner ear are very acute or very strong and are associated with a marked swelling of the inner ear which presses upon its surrounding cellular structures, noticeable pain and pressure sensations join with the acoustic warning signals, which are felt in the depths of the ear, around the ear, or in the auditory canal.

With tinnitus it is no longer possible for the overstressed hearing cells to effect repolarization of the cells, or recreation of quietness, a process requiring high energy consumption (ATP). The cell persists in a state of continuous excitation, which is expressed as a **continuous noise (tinnitus)**.

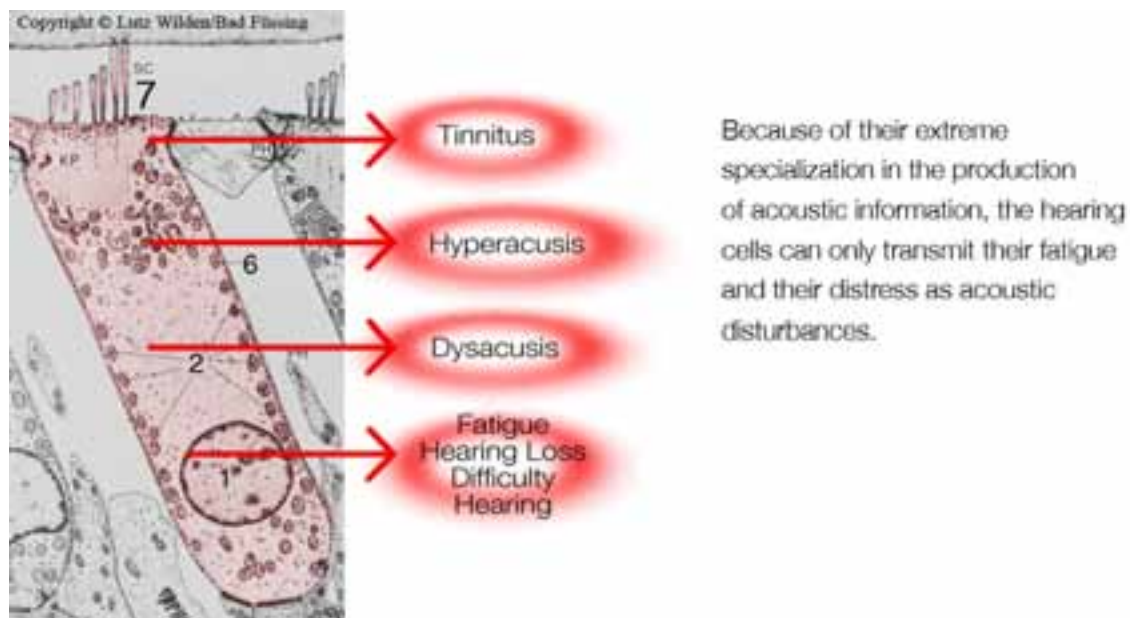


Illustration 38

**Distress signals of the hearing cells**



The arising of tinnitus sounds follows a continuous stimulation. This occurs due to a continuous inflow of potassium ions through exhausted ion pumps; that is, when ATP is lacking.

Illustration 39

Only quietness (not having to hear) enables the hearing cells to rest.



Illustration 40

**Active hearing protection (earplugs) protects the hearing cells from unnecessary work and premature exhaustion**

By reducing the sound pressure reaching the inner ear 10 dB, a 20% reduction of the inner ear's work load is accomplished.

**Thus works the Balance Cell**

The cells of balance work according to the same principles as the cells of hearing. They also possess hairs which are moved by the fluid present within the inner ear. The movements of the inner ear fluid in the organ of balance are caused by movements of the head, or the entire body. Tangential movements (movements sideways) and vertical movements (up and down movements) are perceived in the “belly” of the organ of balance (the so-called capula); circular movements more in the bows of the labyrinth.

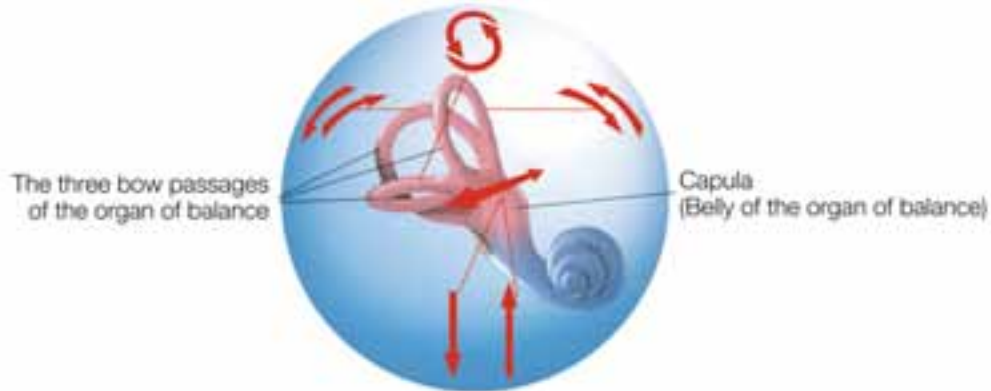


Illustration 41

Just as is the case with the hearing cells, the sensory work and energy-consuming (ATP) processes of depolarization and repolarization are bound to the cellular membrane.

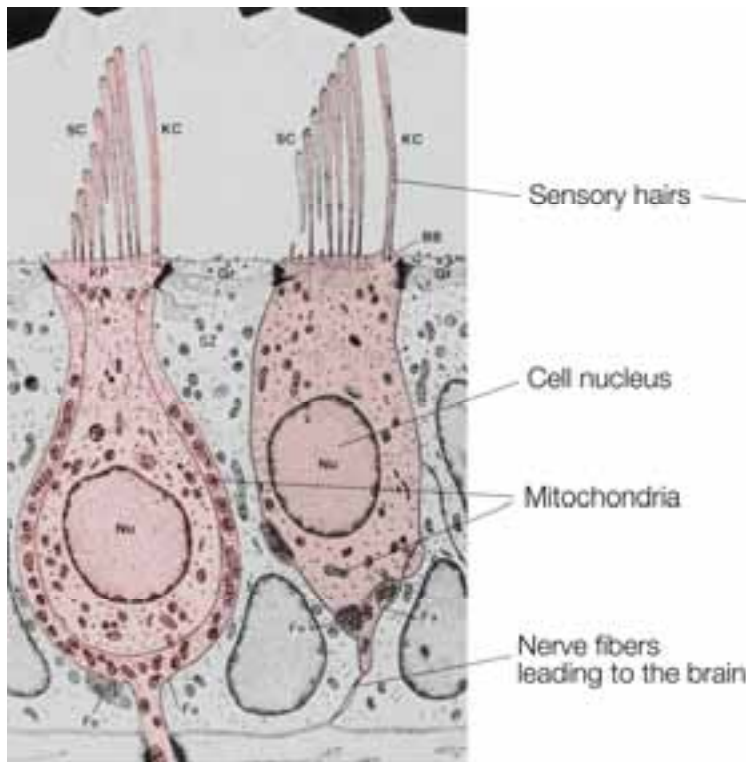


Illustration 42

**Cross section through two balance cells**

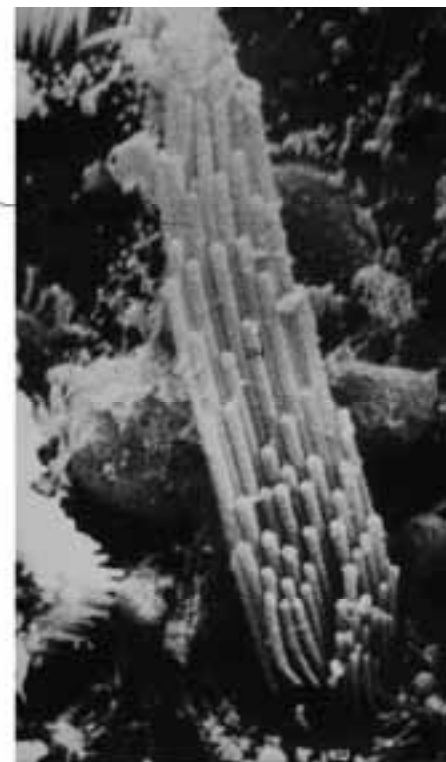


Illustration 43

**Electron microscopic representation of the sensory hairs (enlarged one million times)**



Similar to the hearing cells also the balance cells have sensoric hairs which are sticking in a galleritic membrane and are moved in this way with all the swinging system of the inner ear organe.



Illustration 44

**Balance cells in a Semicircular canal**

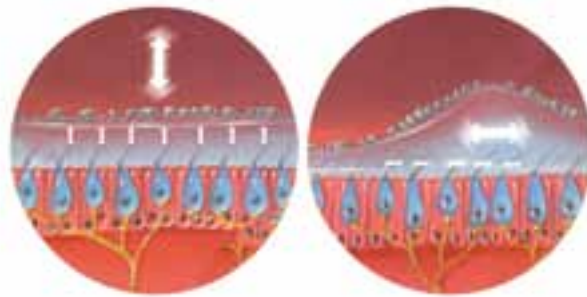


Illustration 45

**Balance cells in the Capula**

The excitation (Depolarization) of the balance cell is effected by motion of its hairs and associated influx of potassium ions.

This is the consequence of both head and body movements, which progress via the fluid system of the inner ear (movement of the endolymph in the endolymphatic tubule) to the hairs of the balance cells causing them to move. Just as with the hearing cells, it is not depolarization which consumes energy, but rather repolarization or reestablishment of the resting state. The balance cell also has to actively pump back the potassium, which has flowed in during the excitation phase, into the potassiumrich endolymph.

Even so as with the hearing cells, the repolarization of the balance cell (the reestablishment of the resting state) is the most energy consuming part of the entire sensory perception. Every time a balance event occurs, requiring an uninterrupted back-pumping of potassium to reestablish the resting state, the organ of balance, just as the organ of hearing, consumes enormous amounts of cellular energy (ATP).

Even as with the hearing cell, the work required is much more energy-expensive than the simple conduction of nerve impulses to higher centers in the brain and their associated networks. Certainly the balance cell has a certain advantage over the hearing cell in that it is not subjected to the same up and down movements as the hearing cell, which sits on the constantly swinging basilar membrane. It also does not have to reinforce the movements of a membrane.

Nevertheless besides the production of a nerve impulse, it must bear the mechanical burdens on its hairs.

**Nature provides the balance cells with a great deal of resiliency.**

Just as with the hearing cells, the balance cells, because of the lifelong on-going tasks, possess a very high-grade biological quality or toughness. (see also [www.dr-wilden.de](http://www.dr-wilden.de))

And even like the hearing cells, this high biological quality determines their fate.

**Why?** Because this prevents us from knowing what is happening to them.

To have balance, not to be dizzy (vertiginous), to be oriented in space are all attributes we take for granted as long as we are healthy. We believe this all happens "by itself" just as with hearing. We do not attribute this to any special activity in an organ as we would, say, to our stomach or colon, heart, kidney or liver.

Indeed, if the organ of balance should divulge its distress to us, we would most likely attribute its signals to our blood pressure, our cervical spine (neck), etc.



However the continuously increasing general stresses of civilization, (high speeds, rapid up and down movements, toxic influences, noise volume, etc.) to which people are subjected for years and decades, eventually lead to a progressive exhaustion of the organ of balance, if it is not protected.

## The Warning Signals of the Balance Cells

Naturally whenever an acute or progressive exhaustion threatens our organ of balance, as with any other bodily system, it unleashes a cascade of organ-specific warning signals, intended to inform the affected individual of the approaching crisis. With regard to the balance cells these signals are:

- an acute or increasing uncertainty of gait and movement.
- an acute or increasing or recurring vertigo (dizziness)
- a whirling vertigo associated with nausea and vomiting (Meniere's Disease)

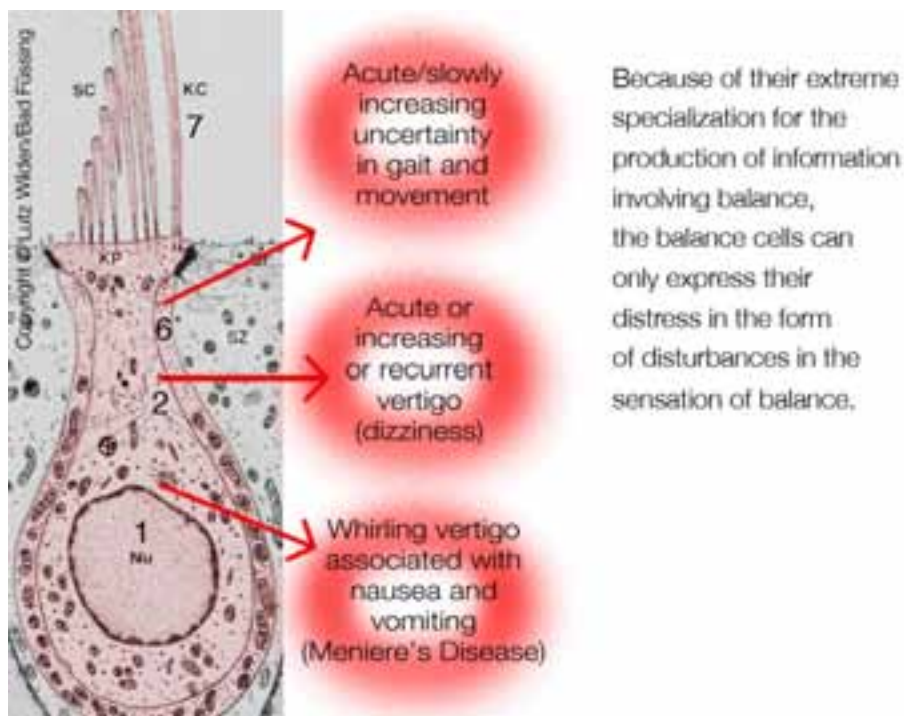


Illustration 46

### Distress Signals of the balance cells

Our organ of balance only gets a rest pause when we are ourselves at rest (eg. We lie down and thereby hold our head still) Since high sound volumes are carried into the endolymph, common to both organs of balance and hearing, loud noises affect both organs simultaneously.

The pop industry, the organizers of concerts and the promoters of discos use this to advantage by pushing huge sound volumes (in particular bass) on their customers, producing bodily sensations and feelings of giddiness (light-headedness, dizziness ) similar to a trance-like state. If the visitor has abused his inner ear by then to the extent it begins to signal its distress ( difficult hearing, tinnitus/ear noises, hyperacusis/ oversensitive hearing/ dysacusis/ hearing distortion/ ear pressure/ collapse of hearing/ vertigo and Meniere's disease ), then he has only himself to blame for his condition.

The active avoidance of noise is an effective form of individual protection for the organ of balance. Naturally certain pleasures which directly stimulate the organ of balance should be avoided. Fairs, circuses, and pleasure parks come to mind here.

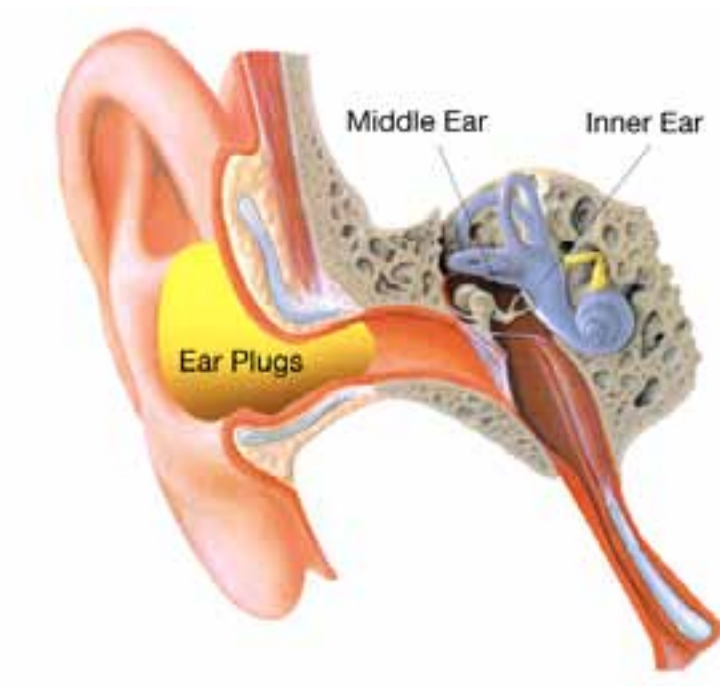


Illustration 47

**Through active ear protection you can also protect your organ of balance (labyrinth) from senseless stresses**

## The Organs of Hearing and Balance work with the same Technology

Thus we see that the two divisions of the inner ear, the organ of hearing (cochlea) and the organ of balance (the labyrinth) possess a unified technology, with which the inner ear is able to process physical data from outside the body and thereby fulfill its mandate as an organ for warning, communication and navigation.

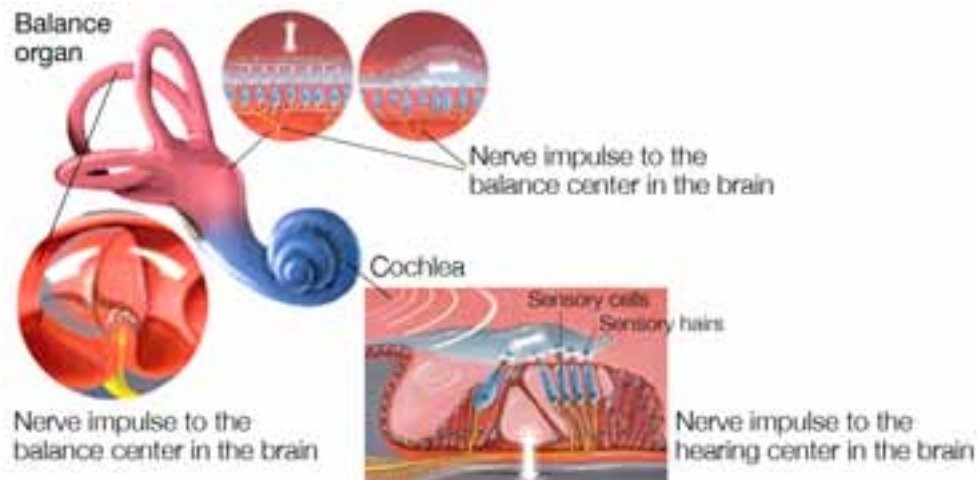


Illustration 48

**The inner ear processes our hearing and balance experiences using the same organ technology**

Besides this anatomical and functional information, each of us requires additional information about the biological characteristics of the inner ear in order to better understand it. From this understanding we may then protect it from overstress (prevention) and in case damage is already present, how to best treat it. (self-help).

At the conclusion of these presentations, it should be mentioned, that many other cellular processes are also occurring, besides those involving hearing and balance. (Eg., the in-and outflow of  $\text{Ca}^+$ , release of molecular substances within the cell, etc.) Their consideration here would add nothing to our understanding of hearing and balance as energy consuming processes, as are all other cellular activities (ATP consuming). ([www.dr-wilden.de](http://www.dr-wilden.de))

## **The Capacity for Regeneration in the Inner Ear especially the Cells of Hearing and Balance**

Before we consider the subject of regenerative ability in the nerve cells of the inner ear, the concept of regeneration needs to be more exactly defined. Regeneration implies the internal ability of a cell or an organ to return to an original condition. ( self-healing ) Without the ability to repair damaged tissue or wounds, life would not be possible. Every scratch or mosquito bite would result in death. Nature has provided all creatures with astounding powers of regeneration.

The power to regenerate tissue has its basis in the power of the individual cell to regenerate itself.

Example: When we say an organ heals (skin, muscle, tendon, bone, liver, kidney, heart, etc.) we mean the corresponding tissue cells heal (skin cells, muscle cells, tendon cells, etc.), since all human organs, just as the entire individual himself, consists of billions or trillions of autonomic individual cells ( an adult human consists of about 5 trillion cells ). The ability to regenerate is present in every individual cell (self-repair). The cellular nucleus possesses the knowledge to regenerate. With each overstressed state or damage to the individual cell, its nucleus activates the knowledge stored in its own DNA and directs it towards regeneration of its entire self.

The cellular nucleus “ starts “ the process of regeneration (repair) at any lessening of its optimum health, such that this optimum health is restored as quickly as possible. For this purpose the cell requires sufficient energy at hand (ATP). ([www.dr-wilden.de](http://www.dr-wilden.de))

Our entire life revolves about our ability to repair and regenerate. Only when our natural ability to repair and regenerate is either fully exhausted ( the cells ), or overstressed, perhaps by an accident, will cellular death occur and therewith also our ability to regenerate and repair. This is true as much for our entire being as for our individual organs, and, naturally, for our sensory organs of hearing and balance with their component cells.

