





Rayovac Hearing Aid Batteries-
Important Things to Know to Ensure
Patient Satisfaction



After completing this training, participants will be able to:

- Understand how a zinc air hearing aid battery functions.
- Explain the factors that affect the life of a zinc air battery and consult patients on battery life expectations.
- Educate patients on the proper care and use of hearing aid batteries.
- Determine when a patient has a battery issue versus an issue with their hearing instrument, and be able to resolve the situation.




ZINC AIR TECHNOLOGY



What is Zinc Air Technology?

- Zinc air technology uses air from the atmosphere as an active ingredient
- This technology is only used in hearing aid battery applications.
 - Since zinc air is designed just for hearing aid batteries, relationships with device manufacturers is critical to ensure batteries are built for the devices.
- By using air as an ingredient there are many unique aspects that are different from other types of batteries:
 - Needs tab to seal and prevent dry out
 - Best when used soon and consistently after activation
 - Performance can be sensitive to environment temperature and humidity

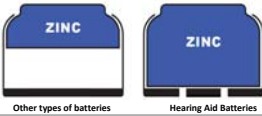


The diagram shows a cross-section of a battery with a tab at the bottom. Two blue arrows labeled 'O₂' point upwards into the battery from the tab, indicating that oxygen from the atmosphere enters the cell.

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Why Zinc Air Chemistry for Hearing Aid Batteries?

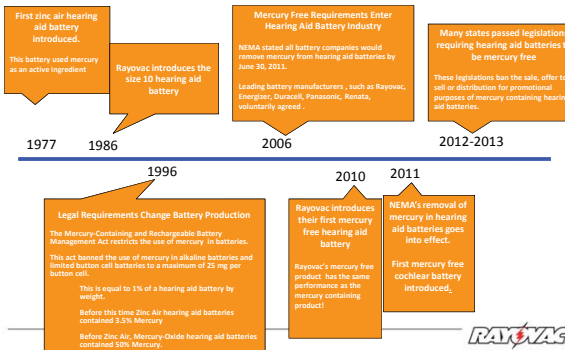
- Zinc air batteries provide longer life and more energy than any other cell system
 - Systems that use other button cell batteries, such as watches, don't require the same sort of power that hearing devices do
- Zinc air batteries have a higher capacity-to-volume ratio than other types of batteries
 - Nearly all cell systems must store all their reactive components entirely within the cell.
 - Since zinc air uses oxygen from the air as a battery reactant, it frees a large amount of internal volume to allow for more zinc. The more zinc means the longer the life.



The image shows two battery types side-by-side. On the left is a 'ZINC' battery, which is a standard button cell. On the right is a 'ZINC' battery, which is a zinc air battery. The zinc air battery is shown with a larger internal volume, indicating more space for zinc.

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Battery Chemistry Evolution



The timeline shows the evolution of battery chemistry from 1977 to 2013. Key events include the introduction of zinc air hearing aid batteries in 1977, the introduction of zinc air hearing aid batteries by Rayovac in 1986, the introduction of zinc air hearing aid batteries by Rayovac in 1996, the introduction of zinc air hearing aid batteries by Rayovac in 2006, and the introduction of zinc air hearing aid batteries by Rayovac in 2010 and 2011.

1977 First zinc air hearing aid battery introduced. This battery used mercury as an active ingredient.

1986 Rayovac introduces the zinc air hearing aid battery.

1996 Legal Requirements Change Battery Production. The Mercury-Containing and Rechargeable Battery Management Act restricts the use of mercury in batteries. This act banned the use of mercury in alkaline batteries and limited button cell batteries to a maximum of 25 mg per button cell. This is equal to 1% of a hearing aid battery by weight. Before this time Zinc Air hearing aid batteries contained 8.3% Mercury. Before Zinc Air Mercury Oxide hearing aid batteries contained 50% Mercury.

2006 Mercury Free Requirements Enter Hearing Aid Battery Industry. NEMA stated all battery companies would remove mercury from hearing aid batteries by June 30, 2011. Leading battery manufacturers, such as Rayovac, Energizer, Duracell, Panasonic, Renata, voluntarily agreed.

