AEML, Inc.
Microbiology Laboratories

Show Number: 625 May 7, 2021

"ATP Use and Misuse in the Restoration Industry"

Ralph E. Moon, PhD

This week IAQradio+ brought back another audience favorite guest, Dr. Ralph "Bad Moon Rising" Moon to preview his study on the use, interpretation and viability of ATP in the restoration and remediation sector. The study was recently published in the CIRI peer reviewed "CSQ" Journal. https://www.ciriscience.org/

Ralph E. Moon, PhD is a Building Scientist with more than 34 years of consulting experience in the areas of duration of loss studies, risk assessment, project management, industrial hygiene, and indoor air quality assessment. Dr. Moon has published over 100 peer reviewed articles and papers and is a frequent expert witness on insurance related claims and projects. Dr. Moon has a unique background that combines extensive field experience, seminar development and presentation, research, and legal services in IAQ, building science and disaster restoration.

Nuggets mined from today's episode:

Why did you do a deep dive into ATP?

Dr. Moon's interest in ATP was piqued at a CIRI Science event at which a study the ATP testing conducted in K-12 schools upon which the ISSA Clean Standard is based. https://www.issa.com/certification-standards/issa-clean-standards

Dr. Moon was aware that ATP is an incredibly sensitive sampling method and wondered if the method was too sensitive to be used in disaster restoration? Dr. Moon opined that while ATP is a great test method users need to be cautious when using it: ensure they know what they are doing, formulate a written sampling protocol, prepare a site specific sampling plan, and understand the context in which it is being applied.

What is ATP?

ATP (adenosine triphosphate) is a molecule that provides cellular energy for all living organisms. All living organisms use ATP as the source of energy for basic cellular functions such as growth, reproduction, and cell maintenance. When humans consume food our bodies convert the food into actions (thinking, seeing, doing) and builds other molecules to promote tissue growth, make sugar and create and utilize ATP.

Does ATP measure the efficacy of sanitizing/disinfecting?

ATP testing does not distinguish dead from live biologicals and therefore may be an inadequate measure of disinfection?

Variations of ATP concentrations among organisms?

All microbes do not share the same ATP concentrations. When ATP levels are compared between eukaryotic cells (fungi, humans, animals, etc.) and prokaryotic cells (e.g. bacteria), the larger eukaryotic cells contain higher ATP concentration. Microorganisms vary in the amounts of ATP they contain. Bacteria have less ATP than eukaryotes. On water losses bacteria are the first organisms to amplify. Higher readings may not mean high levels of contamination are encountered.

Do viruses contain ATP, are viruses alive?

According to Dr. Moon it depends on which side of the cellular membrane the virus is. He offered the analogy of an orchestra conductor and an orchestra. When the conductor is outside of the music hall; he has no control over the orchestra. When the conductor is inside the music hall; he takes over the musicians and this is when things get dangerous when the conductor begins to take over everything for his own purpose. Viruses cannot generate or store energy in the form of adenosine triphosphate (ATP), but have to derive their energy, and all other metabolic functions, from the host cell. They also parasitize the cell for basic building materials, such as amino acids, nucleotides, and lipids (fats).

Are all ATP devices created equal?

Through side-by-side comparison, Dr. Moon found that while all the luminometers performed in parallel at lower concentrations and flattened out when high concentrations were encountered. Instruments cannot be mixed and matched.

Do background chemicals interfere with ATP readings?

ATP sampling is skewed by interference from other living things and from chemicals such as cleaning agents and disinfectants. He did an experiment to determine the effect of different antimicrobials on ATP results. Chlorine had the highest reading. (Z-Man added that strong solutions of household chlorine bleach will damage stainless steel.)

Inappropriate use of ATP?

Sampling ceiling joists in an attic. Showed slides of wood cut horizontally and vertically revealing porosity and absorption capacity providing great surface areas for contaminates to accumulate.

ATP sampling corresponded with Agar Stamp sampling.

Agar media comes in sausage shape and section is cut off and placed in holder and then pressed onto surface and then incubated.

Microbial/Fungal colonization on deteriorated wood?

Deteriorated wood had 10X more ADP and AMP than non-deteriorated wood. Moisture + Cellulose = Fungi

Inconsistencies in sampling.

Incredible variability during swab sampling: pressure, roll or scrub with swab, size of area swabbed.

Surface conditions, we often don't know?