Examples from our everyday life:

You eat soup which is too hot and burn your mouth. That hurts, but the sensory organs in your mouth ( temperature sensors, taste buds ) recover. The same is true if you “ eat “ a spoonful of pepper. This overwhelms your sensory organs for a short while, but they do recover.

You expose your eyes to very strong light (welding, glacier light, etc.). You overwhelm the eye's sensory organs temporarily, followed fortunately by recovery (regeneration). You ride on a merry-go-round and become dizzy. You temporarily overstress your organ of balance, but recover fully.

You go into a disco, attend a soccer or ice hockey match or auto race. Perhaps you visit a factory, etc. where noise is loud and prolonged. Afterwards you feel a heaviness in your ears, hear worse, perhaps notice a fleeting whistling in your ears. You have temporarily overstressed your hearing organ, but this also fortunately resolves completely (regenerates)

There are no small corners anywhere in our bodies where the power to regenerate does not exist. In this regard our cells possess two forms of regenerative capability:

- **The ability of each individual cell to independently regenerate or repair itself**
- **The ability to regenerate through cell division**

Under the concept of **individual cellular ability to regenerate** is understood the ability of an individual cell to recover from a condition of stress using its own resources. For example: You press your fingertip into a table edge or other such surface. You then notice that a groove appears in your fingertip after a while the groove disappears. This means the previously mashed in cells have recovered (regenerated) and thereby the fingertip is restored to its previous size and shape.

This is possible through the ability of the individual cells to repair themselves.

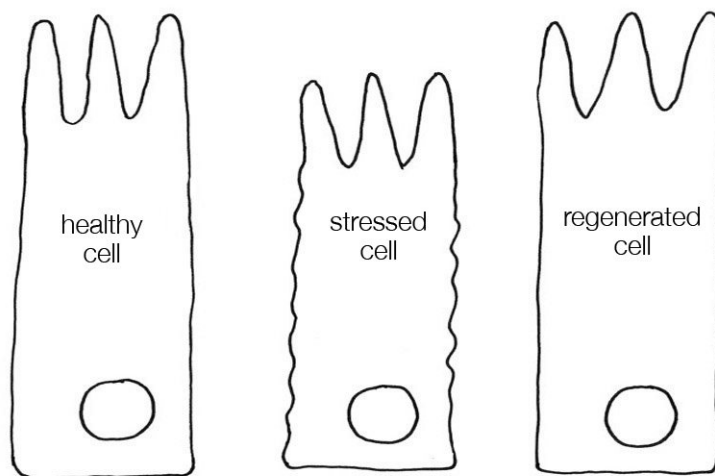


Illustration 49

#### **Individual power of regeneration**

Under the concept of **regeneration through cell division**, is understood the capability of cells to effect repair through cell division or the production of new cells.

For example: With an abrasion one or more layers of skin may be “scraped off” or destroyed.

Regeneration here involves the production of new cells through cell division.



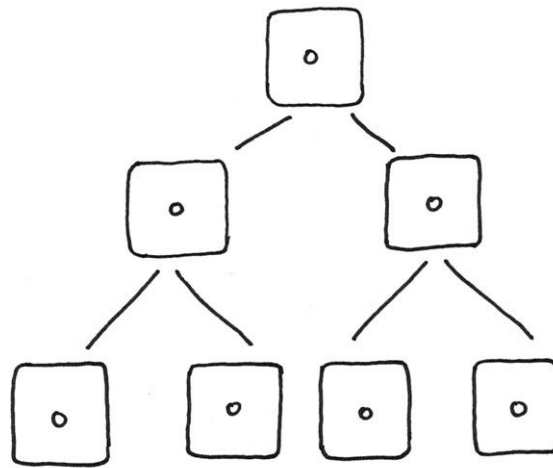


Illustration 50

### **Regenerative capability through cell division**

Each of our approximately 5 trillion cells possesses its own regenerative capability, but all cell types do not possess the ability to divide.

The ability of each individual cell to resist stress, that is the individual power to regenerate, is governed by cell type. The greatest individual cellular capacity to regenerate (toughness + length of life) is possessed by nerve cells.

The sensory cells of the inner ear organs of hearing and balance are nerve cells and possess a very high degree of stress resistance, that is to say, a very high ability to regenerate. In order to be able to effectively protect oneself from overstressed inner ears and their associated symptoms (difficult hearing, tinnitus, hyperacusis, dysacusis, pressure in the ear, collapse of hearing, vertigo and Meniere's Disease ) and to be able to effectively treat an existing condition of overstressed inner ears, it is important to discuss the concept of individual cellular regeneration.

In regards to this there exists a body of dangerous and confusing disinformation. Opposed to basic biologic facts, especially as regards the cells of hearing and balance in the inner ear, there are elements in the public which deny any capability of regeneration in these cells. How can this be?

One reason is the mixing and confusing of the concepts of individual cellular regeneration and that through cell division. The relationships are as follows: The simpler the cell is constructed, the more easily is its regeneration through cell division. The more complicated a cell is constructed, the less likely it will be able to divide itself.

And: the simpler the cell is constructed, the less it would possess individual regenerative capability. The more complicated the cell is constructed, the greater would be its individual regenerative capability.

For example: The simple skin cell has a limited capability for individual regeneration. It is easily overstressed and has a life cycle ( individual life span ) of only 3 months. However it possesses a very high capability for regeneration through cell division, which each of us has observed following abrasions.

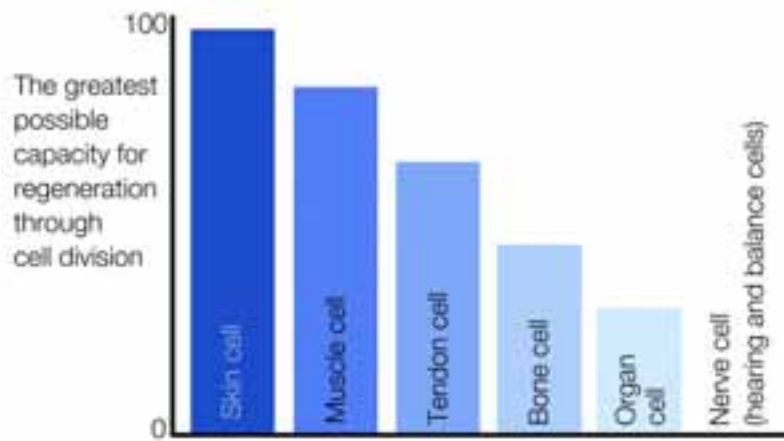


Illustration 51

A highly complicated hearing or balance cell, like all nerve cells, possesses great ability for individual cell regeneration. (Stress-resistance, toughness) It is only very difficult to “make smaller”, and has a lifelong life cycle, that is, it arrives with us in the world and remains with us until we depart, in some special cases up to 130 years. It therefore has to possess an enormous individual resistance to stress, or individual power of regeneration, which is, in fact, the case.

In regards to this the impression, which most people have about their organs of hearing and balance is completely false, and does not correspond to the biological facts.

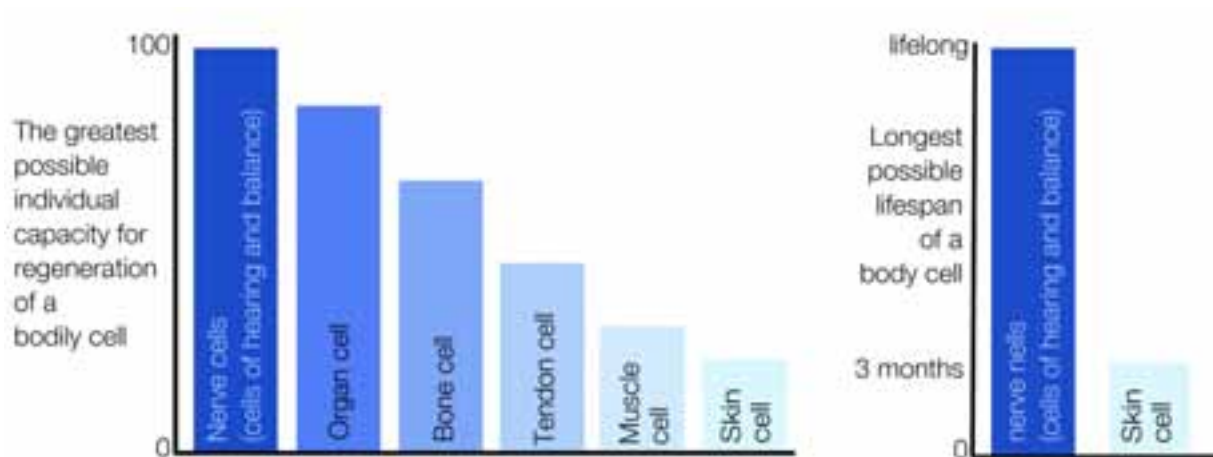


Illustration 52

The biological fact, that the cells of hearing and balance accompany us for an entire lifetime, means that they must work through all the acoustic and balance related tasks for an entire lifetime.



Illustration 53

**Embryos react to acoustic stimuli already by the third month of pregnancy and can orient themselves spatially.**

From the first cry at birth to the last breath and perception of our surroundings, all sound and balance experiences of an entire life have to be processed by these same cells of hearing and balance. These biologic facts require conscious and active care of our organs of hearing and balance, if we wish to keep them healthy to life's end.

## Use Your Personal Audiometry to assess current Condition of Your Inner Ear

Is there a possibility to assess the current condition of your hearing and balance cells? Fortunately yes!

- The method suited to this is audiometry (hearing curve).
- Audiometry is a well-tolerated method of investigation, that is, it can be repeated as often as desired, and carries no detriment to the body, such as X-rays might.
- To be sure, the frequency of examinations, where the hearing loss is 80 dB or more should be considered, due to the necessity of introducing high sound pressures of the test sounds in this region, which could represent a stress to the hearing organ of the affected patient.
- Also the so-called masking of the opposite ear during the examination may cause stress to this ear. This investigational method is unnecessary in my opinion and only contributes objectivity to the test results. This is also true for a one-sided hearing disturbance. Under masking it is understood, that the ear opposite the one being investigated is subjected to loud noise during the audiometry.
- During the audiometry the sensitivity or biological quality of the organ of hearing is tested. The sensitivity of a sensory organ is simultaneously the measure of its biological quality. The greater the biological quality of a sensory organ (= the healthier it is), the greater is its sensitivity and reversed. The better the eye sees, the better is its biological condition (its health). The better the ear hears, the better is its biological condition (its health)
- Performance of audiometry: The audiometric exam should be carried out in a very quiet room in a relaxed atmosphere. ([www.dr-wilden.de](http://www.dr-wilden.de))



Illustration 54

**Testing of air conduction in the audiometry room at the private practice of Dr. Lutz Wilden, Bad Füssing, Bavaria, Germany**

The audiometer produces test sounds, which are conveyed to the ear by way of two different head phones.

## Air Conduction

First the air conduction is measured by an earphone placed directly over the external ear.

Air conduction tests the progression and perception of sound as it travels through the ear canal, the ear drum, the chain of small bones in the middle ear, and on into the hearing cells.

In the audiogram the air conduction is represented as a closed line. Using a colored audiogram, the right ear is red and the left ear is blue.

## Bone Conduction

After finishing the air conduction, measurements are made of the bone conduction, using a special headphone.

The headphone for the measurement of bone conduction consists of a metal sphere, which is placed behind the external ear onto the mastoid of the tested side. During testing the metal sphere transmits the test sound as a vibration onto the skull.

Bone conduction tests the progression and perception of sound, which accompanies the sound event as vibrations through the skull to the hearing cells. In the audiogram the bone conduction results are represented as a broken black line.

If the organ of hearing is healthy, the bone conduction line runs just above the air conduction line.

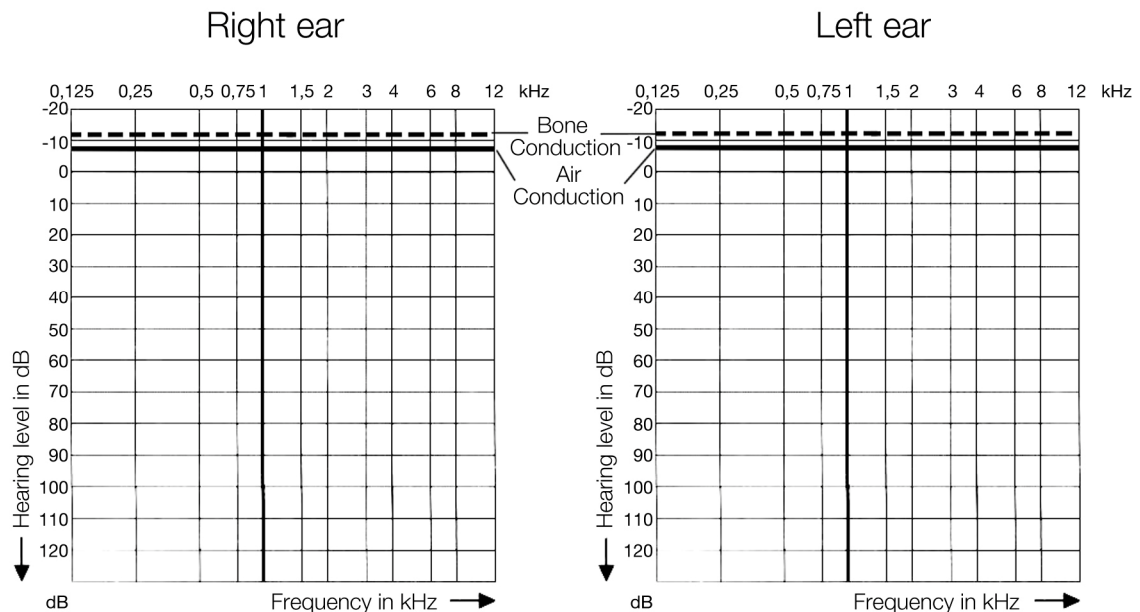


Illustration 55

### Audiogram of healthy organs of hearing

The test sounds used during audiometry have two characteristics. \* they have 12 established frequencies and can be varied in volume from quite low (-20 to 0 dB) to very loud (130 dB).



## The Frequency Scale

The frequencies are divided into KHz (Kiloherz, 1 Kiloherz = 1000 Herz) Physically considered, tones are sound waves.

The unit of measurement frequency tells the number of vibrations of a sound wave per second. The deepest test sound, which the human ear can hear, has 125 vibrations per second (= 0.125 KHz) and is a deep growl.

The highest sound, which the human ear can hear, has 12,000 vibrations per second, and is a shrill sound.

With the sound scale in audiometry spanning the frequencies from 0.125 KHz (125 Herz) to 12 KHz (12,000 Herz), audiometry covers the entire average capacity of the human ear to detect its normal range.

The human organ of hearing is thereby able to detect a very wide range of frequencies. We can hear the equivalent of three piano keyboards.

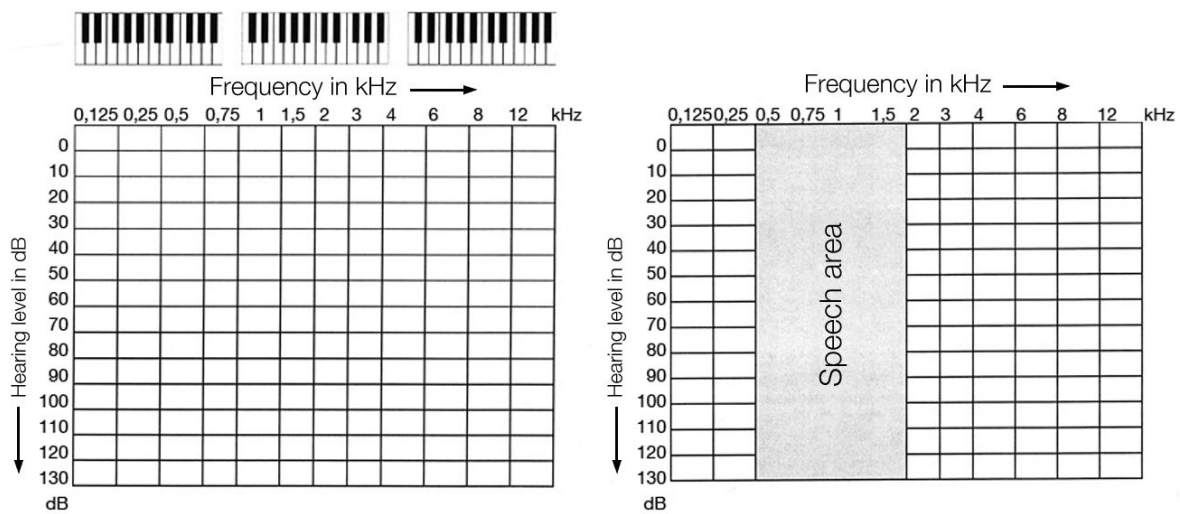


Illustration 56

Each of us can experience that we are able to hear deeper tones than the deepest tone on the piano and higher tones than the highest tone on the piano.

The frequency range of human speech lies somewhere between 0.5 kHz - 2 kHz.

Simultaneously the frequency scale of audiometry tells us quite exactly where the sound is heard within the cochlea. This is so, because the sound wave is bound in the cochlea to a certain location. In other words the hearing cells in the cochlea, which are responsible for converting sound waves into nerve signals are bound by location and frequency.

Again in explanation, the organ of hearing possesses specific sensory cells for each frequency and these sit in the cochlea at a designated location.

For example: the highest tones are heard at the entrance to the cochlea directly opposite the oval window, and the deepest tones are heard in the apex (helicotrema). The cells for speech are located in the "middle" of the cochlea.

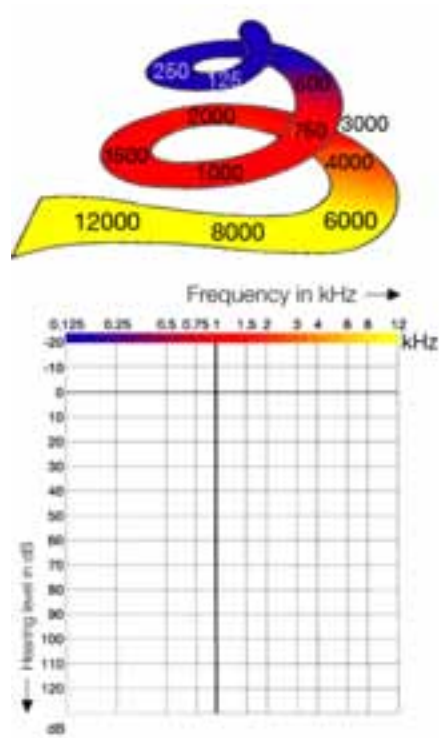


Illustration 57

**The frequency scale illustrates the position of the hearing cells in the cochlea**

## **The Loudness Scale (Decibel Scale)**

Next to the horizontally placed frequency scale audiometry possesses the vertically placed loudness ( sound pressure ) scale. The unit of measurement is the decibel. The range is from under 0 up to 130 dB. It describes:

- a) the ability of the organ of hearing to detect the quietest of sounds (-20 dB)
- b) to endure the loudest sounds (= enormous sound pressure) = 130 dB.