2010 Rayovac introduces their first mercury free hearing aid battery. Rayovac's mercury free product has the same performance as the mercury containing product.


2011 NEMA's removal of mercury in hearing aid batteries goes into effect. First mercury free cochlear battery introduced.

2012-2013 Many states passed legislations requiring hearing aid batteries to be mercury free. These legislations ban the sale, offer to sell or distribution for promotional purposes of mercury containing hearing aid batteries.

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Inside a Zinc Air Hearing Aid Battery

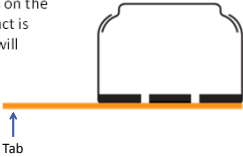
- Removing the tab activates the battery as air enters through the holes
 - Tabs are placed after the cell is assembled in production
 - After tab is removed, the battery needs a moment to catch its breath
 - Let battery sit for one minute before inserting into the device
- Oxygen from the atmosphere and zinc metal in the anode react to provide energy to drive the hearing device.




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Zinc Air Cell Voltage

- While it says 1.45 volts on the battery package, the fact is that a tabbed voltage will measure 1.1-1.3 volts



On the shelf
Tabbed voltage
1.1- 1.3 V
- After un-tabbing, voltage will rise enough to power a hearing aid within one minute. The cell may need up to 24 hours to rise to maximum 1.45 volts.



Ready for use
Un tabbed voltage after 24 hours
1.45 V

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TIPS FOR CONSULTING PATIENTS ABOUT BATTERY LIFE

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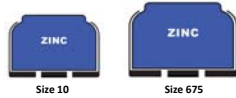
What to communicate to patients to correctly manage expectations on battery life

- It is common for patients to ask how long their hearing aid battery will last. How do you answer this question?
- The truth is there is no one answer that will work for every patient.
 - Each person is unique when it comes to their hearing loss, personal environment, device usage, etc.
 - All these factors combine to make a unique hearing loss as unique as a person's "fingerprint".
 - Each patient's situation is unique to them
 - Therefore, no one patient will have the exact battery life as another
- There are numerous factors that can affect how long a hearing aid battery lasts.
 - Educating staff and patients on these factors, will help them better understand the reason for differences in hearing aid battery life.



Factors that Affect Battery Life

1. An individual's hearing loss
 - As severity increases:
2. The battery size
 - The hearing aid market is shifting towards smaller devices
 - The smaller the device, the smaller the battery needs to be.
 - As a battery's physical size decreases, so does the amount of zinc that can fit in the battery. Remember the more zinc in the battery the longer the battery will last.
 - Look at the size difference between a size 10 and a size 675. A 675 can hold more zinc; therefore, lasts longer.



Factors that Affect Battery Life (cont)

3. An individual's hearing aid usage
 - There are two factors to take into account

How many days a week do they wear their hearing aid?

How many hours a day do they wear their hearing aid?
 - The importance of these two factors is to get an accurate estimate of how long a battery lasts
 - For example, person A gets 5 days out of their hearing aid battery and person B gets 7 days. Which hearing aid battery lasts longer?
 - To answer this correctly you need more information.
 - » Assume person A wears their hearing aid 16 hours a day, but person B only wears their aid 8 hours a day.
 - » The correct answer is person A because their battery lasts 80 hours vs 56 hours.
 - When talking to patients about battery life, use a common measurement of time, such as hours (versus days). That way you get an accurate picture of battery life.



Factors that Affect Battery Life (cont)

4. Instrument differences

- There is a fundamental shift in hearing devices that is driving the battery market

Changes in device market:

- Devices are shifting to digital hearing aids
- Devices have more features and accessories

This shift leads to:

- more demanding usage
- fewer hours of battery life
- more lifestyle dependent (TV, phone use)

Factors that Affect Battery Life (cont)

- When using standard features in today's digital instruments, it can cause the current demand to **increase up to 300%**!