The person doing the ATP sampling often has no idea what else is going on at the surface he is sampling (e.g. presence of chemicals, nematodes, insects, mites, etc.). What variables negatively impact the reliability of ATP testing? Remember not all organisms containing ATP, contain equal amounts of ATP.

Can ATP used to test for COVID-19?

Virus is never alone; as such ATP can be a surrogate test method for virus.

Skewing of sampling?

Sampling results can be skewed purposefully, depending where sampled and how many samples are taken. Ethical and personal responsibilities apply.

What are some benefits of ATP?

ATP is fast, field done, modest cost, can be uniform, is reproducible, and dependable.

Where might you personally use ATP?

He would use in: medical, dental, pharma, food manufacturing and similar facilities.

Where would you personally not use ATP?

He would avoid sampling of: aged/worn surfaces and materials and in harsh environments, and where there are legal or health risks.

What advice do you have for restoration contrcators who use or are considering using ATP sampling?

Restoration contractors should consider, at a minimum, the preparation of a written swab sample collection protocol and sampling plan for ATP testing. All staff engaged in ATP testing must be able to demonstrate formal training and uniformity in the sampling procedure. Don't risk a good job going bad in the eyes of property owner or insurance carrier after the fact. Be prepared to explain what you did and why you did it.

Recommended and Not Recommended Applications of ATP Testing in Conjunction with a disaster restoration project in a residential setting. The limitations posed by the ATP test method supported the following limitations in surfaces selected for sampling.

The following are surfaces where ATP testing is recommended:
1. Hard, smooth surfaces: smooth or unworn plastic surfaces; stainless steel; aluminum; smooth, non-worn, vinyl or melamine-coated cabinetry; glass.
2. High touch areas in homes, especially of the immunocompromised.
3. Qualified food preparation areas.

The following are surfaces where ATP Testing is not recommended:
1. Gypsum board: Painted and unpainted.
2. Plaster.

3. Plastic: worn surfaces.
4.Solid wood materials: trusses, handrails, wood trim, rafters, floor sheathing and joists, plywood interior, exterior, lauan).
5. Composite wood materials: unfaced particleboard, worn surfaces of faced particleboard, medium-density fiberboard, oriented-strand board, Masonite.
6. Flooring: wood (all), concrete, terrazzo, tile (all), carpeting (all).
7. Ceiling materials: plaster, popcorn ceilings.
8. Absorbent materials: fabrics, leather, bedding, furniture.
9. Worn, scratched metal surfaces.

Additional comments by Dr. Moon:

- ATP testing is an effective method to evaluate cleanliness in the proper setting.
- ATP has more potential benefits than detriments.
- Data showed that ATP testing results may overestimate hospital cleanliness.
- Outside of the medical and pharmaceutical applications, the ATP test method offers avenues for criticism and biased interpretation.
- We must always explain and substantiate what we do.
- We should always seek improvement.

John Downey:

- CIRI's Science Advisory Council is in agreement on both the value and limitation of ATP sampling.

- CIRI is promoting more research to practice and practice to research at their upcoming event in Hawaii, 'Bridging the Gap'. https://hb2021-america.org/

Restoration Global Watchdog Pete Consigli:

- The CIRI/ISSA ATP study is relatively recent compared to the roots of ATP sampling in restoration

- From the historical restoration perspective, ATP sampling of remediation projects began in Northern California during the mid 1990s. Sewage backup stakeholders included: property owners, remediation contractors, IEPs, attorneys, insurance companies and local government agencies. (ABAG stands for the Association of Bay Area Governments.)

- It is known that in the late 1990's; Dr. Gene Cole, PhD received funding from private commercial sources to study the use of ATP for pre and post water damage remediation verification. As the results were never circulated or published; it can be surmised that the data wasn't favorable.

Link to the Dr. Ralph Moon ATP Document

Prior IAQ Radio Shows with Dr. Moon

- Air Date: 2-16-2018|Episode 494
- Air Date: 2-1-2013| Episode: 272

IAQ Radio wishes to thank CIRI and John Downey for graciously permitting us to interview Dr. Ralph Moon to discuss his paper published in the CIRI Science Quarterly and for permission to circulate it to the IAQ Radio audience.

IAQ Radio wishes to thank RGW-Consigli for his assistance in organizing and planning today's episode.

Z-Man Signing Off

Trivia Question:
How much energy is potentially released from one ATP molecule?

Answer:
7.3 kilocalories
Answered by: Don Weekes