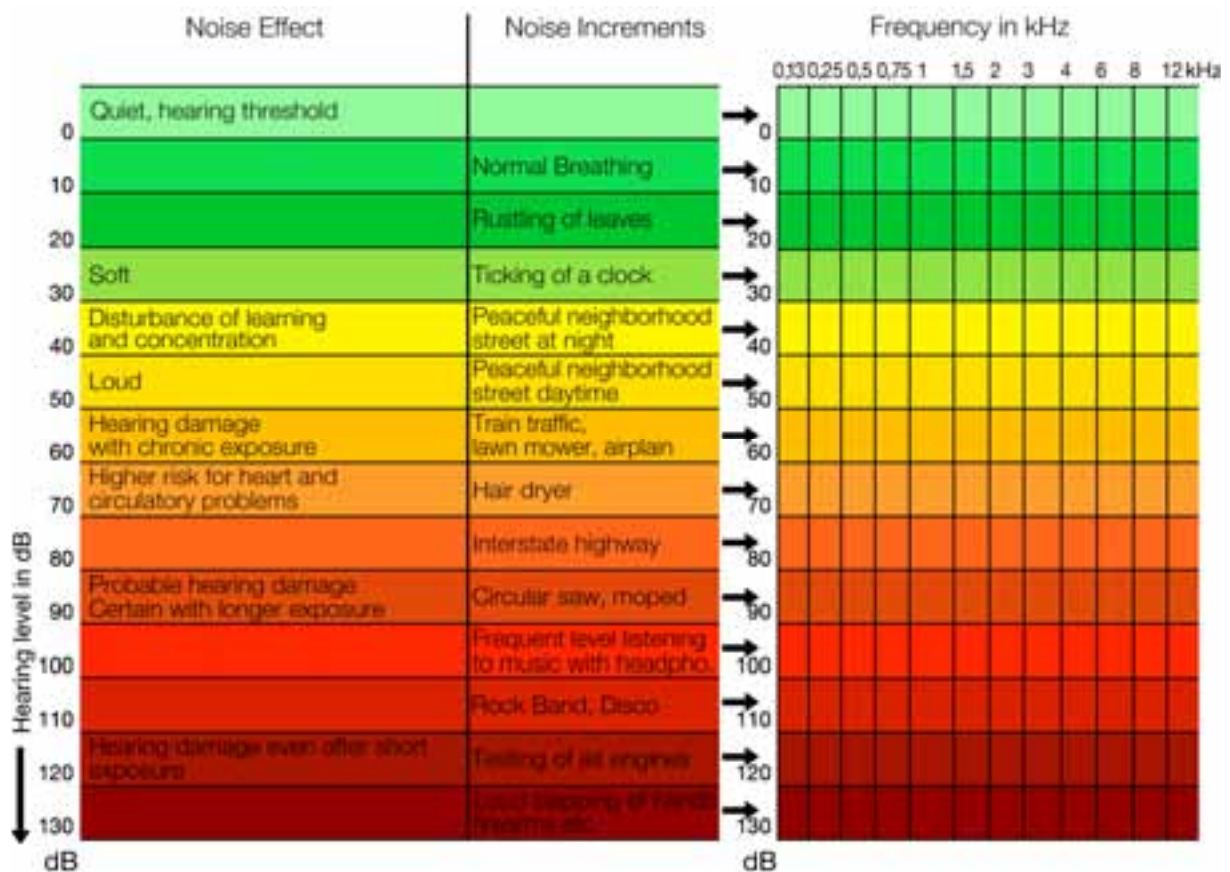


Illustration 58  
The sound levels of the test tones in audiometry

	Example	dB	Perception	
Hearing damage certain after brief exposure	pain threshold	130	„Unbearable“	
	Jet engine, Rock Concert	120		
	Helicopter	110		
	Disco, air hammer	100		
	Factory shop	90		
Hearing damage likely, but certain with longer exposure	Motorcycle, street traffic	80	„Loud“	
Hearing damage with chronic exposure	Loud calling, moped	70	„Soft“	
	Office noise	60		
Learning and concentration disturbance	Conversation	50	„Quiet“	
	Whispering	40		
	Leaves rustling	30		
	Pocket watch	20		
	Breathing	10		
	Hearing threshold	0		

Illustration 59

**The ear is able to accommodate loudness without being overwhelmed by it**

The capacity of the ear to tolerate sound pressure is so great, that it was necessary to introduce a logarithmic scale to measure the ability of the hearing cells.

Otherwise the normal scale would have been much too long.

Translated this means:

Were the sound to be measured in dB by 3 dB more, that would constitute a doubling of the sound volume.

For example: You are in a room with a sound source, say a machine, which has a sound value of 70 dB. If you then bring in a second sound source having a sound value of 70 dB, the measured sound volume will be only 3 dB higher, or 73 dB, although the amount of sound pressure, to which your ears are exposed will have doubled.

The sound pressure, however, is the deciding force, which in the truest sense of the word, penetrates into the organ of hearing.

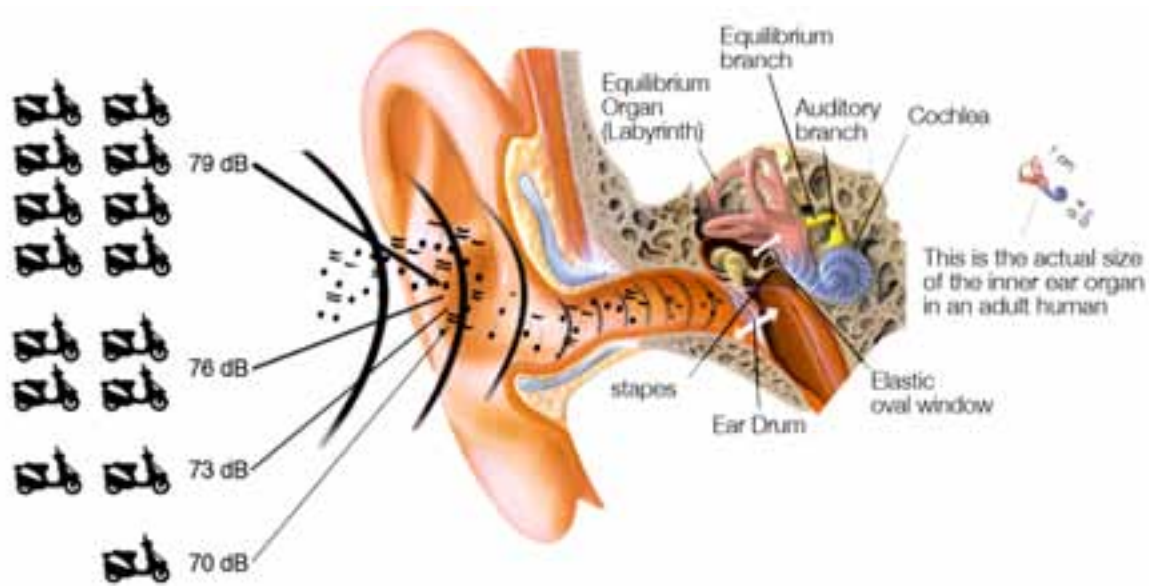


Illustration 60

### Sound pressure stresses the inner ear organ

The vertical db scale depicts the biological tolerance of the inner ear organ as a whole, and the hearing cells in particular.

However biologic tolerance is equivalent to biologic quality. The hearing curve indicates to us the present, current biological quality of the inner ear organ. This means that a hearing curve lying between the values - 20 and 0 dB over all the frequencies in its totality indicates a 100% biological quality or it is 100% healthy.

Any sinking of the curve below the 0 dB line represents a decrease in the biologic quality of the inner ear.

A decrease is found in audiometry when it is necessary to increase the volume of the test tones in order for the tested organ to recognize them.

For example: If the hearing curve lies below 20 dB at all frequencies and not at 0 dB, audiometry describes a loss of biological quality as 40 dB, since a 100% healthy curve lies at -20 dB.

Everything which lies under the hearing curve indicates the current and present biological quality (the area between 20 dB and 120 dB).

## Audiometry is the Instrument for Measuring



## the Remaining Inner Ear Quality.

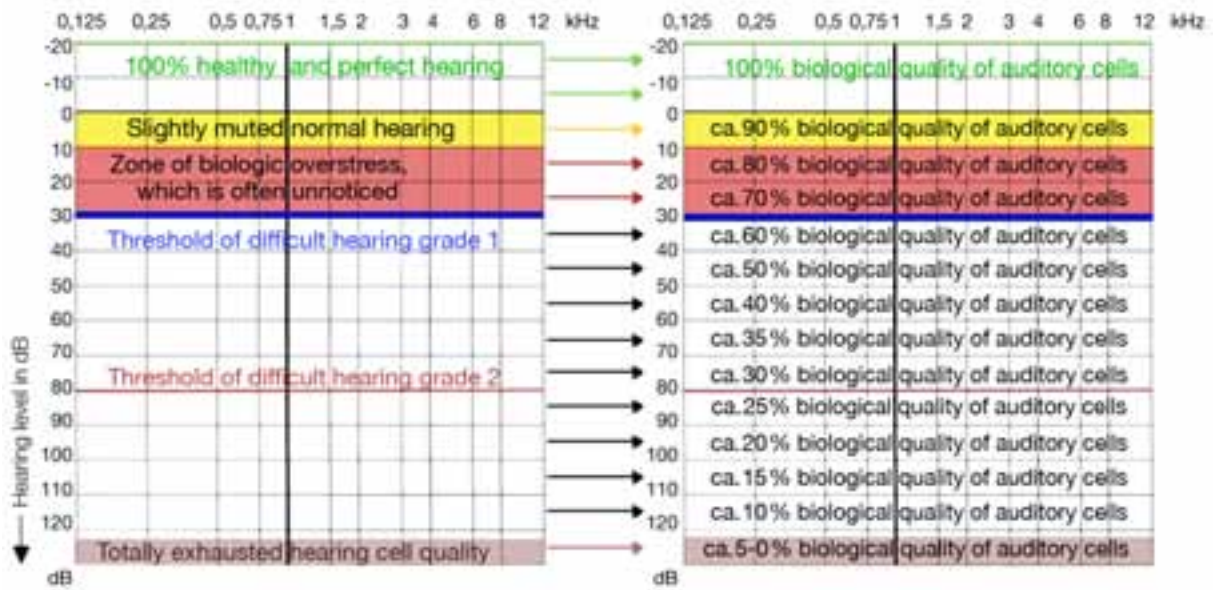


Illustration 61

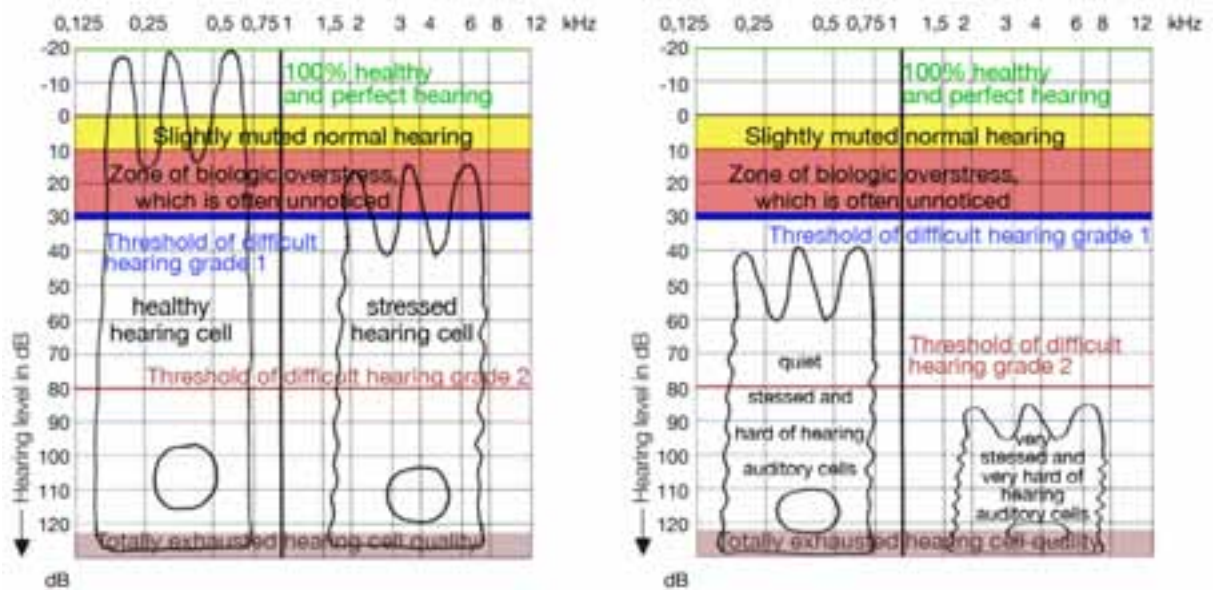


Illustration 62

**Your personal audiometry makes the entire biological quality of your 25000 hearing cells visible**



This is because the biological quality only then is completely exhausted, when sound pressure of 130 dB can no longer excite the inner ear cells.

That is, only then is the inner ear cell “broken” or dead and thereby fully deaf. Even this is a biologically false impression.

Wherever possible the body avoids the death of a cell. This means the body is confronted with a major problem, that is, it has to remove poisonous ( necrotic ) material. It seeks to avoid this at all costs, in particular in the area of the nervous system.

In actuality a completely non-functional hearing cell does not die, but rather changes into connective tissue.

That is, it changes from a highly specialized nerve cell into a simpler connective tissue cell.

This is important in order not to incorrectly believe “...something in the ear has died”

### Audiometry is the Instrument for Measuring the Local Inner Ear Quality

Audiometry not only allows visualization of the biological quality of the inner ear to its fullest, but also indicates accurately the location of a partial overstress and gives a precise picture of the biological quality of the various sections of the cochlea.

This can be seen in the horizontal line of the audiogram, the frequency scale, which represents the entire length of the cochlea.

The drop in the curve at a particular frequency shows the location of the overstress in the cochlea. At the same time the hearing curve measures the biological quality of the hearing cells present there.

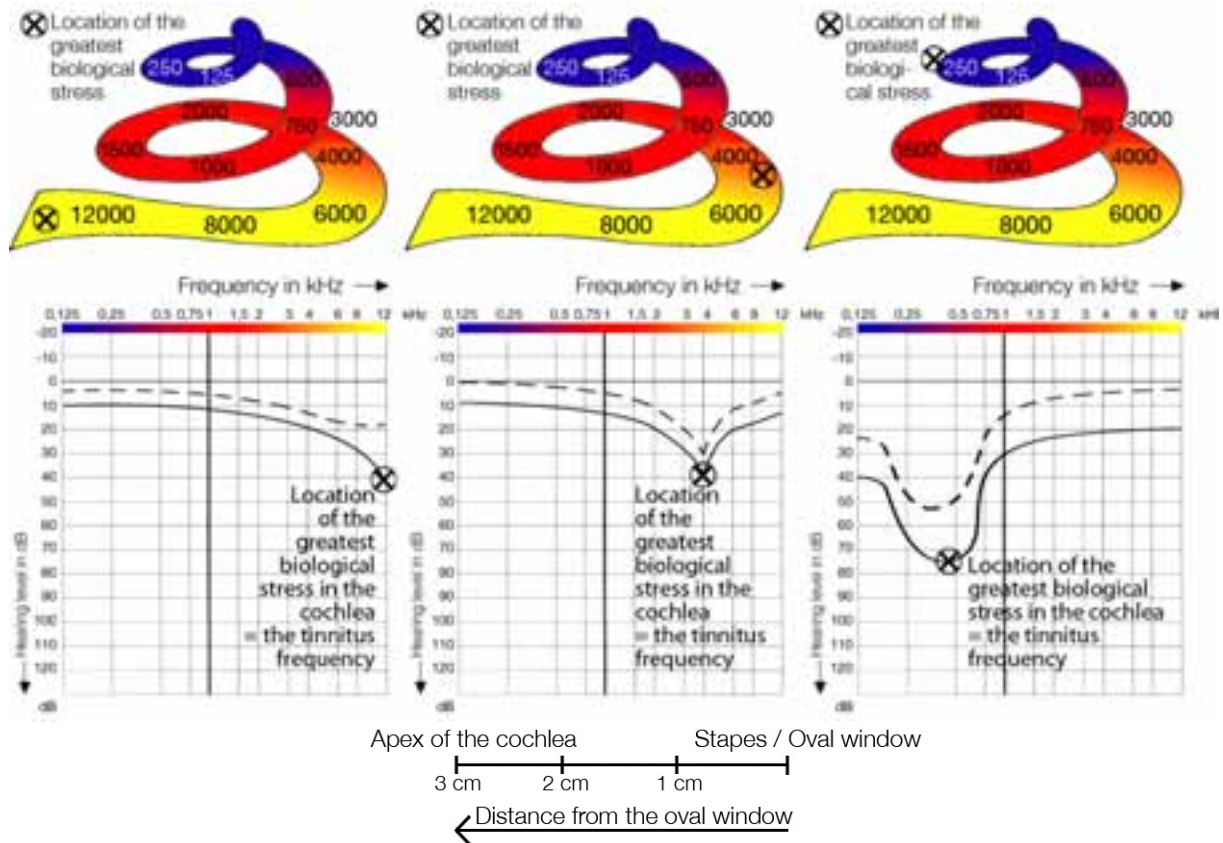
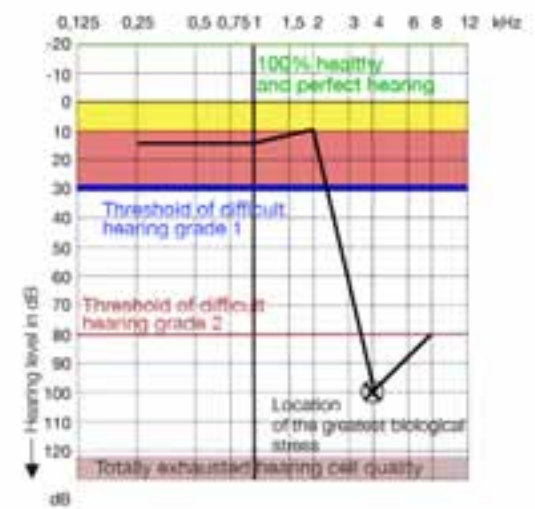
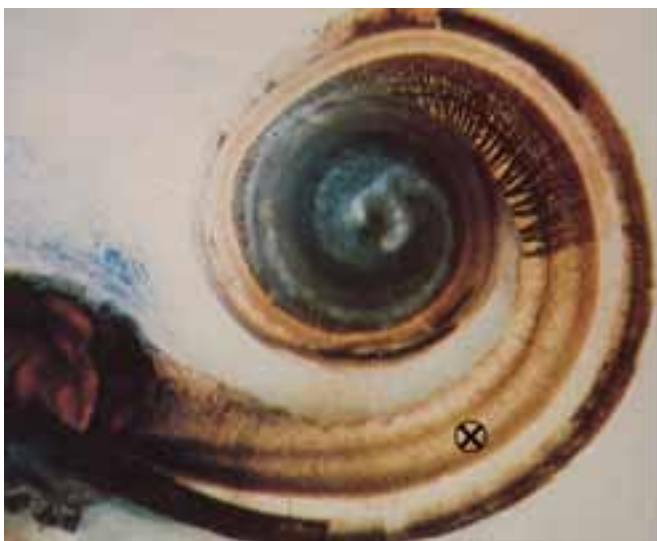
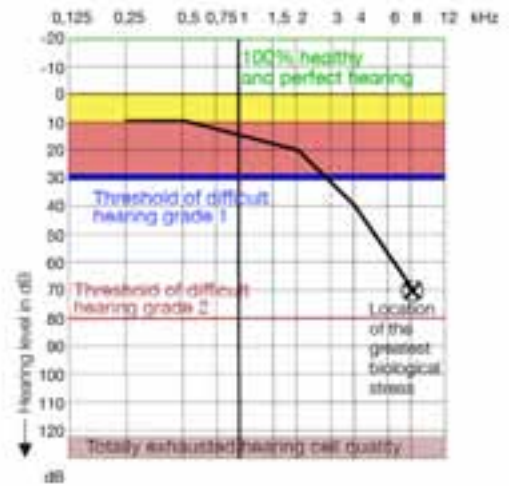
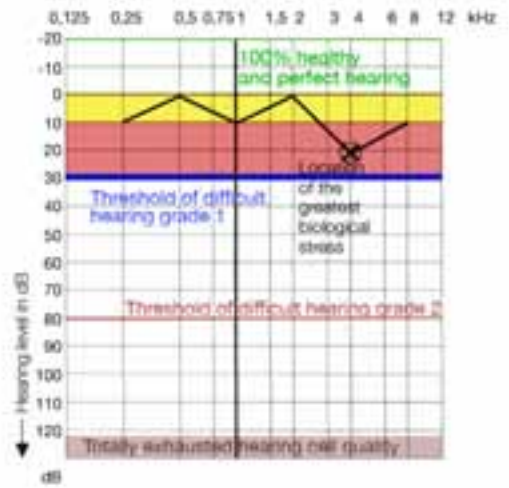


Illustration 63

### The Comparison of the Cochlea and the corresponding

# Hearing Curve using Light Microscopy



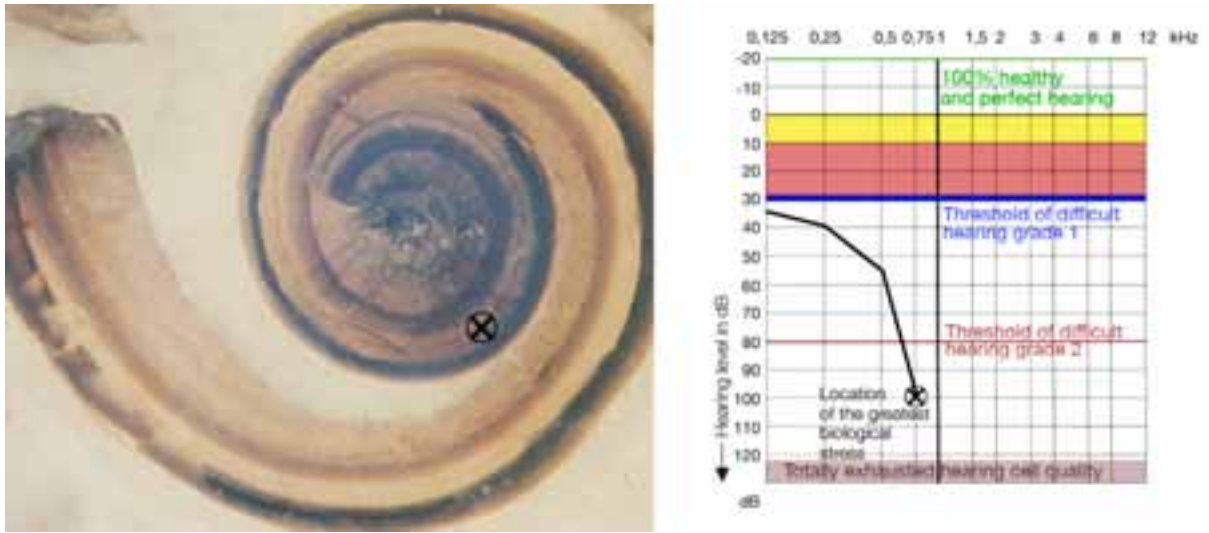


Illustration 64

The pictures show the anatomic preparations of human cochleas, which are placed opposite the corresponding audiograms of the same people. The audiograms were taken weeks or months before the deaths of these people.