Features in today's digital instruments, like:

- Premium Features
 - FM (looping)
 - Generation of sound with tinnitus patients
- Wireless/Bluetooth Features
- OEM Settings
 - Low battery warnings can result in perceived short life

May reduce battery life by 20%

When in use, can increase the current up to **300%**, further reducing battery life

Factors that Affect Battery Life (cont)

- Please watch as Denis Carpenter, Rayovac's Director of Zinc Air Product, demonstrates how current demands on the hearing aid batteries change as advanced features are used.

Factors that Affect Battery Life (cont)

5. Environment

- Zinc air cells are sensitive to environmental conditions. These include:



Humidity

- Dry out in low humidity conditions → Performance loss
- Absorb water in high humidity condition → Leakage



Temperature

- As the temperature is reduced hearing aid battery voltage is lowered and reaches functional end point earlier, reducing battery life.
- This can be an issue if individuals are working outside in the winter or in a refrigerated environment.



Altitude

- As altitude increases the percentage of oxygen in the air is reduced, potentially causing the battery to reach the endpoint earlier



The combination of these factors produce a large range of battery life expectancy

- In a market survey, device users were asked how long their hearing aid batteries last.
- The chart below shows the ranges of battery life based on the market survey results

Battery Size	Life Expectancy*
10	3-10 days
312	3-12 days
13	6-14 days
675	9-20 days

- As you can see the life expectancy ranges vary greatly. This wide range exemplifies why we recommend you not give your patient a specific life expectancy number.
 - This not only sets up the patient with expectations, but if the battery does not meet those expectations they may be coming back to you with complaints.

* Survey numbers account for 80% of those surveyed. The remaining 20% experienced battery life outside these ranges.



Because battery life is unique to the individual, use caution in providing battery life charts

- There are standard industry methods for estimating hearing aid battery life (ex. battery life charts). However, these are not guaranteed accurate.
- There are two factors that are calculated to get the estimated battery life, both of which can be exaggerated:
 - Battery manufacturer's capacity ratings
 - The capacity ratings (mAh) are determined with fresh product, in low drain applications, and is therefore the best case scenario. This creates an overestimated value.
 - ANSI battery current drain
 - To get the value for the current drain, testing is applied to batteries with an aid set to test position, not in a normal hearing application. This creates an underestimated value.

Hearing Aid Battery Life CHART™
Life (hrs.) = mAh / mA

Battery Size	10	312	13	675
10	1.5	1.5	1.5	1.5
11	1.5	1.5	1.5	1.5
12	1.5	1.5	1.5	1.5
13	1.5	1.5	1.5	1.5
14	1.5	1.5	1.5	1.5
15	1.5	1.5	1.5	1.5
16	1.5	1.5	1.5	1.5
17	1.5	1.5	1.5	1.5
18	1.5	1.5	1.5	1.5
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43	1.5	1.5	1.5	1.5
44	1.5	1.5	1.5	1.5
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87	1.5	1.5	1.5	1.5
88	1.5	1.5	1.5	1.5
89	1.5	1.5	1.5	1.5
90	1.5	1.5	1.5	1.5
91	1.5	1.5	1.5	1.5
92	1.5	1.5	1.5	1.5
93	1.5	1.5	1.5	1.5
94	1.5	1.5	1.5	1.5
95	1.5	1.5	1.5	1.5
96	1.5	1.5	1.5	1.5
97	1.5	1.5	1.5	1.5
98	1.5	1.5	1.5	1.5
99	1.5	1.5	1.5	1.5
100	1.5	1.5	1.5	1.5

* Check of estimated lifespan. ** Actual battery life may vary by individual and aid use.
 *** Important! 100% replacement batteries do not give you an aid battery with no capacity connected to hear. Repositioning of metal is required for the chart. The battery will not work to design its intention.



The Bottom Line...

- Avoid giving a standard battery life estimate to all patients, you can work with them individually to determine battery life.
- The best way for a patient to understand the battery life that they can expect, is to benchmark their individual battery performance over time.
 - Have a patient write down when they put a battery in and when they take it out. Do this until the pack of batteries is used up.
 - After this is done the patient should have a good range of how long their batteries should last.



STEPS TO ENSURING A GOOD BATTERY EXPERIENCE



Get patients started off right with their new hearing instrument!