## The Scientific Proof for the Ability of the Cells of Hearing and Balance to Regenerate\*

\* The varied and complex procedures and findings of the international noise research will be shortened and simplified here due to the necessity for brevity and clarity.

Aside from the medical endeavors towards the general population by the Ear, Nose and Throat (ENT) physicians, there exists almost unknown to the same public a worldwide inner ear university-based research effort. With regards to the ability of the individual cells of hearing and balance to regenerate, this effort has concluded the following:

The cells of hearing and balance possess the capability of individual regeneration as do all body cells. There exists a distinct connection between the strengths of an organ-specific stimulus (sound frequency and pressure and changes in the force of gravity) and the degree of the resulting burden on the biological quality of the cells of hearing and balance, as well as their resulting behavior of regeneration.

### The Investigational Methods of International Noise Research

- Establishment of noise and sound-volume profiles. The sound volumes which exist at the work place are measured and documented.

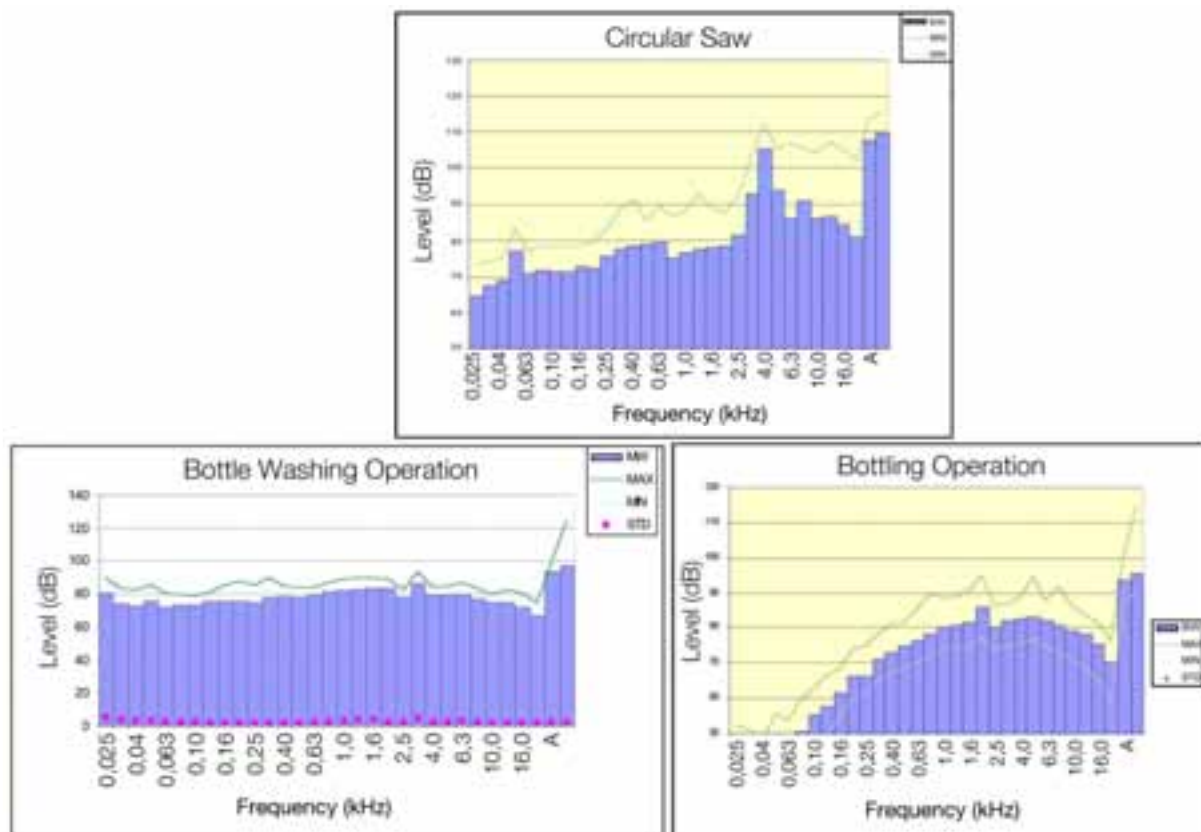


Illustration 65



- Audiometry measurements on population groups before and after specific noise burdens.

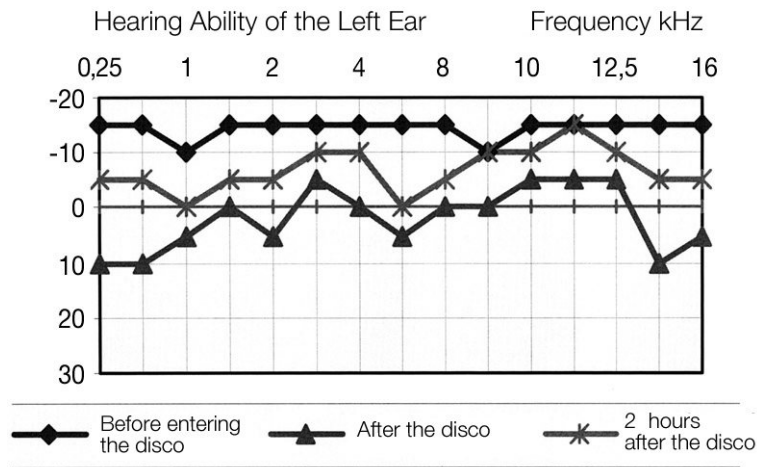


Illustration 66

- Questionnaires from population groups before and after specific noise burdens

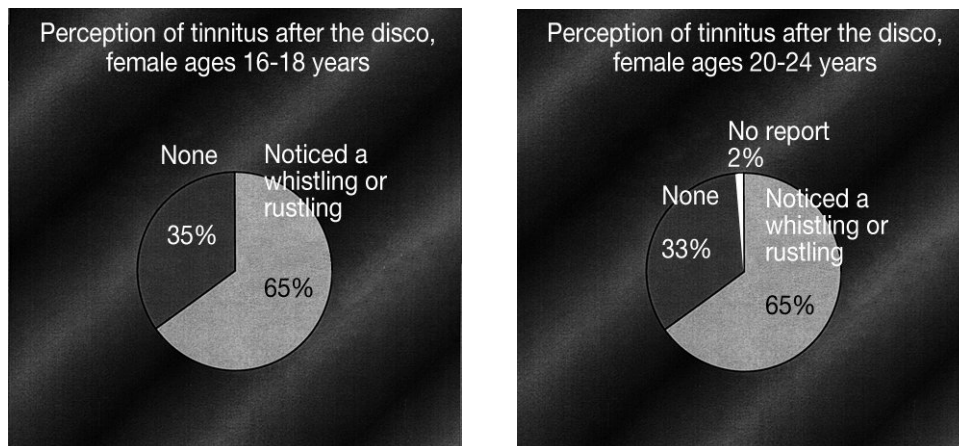


Illustration 67

- In animal experiments the degree of the biological stress of the hearing cells, as well as their regeneration behavior and the necessary regeneration time are being investigated specific to frequency with the help of an objective method of measurement. The method is called : Distortion product otoacoustic emissions (DPOAEs) or simply measurement of otoacoustic emissions. Description: Because of the biologic fact, that every sound event which penetrates into the inner ear sets in motion a complex fluid system, the sound event also produces from the inner ear its own sound. We cannot hear this, but, with the help of a microphone, it can be heard and recorded. For this experiment the animal most often used is the guinea pig.





Illustration 68

By means of a loudspeaker test tones like those used in audiometry are introduced into the ear. A microphone then captures and records the evoked sound (= the otoacoustic emissions).

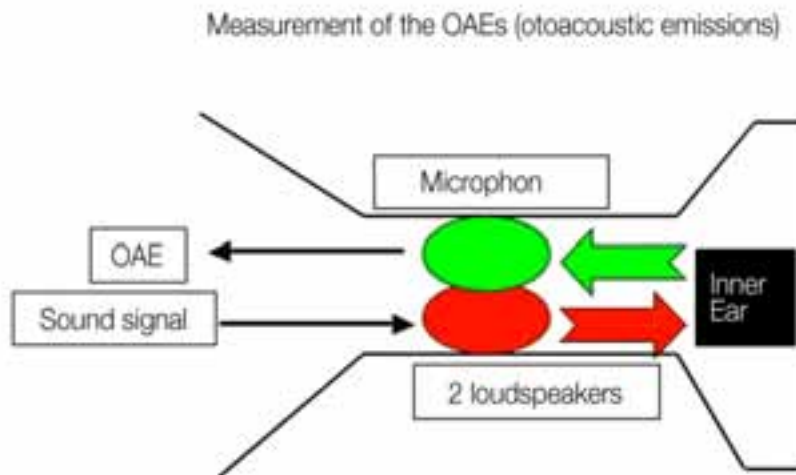


Illustration 69

### The results

- the healthy ear shows a frequency-specific pattern of OAEs from the noise burden.
- the noise pattern of the OAEs changes according to the noise burden.
- in the behavior of the noise pattern of the OAEs, observed over a period of days, weeks, and months, a regeneration behavior of the hearing cells reveals itself, which corresponds to the regeneration times of nerve cells, and which depends on the strength ( dB ), the frequency ( Hz ), and the duration of the relative sound event.

**In summary:**

- 1) we each experience that our organ of hearing can recover after a sound event and that is now confirmed by animal experiments.
- 2) the degree of overtaxing of a hearing organ and its capacity to regenerate depends on the strength and duration of the sound event which penetrates the hearing organ.
- 3) as for all cells, the hearing cells can be completely over stressed. For this to occur, an extremely high sound level or an extremely long period of sound exposure is necessary.

**Microscopic Investigation of the Hearing Cells**

For this the animals used in the investigations have to be sacrificed and their hearing cells subjected to electron microscopic investigation.

Through a massive sound event (110-130 dB) severely damaged cellular hairs.

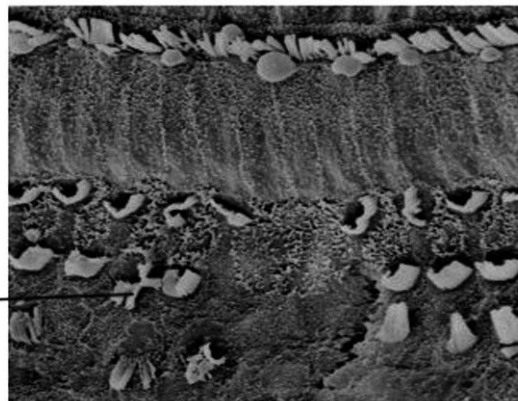


Illustration 70

**Enlargement of damaged hearing cells by electron microscopy**

Unfortunately this method of investigation produces much confusion with the public. Pictures of bent and damaged or missing hairs receive media comment, that this is an irreversible condition, and therefore untreatable. Of course this condition is untreatable for the experimental animal which has to be sacrificed, so that we can use his tested hearing cells. However the animal which is not sacrificed, given time, will emerge from this condition through regeneration of its hearing cells. This is a biological behavior which we can recognize with the help of recovering otoacoustical emissions (OAEs) weeks and months after a sound event.

With the help from monitoring OAEs and the use of electron microscopy, noise research is able to produce an exact picture relative to the localization of inner ear overstress.

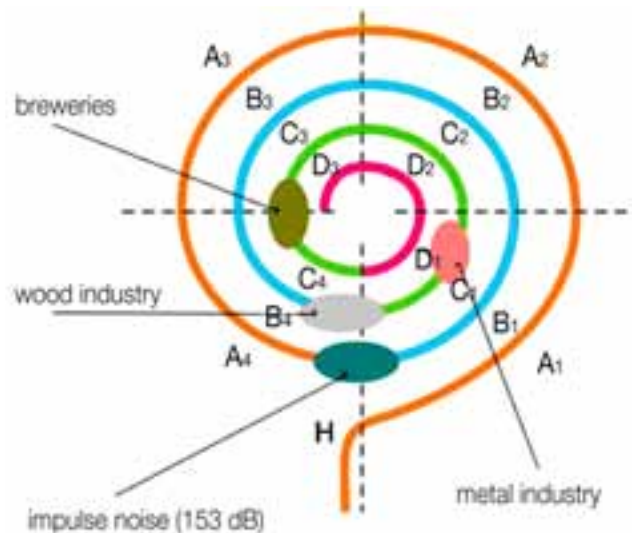


Illustration 71

**The arrangement of typical noise profiles and the localizations of the evoked over stresses in the cochlea.**

The academic inner ear and noise research lists, among others, the allowable levels for:

- industrial noise protection
- professional noise protection (discos, etc.)
- the review of flight and traffic noise
- positions of organizations (eg. WHO) and state and non-state, national and international organizations.
- the individual protection (prevention) of inner ear over stress with help from protection against noise.
- individual self help measures with help of active self-protection against noise when inner ear over stress is already present.

**Why are the results of university research of the inner ear so little known?**

Academic inner ear and noise research are underfunded. This is explained by the almost exclusive funding of academic inner ear and noise research by the professional organizations and their members. The professional organizations are naturally interested in avoiding or reducing their obligations to pay income for recognized, professionally caused noise injuries and thereby place the results of noise research onto prophylaxis of injury ( = occupational noise protection )

All other institutions and entities, which likewise are involved with the consequences of inner ear over stress, do not receive direct financial advantage from the prophylaxis of inner ear over stress in contrast to the professional organizations, and therefore do not feel obligated to further international inner ear and noise research financially.

If one observes society as a whole from the perspective of noise protection, then it becomes clear, that no one, except the affected persons, has any interest in this subject. Everything from production to sale to one's own use of the products and accomplishments of the modern world is more or less tightly bound to the development of noise, but who then will assume responsibility for it?

Only politics or the state remains to come up with the funds necessary to protect us citizens from that which we ourselves produce, market, and consume (note also problem areas of cigarettes, alcohol, etc.,) A difficult undertaking especially now in the age of global deregulation in the sense of general free competition and the general demand for the greatest individual self-determination. In view of this situation what remains realistically for the individual is above all: Self education, self initiative, self protection, and self help. To this end [www.dasgesundeohr.de](http://www.dasgesundeohr.de) will make its contribution.

In summary one must conclude that the ears, our hearing and balance organs, have an insufficient lobby, and, therefore a science, which is concerned with their health, can accomplish but little.

## Test the Ability of Your Hearing Cells to Regenerate for Yourself

With the simple and economical method of **using ear plugs** in your everyday life, you can test the capability of your hearing and balance cells to regenerate.

At the same time you can protect your highly sensitive organs of hearing and balance from “garbage noise” which they have to “swallow”, whether they want to or not.

Simply use ear plugs for several hours, perhaps during shopping, Even after one hour you will notice how loud it is around you when you take out your ear plugs.

By this simple technique alone, your ear has been less overstressed , resulting in improvement in your hearing (= more sensitive and biologically better).

It has demonstrably regenerated itself.

The longer you protect your ears from this daily garbage noise, the more clearly you will appreciate this relationship.



Illustration 72

**With the aid of ear plugs, you can test the ability of your hearing cells to regenerate!**

### The Natural Regenerative Ability of the Cells of Balance

The natural ability of the balance cells to regenerate is also known to everyone from everyday experience. Most commonly these are mechanical stimuli (riding the merry-go-round, dancing a waltz, sea sickness, etc.) with feelings of light-headedness and subsequent recovery. Other stimuli may be chemical or toxic in nature (alcohol, drugs) likewise with subsequent recovery.

In summary:

The experiences of the individual in everyday life as well as academic research prove the ability of the inner ear and its cells of hearing and balance to regenerate. (see also [www.dr-wilden.de](http://www.dr-wilden.de))

## The Biological Explanations for the Individual Symptoms of the Overstressed Inner Ear, their Representations in Audiometry, and their associated Measures for Self-help

### Diagnosis and Differential Diagnosis of the Overstressed Inner Ear

In this chapter the initiatives of the tinnitus experts and the inner ear physician Dr. Lutz Wilden are directed to the affected patients, who have already been worked up with the necessary investigations. These Investigations are:

- 1) Visits to the family physician or to a physician in Internal Medicine and to an ENT physician.
- 2) Completed investigations by these physicians plus additional evaluations by specialists such as neurologists and/or radiologists.
- 3) It is often desirable to have a magnetic resonance imaging (MRI) performed to rule out the possibility of an acoustic neuroma or other possible central nervous system tumor. This procedure can be very loud, and ear plugs are indicated for protection.

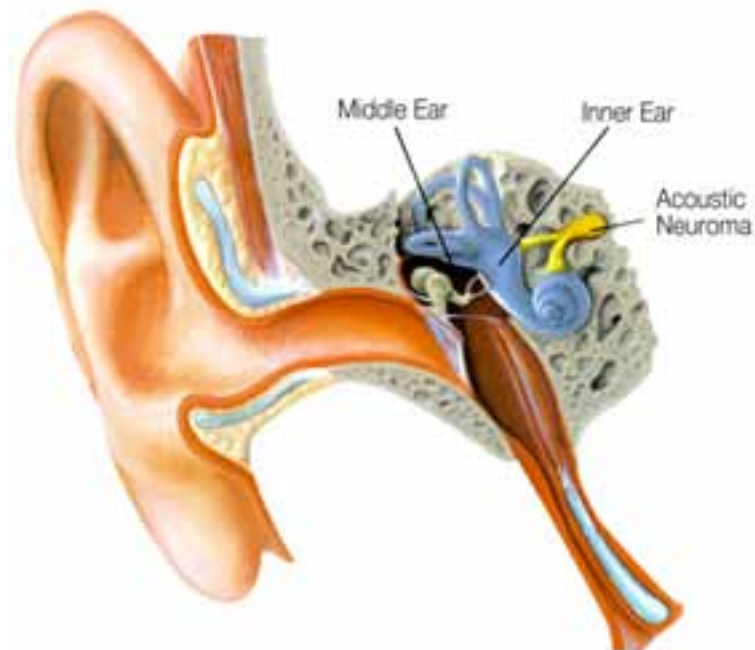


Illustration 73

**By using magnetic resonance imaging (MRI)  
central nervous system tumors can be ruled out**



## Pressure in the Ear

Pressure in the ear is a symptom of an acutely overstressed inner ear. The pressure arises through an edema (swelling) of the endo- and perilymphatic tubular system of the inner ear. (see page 13)

The swollen lymph system presses through the upper situated perilymph tubule onto the inner situated elastic oval window, which in turn presses the stapes and the other tiny bones in the chain originating at the ear drum.



Illustration 74

### Thus arises the feeling of pressure in the ear

Through this there arises the feeling of pressure or cotton wool in the ear for the affected person. Many patients describe this with the words, " My ear is blocked up" or " It feels like being in an airplane when you come down to land."

The patient often has a need to pull at the affected ear lobe or touch the ear with his hand.