- The first step to ensure your patients will have a good initial battery experience is to remember:



Always use a fresh hearing aid battery to program a hearing instrument. The programming cycle of a hearing instrument can put high demands on the hearing aid battery, reducing battery life.



It is equally important to put a fresh battery in the hearing aid after programming. This ensures that the patient will get the full life out of their battery the first time they use their aid.



As you send a patient home for the first time, remind them of these hearing aid battery care tips.



Store your hearing aid batteries at room temperature. Avoid temperature extremes, as heat will shorten the life of the batteries, and refrigeration is not recommended.



Metal objects such as coins and keys can short our batteries, so don't carry loose batteries in your pocket or purse. If possible, store in the original packaging or a battery caddy. Don't allow batteries to touch in storage.



Always be sure to store and discard batteries in places that cannot be reached by infants or children.



After servicing a patient, they will most likely come back to you with service and usage questions

- Whether you are new to offering hearing aid batteries or have been offering them for years, it is important to know how to handle patients that are having battery difficulties.

- To determine if batteries are part of the issue, go through this protocol



Ask questions. Don't assume anything. The problem may not be with the battery after all. Simply trying a new battery is a great way to find out.



Listen carefully. The smallest comment can lead you to the answer.



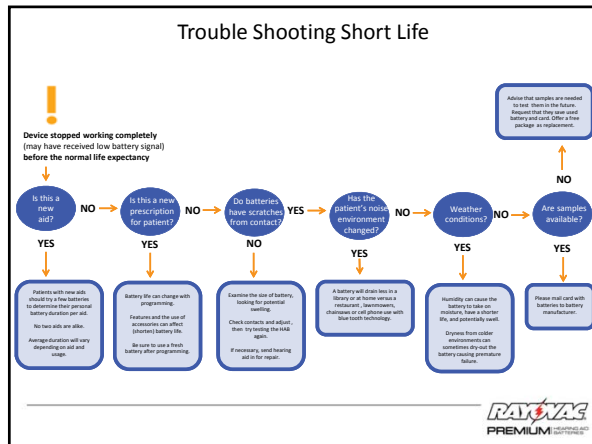
Use your resources. Since batteries are only a small part of your patient care, you cannot be expected to remember every detail.

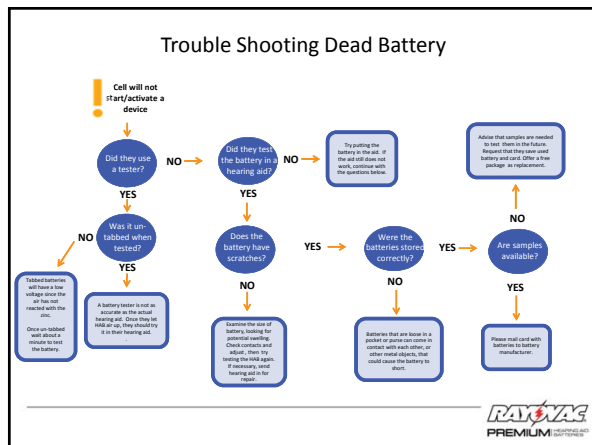


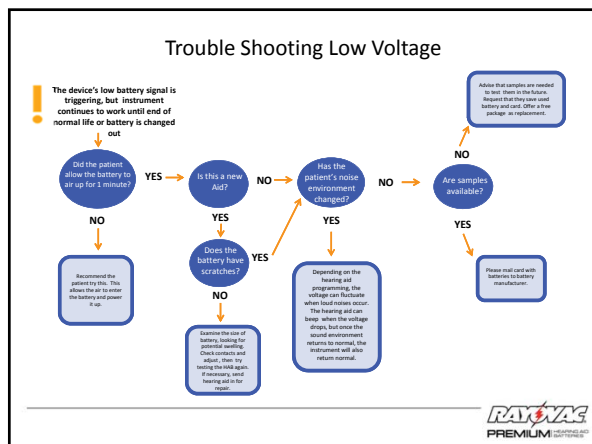
Trouble-shooting hearing aid battery issues –
Determine the type of complaint.