Sometimes the swelling is so bad that the patient complains of a drawing or sticking pain, which can be felt in the bone behind the external ear or around the entire external ear.

If the pressure in the affected ear becomes painful, it means the condition has arisen from a particularly intense and acute overstress of the inner ear. The feeling of pressure in the ear can also be associated with dizziness and uncertainty of gait. ( see page 15 ) The development of edema is an entirely normal biologic reaction of the body and its organs to injury and stress.

Everyone knows this condition, such as occurs in overstrained limbs, but it also occurs in inner organs, such as the liver, kidneys, spleen, etc., . The occurrence of this in the inner ear must be viewed therefore as " biologically normal".

## First Aid for Pressure in the Ear

As is the case for all other organs in the body, an edema of the inner ear (= pressure in the ear) is best treated initially by placing the organ at rest. Just as a swollen joint would be treated by a cast to promote rest, a swollen liver or kidney would be given rest through special diets.

The treatment of the inner ear is first of all initiated through avoidance of noise. This may be accomplished by retiring to quiet surroundings and through the use of ear plugs to further reduce the every day sounds not otherwise avoidable. Pressure in the ear can occur at the very beginning of inner ear overstress, and may be, as mentioned before, the very first symptom of a beginning inner ear overstress. It can, however, recur and persist over weeks, months and years in the context of a continuously increasing inner ear overstress, and be more or less continuously present. The use of ear plugs is therefore not only needed in the acute case, but also in recurrent or persistent cases of pressure in the ear. The protection against everyday noise with ear plugs should be long term, even after the symptoms have abated.

### Audiometric Changes with Pressure in the Ear

Pressure in the ear ( swelling of the inner ear ) is also seen in audiometry. Pressure in the ear leads to a delay in the conduction of sound through the external auditory canal, middle ear and inner ear.

This can be measured in audiometry over the air conduction. For this the test tones are introduced directly from the head phones into the ear passages. Bone conduction with pressure in the ear is affected less in contrast to air conduction.

This path of sound is measured audiometrically using bone conduction. Pressure in the ear leads to a divergence in the test results between air and bone conduction.

When healthy the bone conduction curve lies just over that of the air conduction.

In the case of pressure in the ear the bone conduction curve lies higher over that of the air conduction, that is, they diverge.

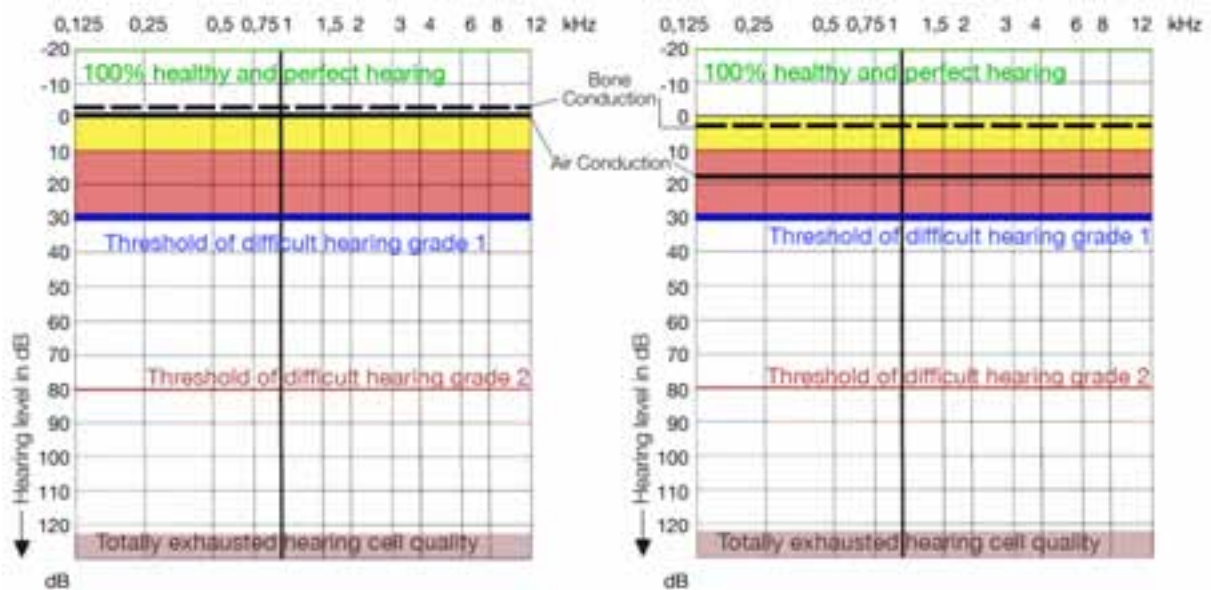


Illustration 75

Normal hearing curve

Example of a hearing curve for pressure in the ear

## Pressure in the Ear and Otosclerosis

The evaluation of the divergence between air and bone conduction in audiometry is made more difficult by the circumstance, that otosclerosis causes a similar divergence.

Otosclerosis causes the bone chain in the middle ear to become stiff. This is a sort of rheumatic process involving the joints between the tiny bones of the middle ear chain including that to the oval window, which causes the conduction of sound to slow through the middle ear into the inner ear, thereby leading to a divergence of the air and bone conduction curves. Intense or frequently recurring middle ear infections can lead to otosclerosis. These intense infections can attack the bone chain in the middle ear and reduce its biologic quality.

Numerically observed, the incidence of pressure in the ear is much greater than otosclerosis as a cause of divergence of the curves in audiometry. In the differential diagnosis the fact that otosclerosis tends to be familial and these patients do not complain of pressure in the ear may lead to simplification. In the patient interview a history of frequent middle ear infections may turn up.

## Pressure in the Ear and Acoustic Neuroma

In rare cases an acoustic neuroma ( tumor of the Eighth Cranial Nerve = nerve of hearing and balance ) may cause pain or pressure in or around the ear.

An acoustic neuroma normally does not cause a divergence of the hearing curves and, using a magnetic resonance imaging exam (MRI), can be ruled out. (see page 61)

### **In summary**

The symptoms of pressure in the ear, cotton wool in the ear, a “ blocked ear”, pain in or about the ear, and dizziness have to be evaluated and clarified by a physician. If this clarification ensues, and the named symptoms persist, then it is a sensible self-help approach to use ear plugs actively and long term against the intrusion of everyday noise.



Illustration 76

## **Hyperacusis (Sensitive to Noise and noise Volume)**

Hyperacusis is the symptom of oversensitivity to noise and noise volume. This oversensitivity may be exclusively to noise volume and/or to individual sounds ( frequencies ), eg., very high sounds.

Hyperacusis is a symptom or sign of an acute inner ear overstress just as is pressure in the ear. Both can occur simultaneously.

Hyperacusis can occur, just like pressure in the ear, at the beginning of an inner ear overstress, or in the course of a continuously or stepwise progressive overstress.

Hyperacusis does not develop from a swelling ( edema ) of the lymph system in the inner ear like pressure in the ear, but rather from an alarm signal sent directly from the acutely overstressed hearing cells. (see also page 36)

With this symptom the overstressed inner ear organ seeks to make us avoid loud noise.

Since the inner ear with its 25000 hearing cells has to respond to any noise at all, and has to convert this noise into nerve impulses, it only makes sense to avoid any work, that is, not to hear at all. With the sensitivity towards sound volume the hearing cells reach out to us to flee from loud noise, that is, to avoid it.

### **First Aid for Hyperacusis**

The best we can do in the case of a hyperacusis is to protect the affected hearing or balance organ by using ear plugs actively and for the long term against everyday loud noise.

### **Hyperacusis and Exceptional Hearing**

Hyperacusis is often confused with exceptional hearing ( = good hearing ).

This means one thinks his hearing is very good, since it is intense.

This, however, is an illusion.

A clear, healthy and very good ear is very sensitive to be sure. It reports well and exactly the loudness of all that surrounds us, but does not develop a painfully sensitive hearing such as with hyperacusis.

The difference between hyperacusis and a good, healthy, clear hearing is easily detected by audiometry.

## **Hyperacusis in Audiometry**

Audiometry illustrates exactly the biologic quality of the hearing and balance organs. (see also page 44)

An absolutely healthy and highly capable hearing and balance organ looks like this:

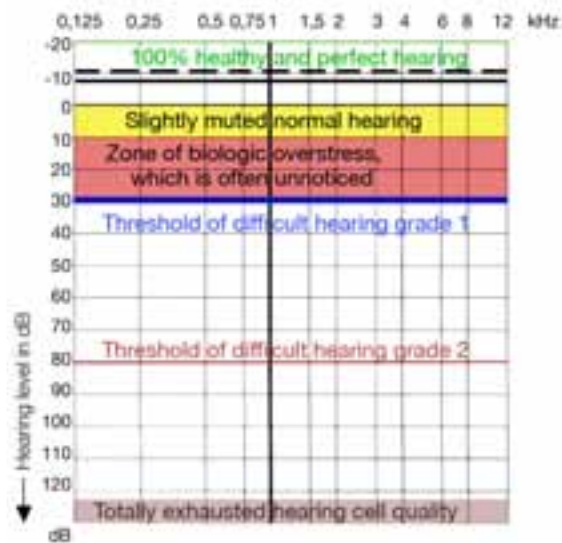


Illustration 77

#### **Audiometric picture of a 100% healthy, absolutely clear hearing inner ear organ**

Due to the generalized, massive, daily overburden of loud noise in civilized society, the only time this picture is seen, is in children or in remote, isolated tribal peoples.

He who must live and work in the continuous, everyday, noisy, environmental surroundings of our modern society, will show, as a normal hearing adult, a blunted normal hearing curve at best. This zone lies between 0 and 10 dB.

This condition is observed by doctors to be good generally and as a rule.

The loss of biologic inner ear quality of 20-30 dB is not perceived by us as disturbing or as poor hearing. Conversely, this condition is for us all a normal and even pleasant situation, because it allows us to endure normal city noise and noise volume without difficulty. We actually do not notice this noise pollution around us and this can be pleasant. For example:

On the railway platform an inter city train pulls in with squealing brakes. On the platform there are adults, young people and children. While at least some of the children and young people spontaneously hold their hands over their ears, most adults may distort their faces, but seldom shut their ears. The ears of children are normal and clear, they close them spontaneously.

The adult organ of hearing is blunted, and its owner believes falsely, that the noise does not affect it.

A further, perhaps theoretic example might be that of an Indian from an isolated territory in the Amazon.

Based on the prevailing state of quiet there, his hearing organs have retained a high sensory quality (= biological quality).

They are not blunted. Then he arrives in some metropolitan area. For the first 6-8 weeks he is terrified by the general, surrounding noise and noise volume.

Then after living for 2 months in civilization, he becomes less affected by the noise. He can get about more comfortably, because now, his formerly healthy, clear hearing ears have “normalized” to the ongoing working stress to which they have been exposed.

Now he has “normal” hearing and his hearing curve lies between 0 and 10 dB.

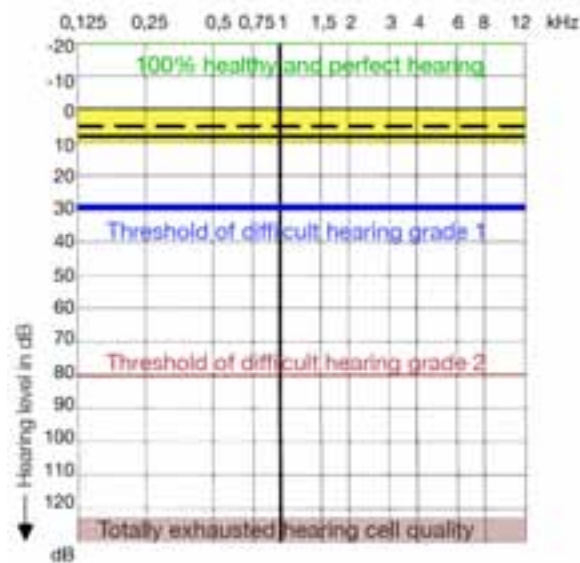


Illustration 78

**Audiometric picture of blunted normal hearing**

Hyperacusis, the state of painful, oversensitive hearing, appears first, when the hearing cells of the affected person are driven from blunted normal hearing into the next level of biologic exhaustion from long exposure to so-called normal everyday noise.

This condition is reflected in audiometry. To prevent further overstress from this work load which is adversely affecting the hearing cells, these then “report” their condition to us in the hope, we will understand and do something to protect them from further noise volume.

Often this hope is misplaced..



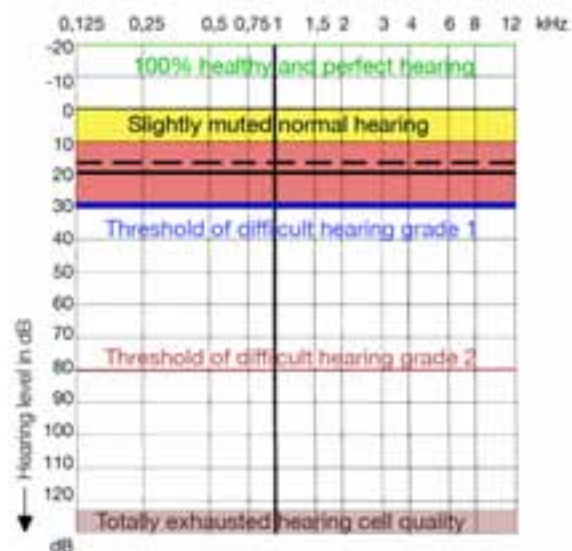


Illustration 79

**Audiometric picture of hyperacusis**

**Hyperacusis and Difficulty Hearing**

Only when the tiredness and overstress of the hearing cells has progressed to a hearing capacity of less than 30 dB, do we experience difficulty in hearing. (difficult hearing grade 1 in audiometry) For understanding of speech it is important to know, that this is only considered serious, when the exhaustion of the hearing cells in the speech frequencies (0.5-3kHz on the frequency scale of audiometry) has reached or exceeded 30 dB. Since difficult hearing is always associated with the condition of biological overstress of the hearing cells, it always goes together with hyperacusis (noise sensitivity).

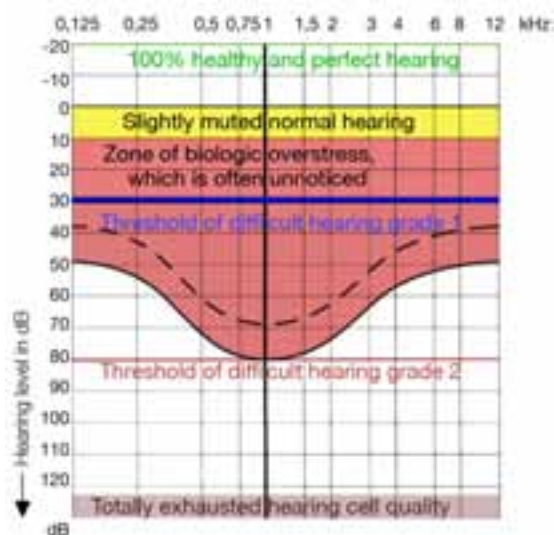


Illustration 80

**Difficult hearing is almost always accompanied by hyper/dysacusis and often by tinnitus**

Therefore he who hears poorly has to protect his exhausted hearing cells from senseless noise.

## Selective Hyperacusis

Under selective hyperacusis is understood that individual frequency sections ( inner ear sections ) are especially overstressed and therefore especially noise sensitive. For example you notice that high pitched sounds cause pain and are frightening. Examples could be rattling of glasses or plates, high voice ranges of your fellow beings, the whistling of the supermarket cash register, or high flute notes.

In this case the hearing cells, in particular those responsible for the perception of high pitched sounds, and which sit at the entrance to the cochlea, are especially overstressed. If the hearing cells for deep sounds, which reside in the apex of the cochlea, are compromised, you will experience this as sensitivity to deep sounds. For example the rumbling of a motor or the deep notes of a bass instrument may be unpleasant.

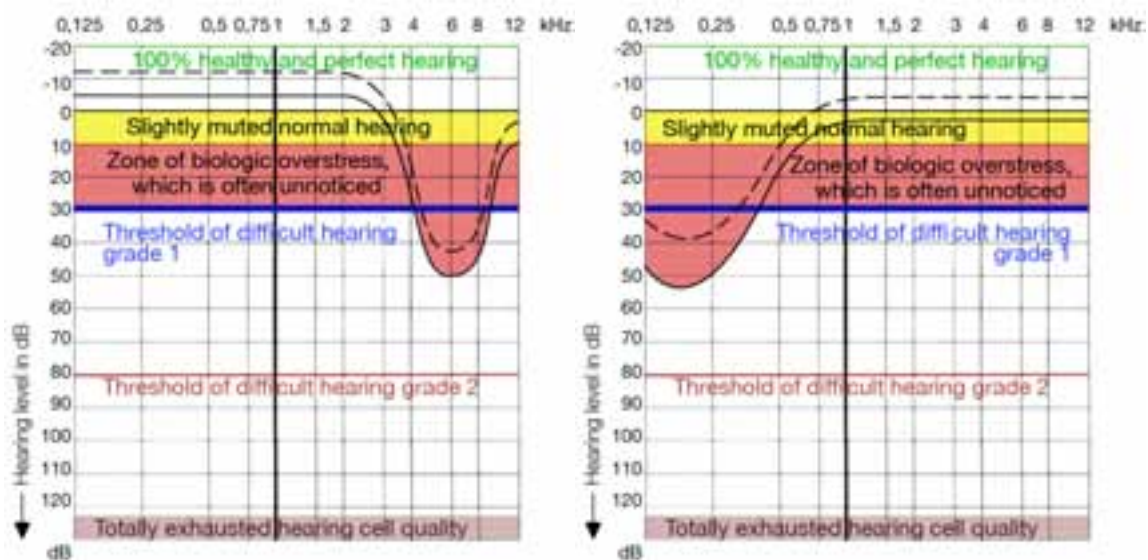


Illustration 81

Selective sensitivity to high-pitched sounds

Selective sensitivity to deep-pitched sounds

### In summary:

Hyperacusis (noise sensitivity) is a warning signal of overstressed hearing cells. The continuous work stress of the hearing cells, which goes with the so-called everyday normal noise volume exposure, drives these cells out of the blunted normal hearing range into a progressive biologic exhaustion. The result is sensitivity towards further burdens (sounds, noises, noise volumes)

The biologically correct answer for this is the immediate avoidance of noise and noise volume and active protection against this everyday loudness through the use of ear plugs.



Illustration 82

Since hearing cells are nerve cells, they are on the one hand very durable (= high individual capability for regeneration) (see page 40), but on the other hand, when they experience an overstepping of their capabilities, they require a correspondingly long time to regenerate. From this it follows, that the active protection against further auditory burdens should last for a correspondingly long while, at least 3 months.

## **Dysacusis (Hearing Distortion)**

Dysacusis is the term used for hearing distortion.

The accustomed hearing impression suddenly changes.

The persons affected hear sounds and speech unclearly, there is echoing and hissing in the ears. The condition of dysacusis often is found together with hyperacusis and/or with the symptom of pressure in the ear.

Just as with hyperacusis, hearing distortion is a distress and alarm signal sent out by the overworked and overburdened hearing cells. This can affect the entire ability to hear or just certain frequencies as in hyperacusis.

As we have seen earlier, hearing is an intense energy consuming process (= ATP).

([www.dr-wilden.de](http://www.dr-wilden.de)) It is certain that even the best of our hearing cells sooner or later become so exhausted, that it becomes impossible for them to convey to us a normal hearing impression.

Dysacusis, just like pressure in the ear and hyperacusis, can be an alarm signal, standing at the onset of an inner ear overstress, or proceeding stepwise or progressively in the course of a chronic inner ear overstress.

## **First Aid for Dysacusis**

In dysacusis the inner ear organ and its hearing cells wish to inform us in the same way as in hyperacusis.

“Please, relieve me, spare me, protect me!”

Therefore the biologically correct answer is, as with hyperacusis, the immediate avoidance of noise and noise volume, as well as the active protection against everyday loudness by the use of ear plugs.

## Dysacusis and Difficulty Hearing

Even like hyperacusis, dysacusis accompanies the overworked, poorly hearing cells continuously.

Difficult hearing not only means “hearing poorly”, but also the affected person has to arbitrarily contend with distorted, painful hearing.

## Selective Dysacusis

Under selective dysacusis is understood, that individual frequency sections (inner ear sections) are especially overworked and are not able to correctly process the incoming sound stimuli into nerve impulses as we are accustomed.

The hearing impression is altered for certain pitches (frequencies), causing misunderstanding, distortion, echoes, etc.

## Dysacusis and Audiometry

Dysacusis (hearing distortion) is a symptom bound together with hyperacusis. That is, it occurs under the same or similar biologic circumstances as hyperacusis, and in the hearing curve it falls in the same plane of inner ear exhaustion as for hyperacusis.

### In summary

Dysacusis is a warning signal of overworked hearing cells. The on-going work stress of the hearing cells, which is associated with the so-called normal everyday environmental loudness, drives these out of the blunted, normal hearing range into increasing, biological exhaustion. They become sensitive and dysfunctional, and can tolerate noise volumes, noise and sound less well.

The only biologically correct answer to this is:

the immediate avoidance of noise and noise volume and the active use of ear plugs to protect the organs of hearing and balance from further exposure to everyday loudness.



Illustration 83

## **Acute Hearing Collapse**

Acute hearing collapse is the acutely overstressed state of the entire inner ear organ. It occurs together with loss of hearing, pressure in the ears, hyperacusis, dysacusis, tinnitus and dizziness/vertigo. At the cellular level this means that previously asymptomatic hearing and balance cells suddenly lose their biological quality. An acute hearing collapse results almost always from a preexisting ( but unnoticed ) exhaustion of the inner ear. However, because of the basic high biologic quality of the sensory cells ( nerve cells ) of the inner ear organ, it is possible in many cases for them to stabilize themselves , but at a lower niveau compared to the original.

The affected persons usually experience this condition by turning to medical treatments, eg infusions, tablets, inpatient hospitalizations. They credit these treatments then with their improvement or healing. Not to diminish the value of these prescribed measures, it is, however, the inherent ability of the hearing and balance cells to regenerate, which often prevents a total collapse of the entire inner ear organ.

## **First Aid for Acute Hearing Collapse**

As for all other acutely overstressed states in our bodies, acute hearing collapse is best treated also by the immediate placing at rest of the affected organ.

For acute hearing collapse the consistent and long term use of ear plugs is needed to protect the overworked ear from further unnecessary and senseless stress.

Since every conscious or unconscious auditory stimulus causes biological work for the ear, complete quiet is the best treatment for the overworked organs of hearing and balance.

## Acute Hearing Collapse and Audiometry

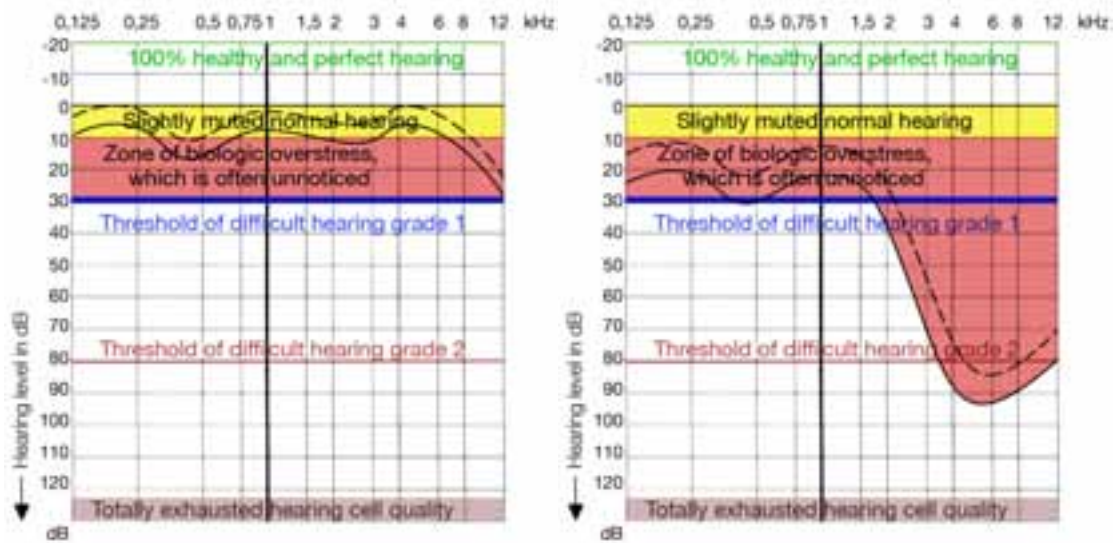


Illustration 84

Before a hearing collapse

After a hearing collapse

### In summary

Acute hearing collapse is associated with a dramatic and sudden “break down” of the accustomed (unnoticed) inner ear quality. As for any other acutely occurring overstress condition in our bodies, the organs of hearing and balance require quick and efficient help. The use of ear plugs, together with the imposition of quiet, is needed. This is even recommended should treatment be required as an inpatient.



Illustration 85



## **Condition After Hearing Collapse**

The condition is characterized by recovery to a level somewhat lower in comparison to the original level. The therapeutic strategies available today for the person who has suffered an acute hearing collapse, condemn him to a lifetime condition of uncertainty and danger. That is, once he has had an acute inner ear overstress, he must protect his inner ear consistently from unnecessary noise loudness for the rest of his life. With this he differs from the individual only slightly who believes that he has never experienced an inner ear overstress. Only the insight that our hearing is dependent on the energy-consuming work of our inner ear organs and their cells will be able to keep us from overworking them and making them sick.

## **First Aid for Acute Hearing Collapse**

As for every other chronically overburdened organ in our bodies, a chronically overburdened inner ear has to be spared further stress for the long term. Therefore for the condition following hearing collapse, an active, long term commitment to protecting the organs of hearing and balance is the best possible self-help measure.

## Condition After Hearing Collapse and Audiometry

After hearing collapses the audiometric picture shows a loss of hearing capacity on the suffering ear.

### **In summary**

The condition after hearing collapse marks the attempt of an acutely overworked inner ear organ to stabilize itself at a lower ( more exhausted ) level than the original. The most effective self-help measure in this situation is imposition of quiet to the extent possible. Further the overworked organs of hearing and balance should be protected actively and continuously from everyday noise loudness with ear plugs.



Illustration 86

## The Fluctuating Ear

A fluctuating ear is one which has experienced an acute hearing collapse after an acute auditory overstress situation and is characterized by alternating between a somewhat better biologic quality and a somewhat worse biologic quality. Biologically considered, this is the better situation compared to the rather rigid condition after acute hearing collapse.

The overtaxed cells are able to take advantage of favorable living conditions (quiet, less stress, etc.) in order to work their way back into a better biological situation.

At the same time the fluctuating ear is still highly susceptible. That is, if stresses recur, such as loud noise, stress, additional sicknesses, etc., then a massive worsening of the biological condition may follow.

Due to the alternating biological qualities of the inner ear, the affected person experiences a continual up and down of the symptoms difficult hearing, pressure in the ear, hyperacusis, dysacusis, tinnitus and dizziness/vertigo (Meniere's Disease).

## First Aid for Fluctuating Ear

Again, as for all other acute and lasting conditions involving overworked organs in the body, the fluctuating ear benefits from an immediate and lasting cessation of activity as the first sensible measure.

## Fluctuating Ear and Audiometry

The audiometric picture of the fluctuating ear is similar to the picture seen with acute hearing collapse with periodic individual variations.

### **In summary:**

Fluctuating ear is associated with labile biological inner ear quality.

Treatment requires a careful and persistent protection against noise and loudness.

This is possible as an everyday measure with the help of ear plugs and the imposition of quietness.



Illustration 87

## Tinnitus

In the public's perception tinnitus dominates all other inner ear symptoms. Probably because the majority of people experience their overtaxed inner ears symptoms first and foremost through this mechanism. Only then when overtaxed organs of balance lead to dizziness/vertigo (Meniere's Disease) or when difficulty hearing appears in the foreground, does tinnitus take a back seat to these other symptoms.

The majority of tinnitus sufferers, however, are tormented, and this frequently becomes the only symptom experienced.

Unfortunately this has often caused tinnitus to be misunderstood as not what it actually is, a pain signal of the overworked hearing cells in the inner ear. (see also page 36 and [www.dr-wilden.de](http://www.dr-wilden.de)) The hearing cells are so specific in their tasks of conveying acoustic signals, that they can only use acoustic signals to express their pain.

This is similar to visual cells "seeing stars" in response to a blow to the eye. Since the hearing cells as nerve cells have a decidedly high capacity for individual regeneration, they also have by nature much tolerance for biological burdens. In other words people use their ears years and years without even noticing them, but in spite of this capacity every biologic system has its limits.

Should this be reached, then the cellular system jumps to produce distress signals in order to warn about the approaching cellular crisis. This is exactly what happens with tinnitus.

To visualize this a glance at your personal audiogram should suffice. (hearing curve)

### First Aid for Tinnitus

Since tinnitus is never an isolated phenomenon, but rather a serious and true biologic signal emerging from a very valuable sensory organ, you should in fact take it very seriously and attempt to discover what you can do to positively influence it.

The use of ear plugs everyday is an excellent option for consciously sparing the one or both hearing organs from everyday noise and loudness. There is one small problem to overcome in the process. In that moment when the affected person places an ear plug in his ear canal, he will hear his tinnitus even louder than before. Since now the masking effect of the surrounding environmental noises will be lost. At first this is a shock.

But then, if this can be overcome and the protection from noise and loudness can be maintained for a while, the affected person notices that this quiet is beneficial, that the tinnitus becomes less tormenting and aggressive. Exactly the opposite occurs whenever he experiences more noise and loudness such as after a long drive, a concert, or after a long telephone conversation.

## Tinnitus and Audiometry

Tinnitus always appears at the site of the greatest biological stress in the cochlea. If you suffer from a high frequency tinnitus, then you will find the greatest drop-off in your hearing curve in the high tone region (at the entrance to the cochlea).

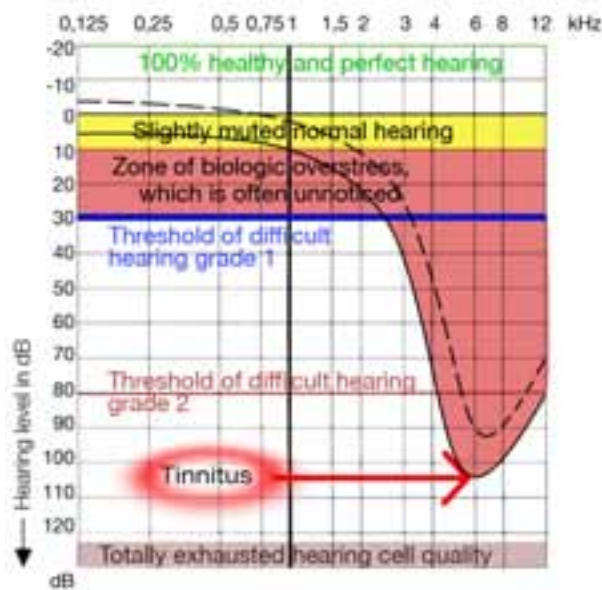


Illustration 88

**High tone tinnitus with massive overstress in the high tone region**

Should you suffer from a deep, rumbling tinnitus, then you will find the greatest drop-off of your hearing curve in the deep tone region of your audiogram.

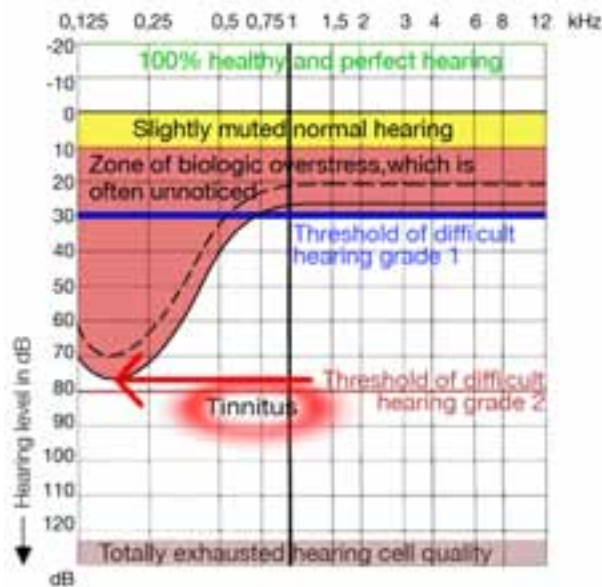


Illustration 89

**Deep tone tinnitus with massive overstress of the deep tone region**

Should you suffer from a tinnitus consisting of varied sounds or noises, you will find a corresponding representation among the frequencies in your hearing curve indicating the sites of inner ear overstress.

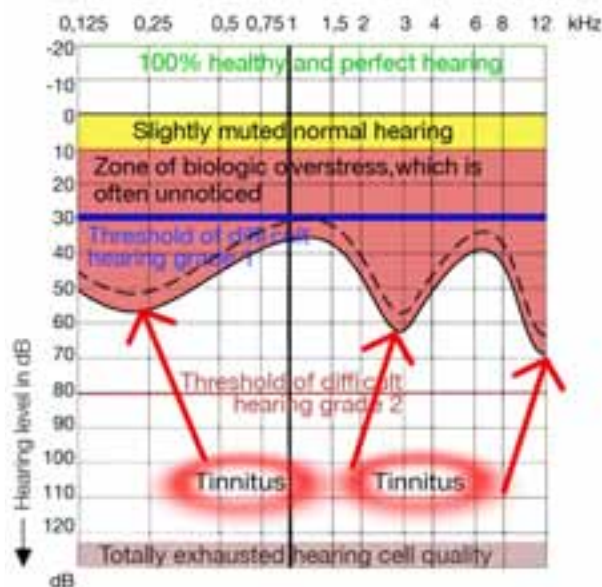


Illustration 90

**Multiple tone tinnitus with massive overstress at multiple sites**

The audiogram indicates also the vigor and aggressiveness of a tinnitus. The steeper the drop-off of the hearing curve, the greater is the cellular stress at that site, and the more vigorous is the associated distress signal or tinnitus. Many affected persons experience this painfully during their own illness. Should tinnitus remain bearable for a long time, then an audiogram will show a lesser involvement.

Suddenly (eg. after renewed hearing collapse) or more slowly, the aggressiveness of the tinnitus increases. Then a control audiogram will usually show either a sudden or gradual drop-off of the hearing curve.

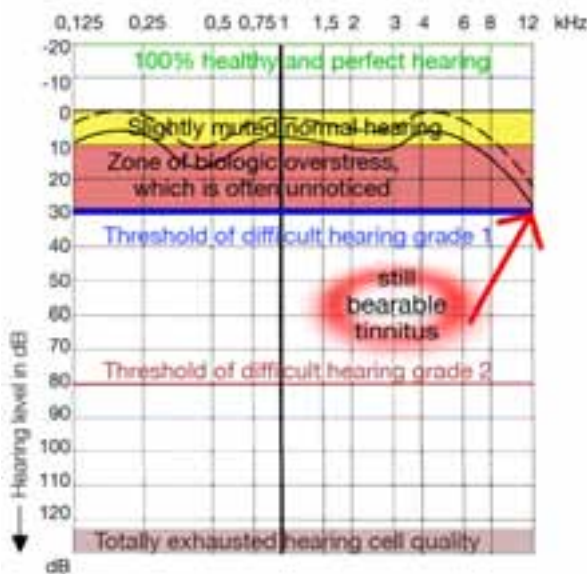


Illustration 91

**High tone tinnitus which is still bearable with a high tone stress which is not too severe**  
**In summary**

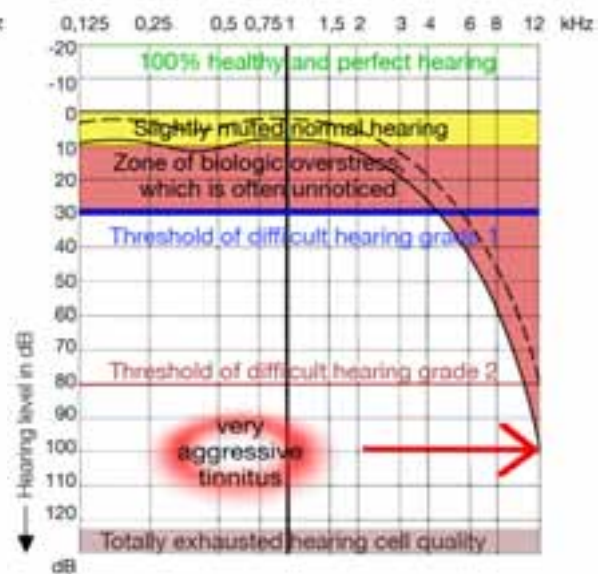


Illustration 92

**Example of an audiogram following a worsening of the tinnitus**



Tinnitus (ear noises) is always a distress signal of acutely or chronically overtaxed hearing cells.

The most important and most sensible biological measure is a conscious sparing of one or both affected hearing organs.

This is possible by seeking as much quietness as possible together with the everyday use of ear plugs. For this there is a biologically clear and basic rule:

The fresher and less advanced your personal inner ear overstress, the quicker and clearer you will experience improvement by using hearing protection against loudness on a continuing basis. The more chronic and the more advanced your personally overstressed inner ears have become, the longer and more patiently you will need to protect them to achieve an ongoing improvement.



Illustration 93

## **Vertigo and Vertigo with Nausea/Vomiting (Meniere's Disease)**

### **Original Description of the Disease:**

**Gazette medical de Paris, 09/21/1861, Pages 597-601**

(quoted from: O. Michel: "Meniere's Disease" Georg Thieme Publishers Stuttgart, New York 1998)

- Disturbances of function can appear suddenly in hearing organs which hitherto have been entirely normal, which consist more or less of continuous or intermittent noises of varied types, and with these noises there becomes associated soon a more or less strong diminution of hearing.
- These functional disturbances, which reside in the inner ear, can call forth symptoms of a cerebral nature such as dizziness, uncertain gait, vertigo and falling; these are accompanied by nausea, vomiting and syncope.
- The above appearances commonly take an intermittent form and are almost always followed by difficulty hearing, which often is suddenly and completely lost.
- Everything points to the labyrinth as the source of the material harm for these functional disturbances.

#### **Prosper Meniere'**

This is a very good description of the symptoms of chronically complex inner ear overstress, and perhaps it is time today, 145 years later, to add to the labyrinth, as stated by Meniere', the second organ region of the inner ear, the cochlea, as a site of the problem. This is the site where one becomes hard of hearing and deaf.

Vertigo and vertigo/vomiting (Meniere's Disease) is the consequence of the more or less serious overtaxing of the entire organ of balance (labyrinth) in the inner ear with its balance cells. In this situation the overtaxed cells of balance are no longer able to send correct nerve impulses to the central coordinator of balance in the brain.

From this it can be seen, that in this condition of biological overstress, the speed of the nerve impulses arising from the balance cells is reduced.

At the center of a creeping development of vertigo there is also a creeping fatigue of the balance cells. If there is a sudden, unexpected, attack-like onset of vertigo (vertigo/vomiting, Meniere's Disease) then the cause will be a suddenly appearing overstress and fatigue of the balance cells in the organ of balance. (see page 36)

These conditions are very common together with a hydrops (edema) of the lymphatic system in the inner ear (peri-and endolymph system), which the affected person experiences more or less as an intense pressure in the ear (cotton wool feeling, blocked-up ear, etc.) (see page 15).

### **First Aid for Vertigo and Vertigo/Vomiting (Meniere's Disease)**

The symptoms of an overstressed organ of balance guarantee the proper treatment by themselves.

Vertigo, vertigo/vomiting (Meniere's Disease) places the affected person at rest, it takes him miserably out of circulation.

Resting, lying down, closing the eyes are measures which relieve the balance organ (which indeed our movement in space has to do without) and which, therefore, in the condition of overstress, forces them.

The relief of these stimuli offers the overstressed balance organ an opportunity to avoid further burdens and to enable the desired regeneration.

You can support this effort by not resisting, but rather by accepting these restrictions and arranging your life accordingly to avoid further burdens.

Thus for example you might want to avoid fairs, amusement parks, ocean voyages, bus trips, or any large gatherings of people. You might want to spend more time alone with nature.

Because the organs of balance and hearing share a common fluid system (peri-and endo lymphatic systems ), it would seem highly sensible, when confronted by vertigo and vertigo/vomiting ( Meniere’s Disease ), to also actively protect against noise and loudness.

## Vertigo and Meniere’s Disease and Audiometry

Frequently there exists in the audiometry of patients a defect in the biological quality of the inner ear most often in the deep tone region or over many frequency regions.