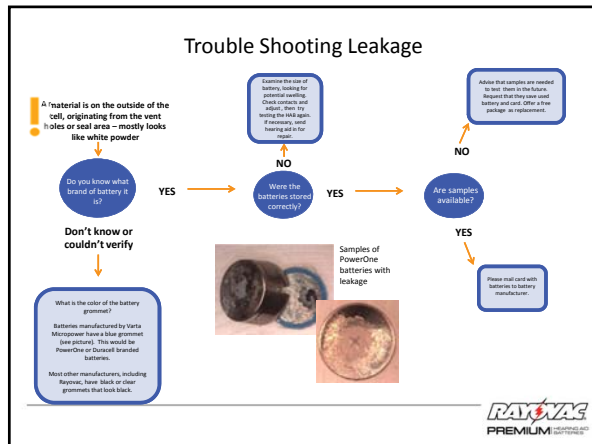
- It is important to determine the type of issue the patient is experiencing in order to figure out a solution.
- They tend to fit in one of these categories:
 - **Short life** – The device stopped working completely before the normal life expectancy of the battery (Patient may have received a low battery signal vs. literally going dead).
 - **Dead** – Cell will not start/activate a device.
 - **Early low battery tone** – Device is signaling a low battery, but continues to work until the end of normal life or battery is changed out.
 - **Leakage** – Originating from the vent holes or seal area (most likely looks like a white powder).
 - **Corrosion** – eating away of the metal with a "rust" color.

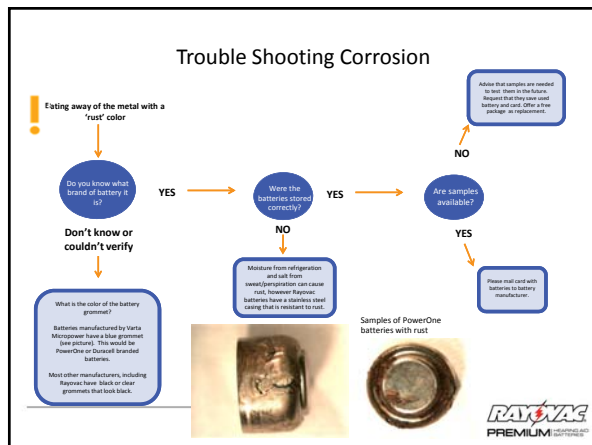












A quick reference for hearing aid battery troubleshooting:

Issue	Definition	Quick Solve
Short Life	Device stopped working completely (may have received low voltage signal) before the normal life expectancy	Is this a new aid or prescription for the patient? If yes, this can affect battery life Check battery contacts to be sure they are in the correct position (look for scratches on battery) Has the patient's noise environment changed? Batteries will drain more in environments with high noise levels
Dead Battery	Cell will not start/activate a device	Did the patient "test" using a tester? If yes, explain that a battery tester is not an accurate way to test batteries. Always "test" using the device. If the patient "tested" the battery in their hearing device, Check battery contacts to be sure they are in the correct position (look for scratches on battery)
Low Voltage	Device is signaling low voltage, but continues to work until end of normal life or battery is changed out	Did the patient allow the battery to air up for one minute? Check battery contacts to be sure they are in the correct position (look for scratches on battery)
Leakage	Originating from the vent holes or seal area – mostly looks like white powder	Verify the brand of battery How is the battery being stored? Heat, cold and humid conditions can effect the likelihood that a battery will leak
Corrosion	Eating away of the metal with a "rust" color	Verify the brand of battery How is the battery being stored? Hot and humid conditions can effect the likelihood that a battery will have corrosion

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Now that you have completed this training, you should be able to:

- Understand how a zinc air hearing aid battery functions.
- Explain the factors that affect the life of a zinc air battery and consult patients on battery life expectations.
- Educate patients on the proper care and use of hearing aid batteries.
- Determine when a patient has a battery issue versus an issue with their hearing instrument, and be able to resolve the situation.

Rayovac offers more materials and information to help you, your office staff, and your patients. Contact Rayovac's ProLine Product Consultants at 800-356-7422 or visit our website thepowerofhearing.com!