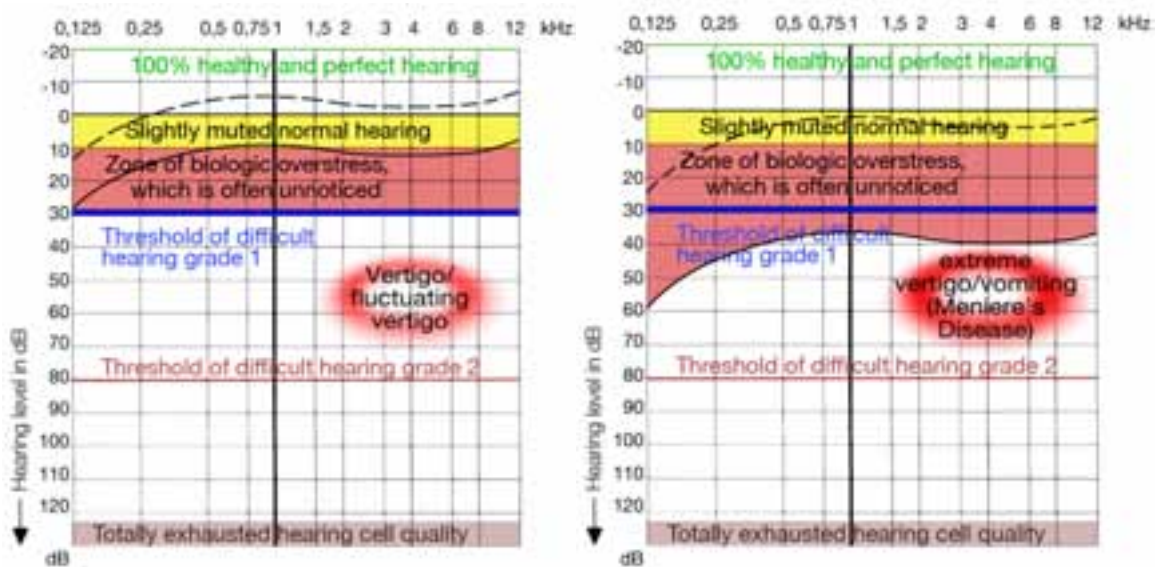


Illustration 94

**Vertigo/fluctuating vertigo  
with a mild inner ear  
overstress**

**Severe Meniere’s Disease with  
severe inner ear overstress**

In acute as well as chronic situations there is often a separation between air and bone conduction as an indication of an acute or chronic hydrops (edema) of the inner ear.

### In summary

Vertigo, vertigo/vomiting ( Meniere’s Disease ) is primarily an expression of an acute or chronic overstress of the cells of balance in the organ of balance.

As for every condition of overstress in our bodies, the organ of balance requires protection and being spared from unnecessary burdens. It is therefore prudent to seek as much rest and quiet as possible and to protect against everyday environmental noise and loudness by using ear plugs.



Illustration 95

## Difficult Hearing

### The Particular Problem for Wearers of Hearing Aids

Hearing aids are basically sound amplifiers.

This is true for all hearing aids, whether fitted in the ear, behind the ear, or implanted within the ear. The same applies also to analog or digital devices.

While eyeglasses merely change the striking angle of lightwaves, they do not increase the amount of light received by the eye. A hearing aid, however, increases the amount of auditory energy entering the ear.



Illustration 96

**This is an illustration representing the increase of auditory energy caused by 9 dB passing through a hearing aid**

Thereby every time a hearing aid is used, the ear or ears affected have to increase its or their work. Since hearing aids are only used in organs which are already clearly exhausted and overstressed, they should be used as sparingly as possible.

That is, you should basically pay attention, that your overstressed (hard of hearing) ears are not senselessly and harmfully burdened by additional background and accompanying noises. You should only use your hearing aid as much as necessary and as little as possible in order to give your already overstressed hearing organs as much rest as possible.

For example as a passenger in an auto, train, bus or airplane, you should not wear your hearing aid to protect your ears from an unnecessary continuous sound burden from the trip noise. It is even to be recommended, that under these circumstances, you should actively wear ear plugs. The same is also naturally true for all others who must deal with ongoing noise and loudness in their activities.

In the public domain there is a widespread opinion, that a fully developed person, who has experienced hearing loss after successfully completing speech development,

needs to have his hearing stimulated through a hearing aid. Otherwise he could forget both hearing and speech. This opinion is objectively wrong. No grown person has yet to be injured biologically because he did not use a hearing aid. No grown person has yet to forget how to hear or speak because he did not use a hearing aid. It is merely correct, that in the formative years between birth and five years of age, or school age, good hearing is necessary for the acquisition of speech. From this fact the dilemma of hearing aid use in children and youth arises.

## **Hearing Aids for Children and Youth**

The optimal care for hearing impaired children requires an optimal cooperation among doctors, parents, sound specialists, speech therapists, teachers of kindergarten teachers and schools. For on the one hand the previously represented interrelationships regarding noise and loudness, overtaxing the hearing organs and protection from loud noise are valid, as are organ-preserving uses of hearing aids for children and young people.

It is recognized that children in particular need stimulation of their speech capability by good hearing of speech. Hearing impaired children need an intensive involvement of parental and speech therapies. Of necessity, hearing aids must be used in hearing impaired children for optimal development of speech capabilities.

**At the same time unnecessary and useless sound burdens must be avoided in children with hearing aids.**



## Loudness Is the Organ-specific Stress for Your Ears

In our bodies each organ has its unique stress producers. Light intensity stresses the eyes but not the ears. Hot pepper stresses the stomach but not the joints. High jumps and hopping stress the joints but not the eyes or ears.

Noise loudness stresses the ears but not the spinal column, the joints, nor the eyes.

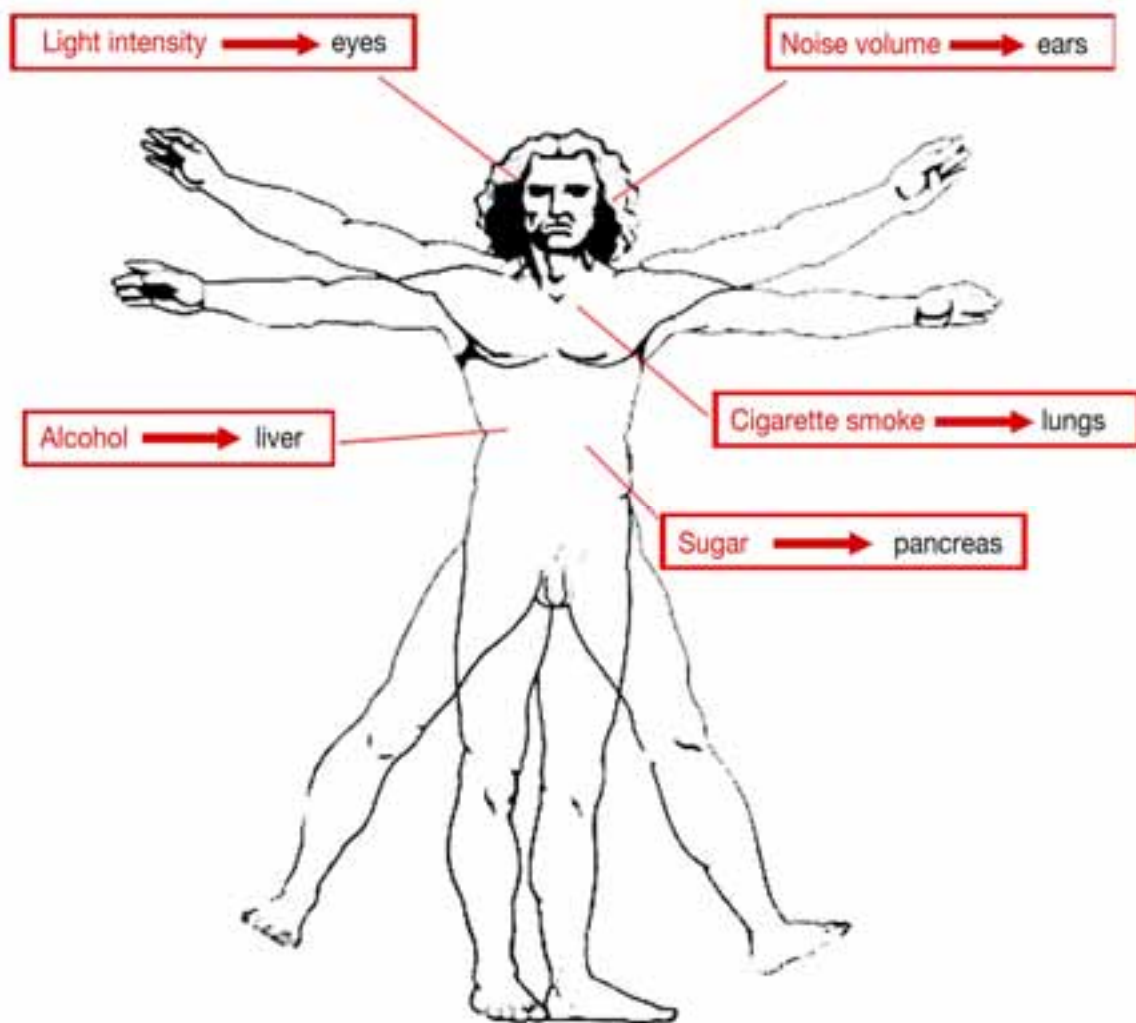


Illustration 97

### Organ-specific Stress for Your Ears

These commonly known medical facts should not be forgotten in referring to our organs of hearing and balance.

If we consider these relationships, then slowly a reasonable attitude can be developed towards our organs of hearing and balance.

## **Pressure, Tinnitus, Hyperacusis, Dysacusis, and Memiere's Disease as Possible Accompanying Symptoms of All Sorts and Stages in Acute and Chronic Overstressed Inner Ears**

All of the above-named symptoms and conditions may occur in the most varied combinations with changing intensity and time of occurrence. This still does not change the underlying biologic causes which have been described. The more these symptoms appear together, the more embedded and persistent are the biological overtaxing of the organs of hearing and balance.

As a single symptom or as a combination of variables they are still the expression of an acute or chronic, more or less complex exhaustion of the inner ear quality. What they share in common is, that with an appropriate relationship to noise and loudness they may improve, even disappear in some cases.

### **Practical Hints for the Use of Ear Plugs and Unwanted Side Effects**

The active protection of our organs of hearing and balance is a very personal affair. The perceptions relative to our organs of hearing and balance are very individual. Therefore everyone has to collect his own personal experiences. In the marketplace there is a wide variety of hearing protectors, which may be critically evaluated and tested.

Above all one should be concerned with hygiene, comfort, wearing ease, and efficiency.

Acoustic specialists offer fitted ear protection, designed to accommodate your acoustic anatomy and your personal inner ear situation (audiometry). Become informed!

**During a long period of wearing ear plugs, you should visit your physician on a regular basis for examination of your ear canal.**

Sometimes pieces of ear plugs may remain in the ear passages, and these can cause reduced hearing and inflammation. Your physician can remove these and provide treatment for any resulting problems.

## What is Everyday Loudness?

As has been described in detail, our organs of hearing and balance are first of all our warning and navigation systems.

This is true not only for humans but for all mammals.

They are subject to a generally valid evolutionary conception.

An important prerequisite to this conception is the natural noise level of our planet.

For millions and billions of years this was constantly low. Only when humans produced the civilization which we know today did this level change.

From the point of view of our organs of hearing, the natural state is one of calm and quiet. Humanity, as a species, developed in a state of untouched nature over millions of years, in which it had to survive.

For this our ancestors needed organs of hearing in order to detect enemies early enough to be able to escape.



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Illustration 98

### **Electron microscopic photos of the sensory hairs of the hearing cell\***

At the same time it was necessary to be able to hear prey in order to kill it for food. Obviously humans fulfilled these tasks well enough to escalate us to the position of dominant species. Had the humans of antiquity suffered with the ears that many of us possess today, this may not have been possible.

Our ears were created for quietness.

Therefore it has basically become too loud for us to expect a lifetime of optimally functioning ears.

Only if people deal intelligently with loud noise can they be helped. They must prevent and protect from overstressing conditions to the organs of hearing and balance.

Education to this end should begin in childhood.

Unfortunately the opposite is the case.

As each must learn, the general level of noise and loudness climbs steadily along with the time of exposure on each individual.

In this sense everything which disturbs human peace and quiet becomes more or less a burden for the organs of hearing and balance. Currently this is not being discussed. The tumult of human interests and personal opinions drowns this out in the truest sense of the word. Only an individual's own insight and commitment to protect his ears can help further.

This is my purpose in giving you this information. Why do so many people whom you know have quite good ears? Or, at least, they believe they have good ears. Biologically considered, the answer lies in the unbelievable durability which nature bestowed on our hearing and balance organs.

These organs can lose 20 - 30 % of their entire quality before they report any symptoms to us. (see page 48)

Partial loss of quality especially in the high tone region can be considerable, yet elude detection for decades.

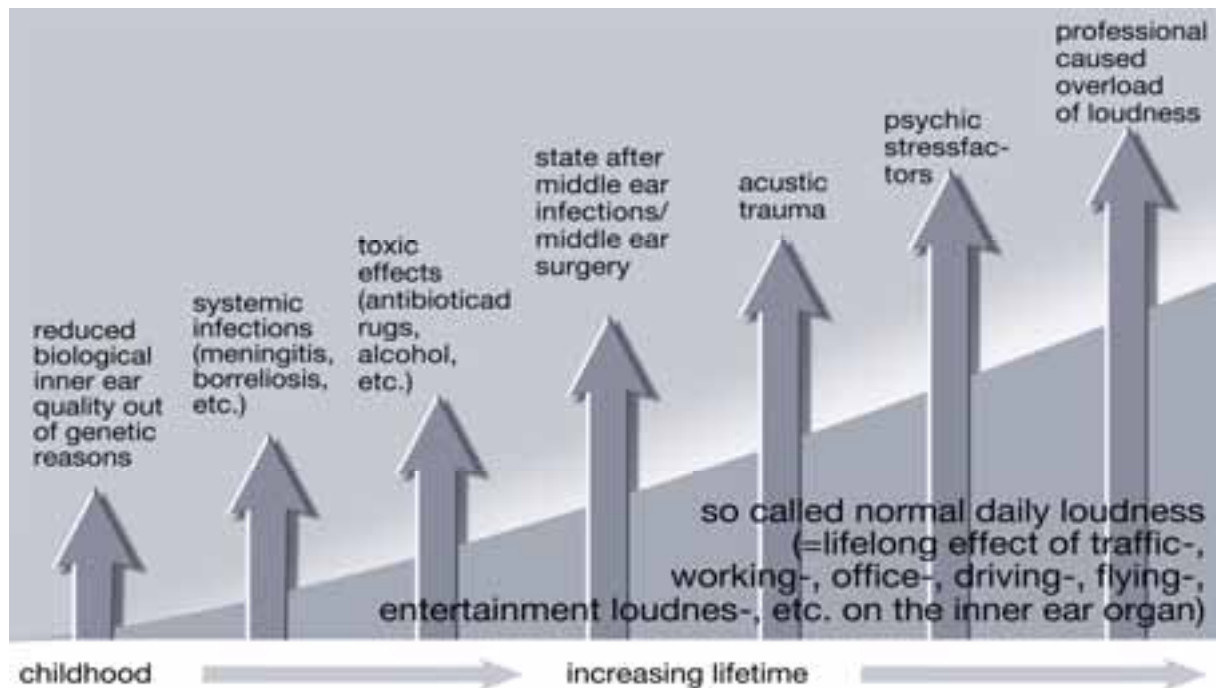
In the meantime generally accepted therapeutic considerations condemn the patient to live on with his overstressed hearing and balance organs. (see also [www.dr-wilden.de](http://www.dr-wilden.de))

	Example	dB	Perception	
Hearing damage certain after brief exposure	pain threshold	130	„Unbearable“	
	Jet engine, Rock Concert	120		
	Helicopter	110		
	Disco, air hammer	100		
	Factory shop	90		
Hearing damage likely, but certain with longer exposure	Motorcycle, street traffic	80	„Loud“	
Hearing damage with chronic exposure	Loud calling, moped	70		
	Office noise	60		
Learning and concentration disturbance	Conversation	50	„Soft“	
	Whispering	40		
	Leaves rustling	30	„Quiet“	
	Pocket watch	20		
	Breathing	10		
	Hearing threshold	0		

Illustration 99

**The ear is not able to accustom itself to loud noise without being overtaxed by it**

General civilization- related loud noise burdens of the inner ear begin already in early childhood and contribute to all other inner ear stresses.



**The general civilization-related noise and loudness affects all other causes of inner ear stress additively**

\* Legend for this illustration from <http://www.dr-wilden.de/info/241.html>

This picture makes the evolutionary concept of the inner ear visible.

The inner ear is a highly sensitive structure, whose task is to enable the mammal-human to survive in his natural surroundings.

In these natural surroundings it was necessary for the human to locate his enemies early in order to escape from them.

This task was obviously well performed for us over the ensuing millennia.

At the same time the environmental conditions, which were determining the evolutionary concept of the inner ear, were vastly different then from now.

It was a world of natural quietness, that is, a world which granted peace and quiet to the inner ear for hours, weeks and years on end, for it was absolutely quiet.

**Today we live in a self-created environment of unchecked and steadily increasing noise pollution, which stresses the inner ears of this world's inhabitants more and more every day.**

Neither you nor I can change that.

To be sure we both can use a simple measure for our own individual protection against this noise chaos which we have created. **Always wear ear plugs whenever it seems sensible to do so.**

A suggestion: the more often you use ear plugs, the less you will want to be without them.

### **Further Individual Counseling**

The information presented here is by nature very generalized and may not describe your situation or make it understandable. In case you wish further individual counseling you may send your most recent audiogram for evaluation to the following address: [office@lux-spa-ibiza.com](mailto:office@lux-spa-ibiza.com)

Also see at questionnaires at pages.115/116



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(Abb. 4)

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# Some Critical Remarks on Tinnitus-Retrainings Therapy (TRT)

Lately there have been noted in the media, articles, which appear to appeal to the public to accept a therapy for Tinnitus patients called Tinnitus Retraining Therapy (TRT) \*<sup>1</sup>.

Tinnitus Retraining Therapy consists of using a type of sound (called “pink sound”) introduced into the affected ear of the patient several hours each day for months. For this the patient must wear a device, fitted into his ear, which produces this noise, and is known as a “Noiser”.

## An Old Concept – Newly Repackaged

The idea, that a Tinnitus patient might be helped by introducing a continuous source of sound into his affected ear or ears is about 20 years old. Until today these sound producers have been known as “maskers”. The theory for this is simple.

The noise from the masking device drowns out the Tinnitus noise, thereby creating in the patient the illusion, that the perceived noise emanates from elsewhere, rather than from within his own head. The assertion is, this illusion psychologically relieves the patient, thereby making his Tinnitus more bearable.

From the representatives of this Tinnitus Retraining Therapy, who, for the most part belong to the ranks of the older proponents of masking, now comes the notion, that this idea is no longer correct. \*<sup>1</sup>

## Scientific Data is lacking

Although the older masker therapy for years has been an officially academically recognized form of therapy by ENT physicians, and still is, and was financed with the help of the health insurance industry, there has been no explanation as to why its former proponents have now declared it to be flawed.

This is astounding, since the ENT university clinics must have huge amounts of data on masker therapy, and, therefore, must be able to properly evaluate the results of their newer “Noiser” (TRT) therapy. In fact this newer Noiser therapy differs from the older masker therapy only in that the introduced sounds are somewhat quieter and more broadband than before.

This less scientific turn of events is also difficult to understand, since the TRT is likewise financed by the health insurance industry. One has to ask, what information does the Federal Committee for Doctors and Insurance companies possess, which compels the insurance industry to pay for TRT.

\*1) see references on page 110

Despite a lack of clinical data (= satisfied patients) and despite a lack of any demonstrable medical or technical innovation, the proponents of the Noiser therapy concentrate on communicating their newer theoretical concepts which are supposed to supersede the theoretical masker concept, as represented above.

In this the TRT has broken no new ground. In the history of Medicine there are many examples where an unproven viewpoint was simply to be sure, did the old teachings cause harm or were they merely a curiosity in the fantasy world of the medical profession.

Since we are dealing with an enormous problem, involving overworked organs of hearing, and the associated disturbances, which potentially affects every level of population, either acutely or chronically, and since obvious dangers exist for the inner ear organs with TRT, it is advisable for all those involved to thoroughly discuss the arguments pertaining to Tinnitus Retraining Therapy.

### **The New Theory of TRT**

The theoretical basis for TRT are as follows:

1. chronic Tinnitus is absolutely incurable
2. each patient with chronic Tinnitus should therefore be treated with TRT
3. chronic Tinnitus develops within 3 months from an acute Tinnitus and thereby changes its etiology (= cause of disease)  
clearly every person with chronic Tinnitus has a defect in his brain

### **The TRT recommends to the public, that it simply accept the current inner ear concepts, instead of rational investigation of the causes**

In regard to 1 + 2. The declaration of incurability of the illness to be treated reeks of despair and helplessness. This is not a rational scientific approach, but rather one which is fundamentally religious. The dangers in this assertion are correspondingly enormous. For one, all endeavours are declared impossible, which might lead to rational investigations which could overcome this asserted "incurability" (this is of course possible: see the biology of the inner ear, [www.dr-wilden.de](http://www.dr-wilden.de) / [www.dasgesundeohr.de](http://www.dasgesundeohr.de)).

For the other the TRT escapes in this way any controls on its success.

The buried message here is that humanity should understand that a cause can never be found. This is why more and more people each day find themselves with overworked inner ear organs.

Instead, everyone should accept, that Tinnitus, hearing distortion, hearing over sensitivity, ear pressure, vertigo and deafness are simple God-given changes, which arise from God knows where, likewise simply become part of us (according to TRT preferably in our brain) and that it is beyond our human abilities to competently treat these complaints.

Simultaneously in acceptance of his suffering, the patient should confidently turn to the TRT practitioners and their Noise concept, and be grateful to accept their help.

### **According to TRT the causes as well as the point of origin of the sickness involving chronic Tinnitus patients change**

In regard to 3. According to the new theories of TRT practitioners, the acute original causes of Tinnitus change clearly and basically over an arbitrary period of 3 months. They assert, that chronic Tinnitus has a completely different cause as an acute Tinnitus.

The TRT practitioners say that the symptoms of acute Tinnitus could arise from "damage to the inner ear, perhaps a sudden hearing loss, noise trauma, infections, narrowing of the great neck blood vessels, problems with the spinal column of the neck or high blood pressure". \*<sup>1</sup>

However, if the symptom described above as "acute Tinnitus" persists over 3 months, despite all the "state of the art" diagnostic and therapeutic endeavours of modern medicine, then, according to the beliefs of the TRT practitioners, this "chronic" Tinnitus clearly no longer arises from the ear, rather from the limbic system, the seat of our feelings and from higher brain levels. \*<sup>1</sup>

### **The TRT lacks a Medical Explanation for this change in the causes of this problem**

Previously the TRT has been unable to deliver an explanation as to how the cause of this overworked ear, such as the spinal changes or narrowing of blood vessels in the neck, was able to change to a cerebral cause alone. If, according to TRT, this change in causality is made with medical certainty, then it must be assumed that this certainty is derived from clearly recognizable connections. Such connections between the old causes (acute Tinnitus) and the new causes (chronic Tinnitus) are neither recognizable nor are they represented by TRT theory. What remains is an assertion of medical authority.

Thus the acute Tinnitus changes its point of origin after 3 months without explanation from peripheral to central.

### **What happens to the original problems?**

This question of what happens to the original disorders once the Tinnitus becomes chronic remains unexplained by this theory of the TRT.

Is this exhausted inner ear caused by noise trauma, exposure to chronic loudness, or sudden loss of hearing, now healthy again? Are previously described neck spine abnormalities no longer there? What has happened to the possibly causative blood vessel narrowing, the infection, the high blood pressure, etc.? Are all these problems gone? Is the affected patient at least now free of these other bodily problems? If so, how did this happen? How can our body do that?

The theory of TRT gives no information to such pertinent questions.

Instead of this it tries to more closely describe this brain defect to the public and to the millions of affected people.

## **According to TRT, the cause of chronic Tinnitus is a defect in the brain**

In regard to 4: The cause of the disease change from acute to chronic Tinnitus is, in the opinion of the TRT practitioners, a defect in the brain of the patients.

Thereby either an incorrect learning process has occurred, which keeps the perception of the Tinnitus noise in the brain in unclear fashion, or the noise has developed independently in the defective brain of the patient. \*1

The representatives of TRT will not commit themselves to either of the above conditions. Here we have an unusual theoretical condition. The theory can neither deliver a conclusive etiology for the first variable, nor for the second representation to explain the presumed occurrences of incorrect learning process or a defective brain.

## **How does this brain defect appear according to TRT?**

According to the theory of TRT, the brain of the person, who is plagued by chronic Tinnitus, can not distinguish between important and unimportant signals, on the basis of an incorrect learning process or a defect in the brain, which has caused the signal to occur independently. Thus the brain filter system, whatever that might be, has become defective.

According to the TRT practitioners, one should represent this suddenly occurring brain problem as such:

Should the Tinnitus appear for the first time, (ex. after a loud movie, concert, disco evening, etc.) the brain places a high value on this signal, "it could indeed be a sign of danger, leading to anxiety and tension.

The brain cries "alarm!"\*1

"Simultaneously the brain over interprets this signal" \*1

With this TRT asserts that an "incorrect learning process" has begun which continues on entire lifetime.

This "incorrect learning process" or "defect in the brain" forces the brain of the affected person to regard this Tinnitus signal not as a harmless background noise, such as the ticking of a clock, which it should filter out. Instead of this the disturbed brain of the affected person senselessly occupies itself with this signal, leading to its development as an independently occurring phenomenon. \*1



### **At first the brain functions normally**

A strange process is occurring worldwide in more and more human brains. At first, during the first three months of Tinnitus, the brain behaves normally. It is upset about this tormenting perception.

In this phase the brain appears to function well enough to direct its owner in the majority of cases to visit their ENT doctor first, not a neurologist or a psychiatrist. Only then after all the ENT and other physicians have failed to help the patient with their diagnostics and therapeutics within 3 months, then the brain defect commences, which is equally unsuccessfully treated by TRT. It is interesting, that in Germany, insurance pays often for both forms of unsuccessful treatment.

### **There is no medical explanation for the brain defect promoted by TRT**

Which biological mechanism is responsible for the fact that worldwide, million of human brains have been changed into incurably sick ones, and which biological mechanism is also responsible for the fact, that daily more and more people suffer the same fate and suddenly can no longer distinguish between important and unimportant information, such information as the TRT practitioners have spread in the media.

Is it a virus? An new form of schizophrenia? A toxicity?

The TRT practitioners can give no answers.

There is no answer, because no such mechanism exists.

In the entire world literature there has been no study which even partially supports or explains a biological, psychological or theoretical learning-process oriented concept, let alone any convincing conclusions in support of TRT.

What is offered as a foundation for the theories of TRT from Atlanta, to patients and the public, are confusing and unproven opinions about the ways our brain work, and last but not least a story from the curiosities of medical history.

## **A story from the cabinet of curiosities of medical history as a basis for brain – independence in producing Tinnitus noise in the brain**

There have been cases where one or more patients in desperation to relieve their chronic Tinnitus have sought surgical relief by having the 8<sup>th</sup> Cranial Nerve, or nerve of hearing, divided. This has generally been unsuccessful, without relieving the tormenting acoustic signals. Therefore the conclusion of the TRT practitioners are thereby proven, that the noises originate in the brain and not in the ear.”\*<sup>1</sup>

### **The “phantom” has a clear biological origin**

Apart from the fact, that added to this story, no single case-history has been documented in the world literature, the following must be established: If any nerve, such as the acoustic nerve (8<sup>th</sup> cranial), is divided, then this nerve is not destroyed, but is massively traumatized and sends an enormous number of signals to its assigned portion of the brain. That this part of the brain would be excited and would reflect its excitement in its specific area of perception is understandable.

In the case of the acoustic nerve, this would reflect acoustic perceptions. These perceptions and signals might continue with diminishing intensity over months or years due to the long time required for nerve cells to regenerate.

So also is the well-known, but for this story, misused concept of phantom pain, no “phantom”, such as an imagined or wrongly-directed sensation in the brain of a leg amputee, but rather is a biological process which goes together with division of a nerve in predictable fashion.

It has been known for decades that “phantom pain” as alluded to above, usually improves with time as natural wound healing occurs. If it does not, then a failure in the healing process has occurred, which can usually be corrected by surgical revision of the nerve stumps, but not by operating on the patients brain.

### **The patient must not be confused**

We doctors may not use complex conditions to confuse or inappropriately reassure our patients, even though these conditions and explanations might be considered a matter of fact by other medically trained individuals. Rather, when we find we lack the sufficient knowledge or training, we must be completely honest in communicating this to our patients.

Only by doing so can we maintain our sincerity in the doctor-patient relationship. And only then, when we have finished with our “Latin and Greek”, can the patient bring in his own creativity in overcoming his personal problem.

Conclusion: There is no proof that an incorrect learning process takes place in the brain of Tinnitus patients, and there is no proof that a continuous signal arises independently in the brain.

Now we come from the questionable theoretical background of the TRT practitioners to the theoretical concepts of TRT which derive therefrom.

**The main therapeutic assertion of TRT are:**

1. The patient should avoid quiet and seek noise.  
"Goal is, to direct the ears again toward the outside"\*<sup>1</sup>.
2. The patient should send sound softly by way of the Noiser into his affected ear(s) over one – two years several hours each day.

This combination of behavioural training should exert a positive influence on the resumed brain defect of the patient according to the assertion of the TRT practitioners.

### **Noise in the brain should be driven out by noise in the ear**

The TRT believes that building a "noise curtain" will cause the affected brain over time to relegate the Tinnitus signal to unimportant background noise and thereby drown it out.

It is remarkable. We are living in a time when a clear parallel exists between a dramatically increasing curtain of loudness which comes with our civilization and equally dramatically increasing number of people, who suffer from Tinnitus. Now we have a concept of treatment, which prescribes for the patient exactly this increased exposure to loudness. This "noise in the brain" should be driven out with more noise into the ear.

As implausible as this new concept is in itself, it is also unable to draw upon even one recognized mechanism which is based biologically, psychologically, or theoretically

to explain its premise.

We cannot drive out pain with more pain; we cannot heal a diabetic by prescribing a higher consumption of sugar; we cannot heal a sick heart by increasing its work load, and we cannot heal an overloaded inner ear, which got that way through exposure to environmental loudness, by exposing this presumed brain defect to increasing levels of more noise. We can only make it worse.

There is no reasonable explanation why a presumed “incorrect learning process in the brain” is reference to an acoustic perception (Tinnitus) should be rooted out, so to speak, by continuous perception of other acoustic signals (environmental plus pink noise from the Noiser).

There is no proof or even an example thereof, where our brain learns and then unlearns something as TRT asserts.

And there is no explanation in the physiology of the brain, where the creation of an independently created noise could be healed or even helped by prescribed noise-curtain.

Lastly this premise is an insult to our nervous system. Our brains are not as stupid as TRT asserts. It does not designate the Tinnitus signal as wrong, it does not accidentally value this signal as “serious” even though, according to TRT it is “meaningless”.

### **Why does not the brain produce “pink noise” independently?**

Our brain is not wrong when it conveys to us the distress signals from our organs of hearing. Our ear is in trouble!

He who errs is the TRT practitioner.

With their Noiser, they deliver the very proof that our brain behaves differently and indeed more intelligently than they assert: Up to two years the patient is supposed to subject his ear and his brain day after day to the pink noise of the Noiser. But why does the brain not then incorporate this pink noise into an independent signal from itself?

After all, it does this with Tinnitus after 3 months, according to TRT teachings.

Or do the patients actually develop this brain-derived pink noise signal, in addition to the old Tinnitus?

Thankfully no!

### **Why do patients accept TRT?**

How can it be that such an illogical concept should be accepted by so many people, experts as well as patients? Why do they accept this concept at least for a certain time? In order to answer this question, let us next turn to this organ, from which the TRT attempts to flee, our organ of hearing.

### **The inner ear reacts to continual noises**

There is a mechanism in the inner ear which allows it to suppress continuous noise for a certain period of time.

This developed from early survival necessity, allowing man and beast alike to differentiate background noises such as rustling leaves during wind or rain. This mechanism works by allowing the tiny sensitive hairs on the hearing cells to stiffen and thereby actually push the background noises into the background.

Example: You go into a loud factory or tavern with a friend. You continue speaking to each other and notice that for a few minutes you cannot understand him or understand him poorly. Then after a certain amount of time has passed you can understand him better. Your ear has pushed the surrounding noise “to the rear”.

Inner ear research teaches us however, that this is an energy consuming process and tires the sensitive cells.

In nature, for which the inner ear was “designed”, absolute quiet always returns. Restperiods, in which the inner ear cells are not required to work, reduce energy requirements and allow the organs to compensate for the high level of work previously demanded of them (refer to [www.dr-wilden.de](http://www.dr-wilden.de)).

It is different in the factory. There is no rest and naturally the affected organs of hearing become at first tired and finally overburdened. This has been firmly established by numerous international investigative studies: continuous noise exposure, irregardless of where it occurs, whether in factories, large offices, airplanes, automobiles or just plain city noises, burden and numb the ear ([www.dasgesundeohr.de](http://www.dasgesundeohr.de)).

## **The ear of the Tinnitus patient is temporarily numbed by the pink noise of the Noiser**

To numb or trick the ear is the goal which TRT seeks and tries to accomplish. The true therapeutic effect of TRT is to temporarily numb the entire inner ear, including the cells, in which the overburdened organ of hearing has sent out distress signals perceived as Tinnitus.

The mechanism here may be compared to an open skin wound. If you apply pressure, you may be able to alter, even reduce pain. Or should you rub a bruise, you may be able to change or lessen the pain sensation through this additional stimulation.

### **A biologically frustrating process**

Finally we all know this to be a biologically frustrating process, and that we do not improve the situation (open skin, bruise). Rather we can make it worse if we do not leave it be.

Just as the TRT treated patient may find his pain temporarily diluted, but the original problem, his overburdened inner ear organs, finally are pushed harder rather than relieved.

### **The biologically negative effect of Noiser therapy is easy to document scientifically**

For this it is only necessary to compare the hearing curves of those patients treated by TRT Noiser therapy before and after completion of treatment. Thereby it is usually established that the hearing capacity of the affected patient has worsened.

Also it is usually that much more notable largely, the longer the therapy has continued. Since audiometry measures the expression of inner ear biological quality, it is simple to document the negative biological effect of Noiser therapy as noted above.

### **Avoid quietness – a spontaneously understandable behaviour is misdirected by the TRT**

But how does it stand concerning quietness, which patients with chronic Tinnitus should avoid and a million times over want to avoid?

An understandable aspect of human behaviour is either misunderstood, misdirected or simply misused by TRT. Naturally each person so affected wants this sound to go away. This is exactly what this sound wants to accomplish with our behaviour –when we perceive in that moment that our overburdened ear reports its distress, whether due to pressure, distortion, oversensitivity, loss of hearing, vertigo and Tinnitus, then we should withdraw from loudness and hectic condition.



### **The inner ear symptoms seek to convince us to assume a biologically sensible behaviour**

To retreat from loud noise and thereby reduce its negative effects on our ears is biologically sensible and a naturally correct behaviour.

Exactly as we would place an overburdened joint at rest when hearing its distress signal, we would wish not to further cause pain and allow relief to occur.

### **The disguising of Tinnitus by environmental noise has to be properly and biologically meaningfully interpreted for the patient**

However, since Tinnitus can be covered over by environmental noise, most affected people avoid absolute quietness, in which their noises are more distinctly heard.

Instead of explaining to the patient the biological connection and allowing him to help himself, understandably afraid of quietness (because his Tinnitus seems much louder then), the TRT practitioners require their patients to avoid quietness and instead to “turn their ears outwardly” thereby increasing the surrounding environmental loudness level, the opposite of that which does the affected ear good.

Basically TRT gives in to the “Pressure of the Street”. It supports a senselessly incorrect behaviour for the patient, which is psychologically understandable but biologically misdirected. The overburdened organ is further burdened not only with the approval, but also at the direction of doctors, who do not seem to appreciate the resulting acute or late effects of their treatments.

**The positive effect of quietness can be accomplished and experienced  
By each patient through self-help measures**

If the Tinnitus patient uses earplugs for days, weeks and months to protect his overburdened ear organs (in traffic, in free time, on airplanes and train, etc.) he will experience over time a reduction of his tormenting symptoms. This is especially helpful with children and youthful patients certainly and generally in the acute phase of Tinnitus.

With the consistent use of self-protective measures against everyday loud noises, the natural, spontaneous power of regeneration of the inner ear cells may in some cases lead to a complete disappearance of the Tinnitus. It is different with chronic Tinnitus. Here the self-help measures must be continued considerably longer.

Still, the chronic Tinnitus may undergo thereby a regression in its pushiness and tormenting intensity over a period of time.

**A well-oiled alliance of hearing aid prescribers (ENT doctors) hearing aid fitters (acoustic adaptation) and hearing aid producers have hampered a biologically correct evaluation of our hearing organs and their symptoms of distress**

Why are these facts, relevant to the discussion of inner ear problems, understood by lay people, not subject to a worldwide discussion?

It is not possible to peer into the heads of those academicians.

It only remains possible to observe this behaviour from the outside.

In regard to this there comes to mind the traditional therapeutic medical hand tool in the area of inner ear organs.

The oldest tool is the hearing aid.

Hearing aids are sound strengtheners.

The treatment of diminished hearing with a hearing aid comes necessarily with a biologically increased burden to the inner ear organs. No doctor enjoys telling his patient that his prescription for a hearing aid ultimately will worsen the problems intended to help. Relative to this we should examine a root of the previous association of the ENT faculties with the inner ear.

It is therefore a fact, that the best known and most prescribed treatment for inner ear exhaustion (diminished hearing is an expression of the overburdened, but previously normal-hearing inner ear) is the hearing aid, whose target organ the inner ear is forcefully and continuously biologically stressed. This should lead us to be considered stupid in regard to our handling of our organs of hearing.

Is it this alliance of hearing aid prescribers, fitters and producers which for decades has changed our highly sensitive ear into a somehow stupid, unreachable, and finally uninfluenceable organ, which can only be reached using ever more sound?

One thing is certain: in case the ENT academic world further denies the biological realities in favour of a one-sided therapy strategy, indeed even promotes arbitrary false information relative to the nature of the inner ear, then people far and wide will slide into an increasing position of having their hearing organs overburdened and taken advantage of.

### **The Dangers of TRT**

Every chronic noise effect leads to arbitrary biological demands in our inner ears and finally to an overburdening of the structures found there.

We have a world wide inner ear investigation, which knows exactly, that hearing in man and animals is always connected to a biological process requiring work. Hearing is like every other bodily function and sensual perception in that it is bound to energy-consuming cellular work ([www.dr-wilden.de](http://www.dr-wilden.de)).

It is general knowledge that work processes in the indicated organs are performed by the cellular components of these organs.

It is also general knowledge, that these cells, as well as our entire organism, cannot continue to work endlessly and without limits, and from this it is also general knowledge, that each organ (as well as its cells) has a certain capacity for endurance. Clearly then, each of our organs can be overstressed beyond its capacity and therefore overburdened.

This should be clear to everyone.

Only in relation to our hearing process does it seem, that no official, personal, medical and academic consciousness exists. There appears to be a general blindness and deafness to the fact, that hearing is a clearly, biologically describable process, bound to an organ which is responsible, the inner ear, and bound to the fact, that this organ, as with all other organs, reacts to an overstepping of its endurance by sending out distress signals.

Further it is even so clear, that these signals are intended to make their possessor aware of this present overburden, in the hope (from our organs) that we will so change our behaviour as to permit countermeasures to this threat.

## **The TRT pushes this general uncertainty regarding the nature of our hearing organs to the utmost**

With our hearing organ everything is different. There the organ specific information (acoustic signals) can only derive from the organ itself. The distress signal could indeed come from the neck spinal column, from the jaw joint, from teeth, from a displaced pelvis, from kidneys or even, as TRT asserts, from a defect in the brain.

The TRT pushes its general uncertainty with its confusing and unsupported concept regarding the nature of hearing and its organs, the inner ear, unscrupulous to the top.

Therein lies the unbelievably high potential for danger of TRT for each patient and for the general public, in my experience and opinion.

That this is no exaggerated opinion is shown by a current press report\*, according to which doctors wish to implant one or more electrodes into the brain of someone who has Tinnitus from a randomly overburdened inner ear.

- 1 Frankfurter Allgemeine Sonntagszeitung 27.04.03, Nr. 17, St. 58  
„Wenn das Gehirn Sturm klingelt“ / Der Spiegel, Nr. 26 / 21.06.04

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