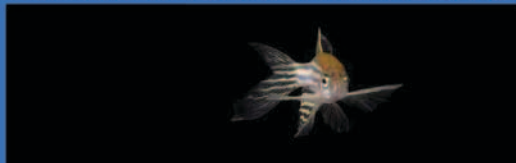


Enhance Your Research with
Our PharmHouse™ Customized Aquatic Housing



Pharmcal's Aquatic Animal Housing Systems

Quality...Reliability...Knowledge...Customization...Service...



Spotlight on Pharmcal Research Laboratories

Species that we have designed systems for:

Brachydanio rerio (zebrafish)
Xenopus laevis and *Xenopus tropicalis*
(African Clawed frog species)
Euprymna scolopes (squid)
Penaeus vannamei (shrimp)
Rana catesbeiana (bullfrog)
Rana pipien (leopard frog)
Pseudacris ocularis (grass frog)
Carassius auratus (goldfish)
Lepomis macrochirus (bluegill)
Oryzias latipes (medaka)
Gasterosteus aculeatus (stickleback)
Homarus americanus (lobster)
Anguilla anguilla (eel)
Notophthalmus viridescens (eastern newt)
Ambystoma mexicanum (axolotl)
Trichoplax adhaerens (placozoan)
Nudibrachs (sea slug)

To learn more about customizing your own
aquatic system, please contact:

Phone: 1-800-243-5350

A recognized leader in the Laboratory Animal Care Field for over 30 years Pharmcal Research Laboratories prides itself as an innovative manufacturer of aquatic housing systems. We build aquatic systems of the highest quality and specialize in tailoring each system to the exacting needs of each client. Our aquatics team are seasoned professionals who will work with you to match the ideal system with your species' environmental needs and with your building space.

Our PharmHouse™ systems are adaptable for a large variety of aquatic species. The requirements of the industry, the health and safety of your animals, ease of use, and low maintenance are the key factors in all of our designs.

For small species such as zebrafish, medaka, minnows, guppies, killifish, *Xenopus tropicalis*, and many other small marine species consider our PharmHouse™ ZFS system. For larger species such as *Xenopus laevis*, bullfrogs, grassfrogs, lobsters, newts, xenoles, sea slugs to name a few, consider our PharmHouse™ XLS System. Each of these systems provides housing rack units designed with the water delivery system(s) of your choice.

The Pharmcal's Aquatic team believes in the personal touch and in 100% customer satisfaction. We are available to design and assist you in creating the right system for your current needs now and with your future growth in mind. We welcome your calls and can be reached at 1-800-243-5350.

“I just wanted to let you know that our system is truly amazing. Thank you so much. It truly is the best system in the business. I've never owned a Cadillac before but I have one now.”

—University of Toronto



Pharmacal's Water Supply Systems

Water Correction...Time Flow...Constant Flow...Re-Circulating systems

Water Systems

Pharmacal takes pride in offering "water system" choices because we recognize "one-size-does-not-fit-all". A complete water system consists of the optimum blend of delivery method and monitoring/control options. The design is based on the water source and species of animal. City, well, RO (reverse osmosis) and DI (de-ionized) are a few examples of domestic water sources, each with a set of parameters that may need to be addressed. Regional variations of water condition also need to be taken into consideration. A water analysis should be performed to check for unknown impurities. Pharmacal takes into account the many variables and custom designs a system just for you.

Water Delivery Methods

Flow-Through Systems

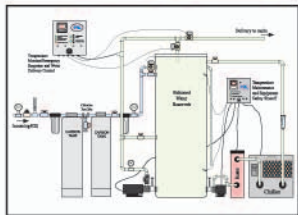
Timed Flow-Through and **Constant Flow-Through** set-ups consist of one **Pre-Conditioned Water Supply** system. They are designed to remove contaminants, adjust parameters, and correct electrolytes as needed, prior to sending the specifically conditioned water to the animal tanks. Upon leaving the tanks, all expended water is sent to a drain. Self-correcting failsafe technology prevents water of an incorrect parameter from reaching the animals. Systems are designed to alert staff to non-correcting problems. And, each unit is a quarantine tank, because water is never re-used.

The size of the pre-conditioned water supply system is dependant on the total water volume, number of water exchanges per day, the temperature variance between the source water and the animal tank water, and the necessary correction equipment required. Pharmacal designs suit systems of all sizes: small, simple systems perhaps utilizing a water-mixing station as well as larger systems that require reservoirs.

Time Flow-Through systems are designed to provide a predominantly tranquil environment. Water is delivered for designated short periods to provide 5-10% water changes several times daily. These changes flush out Nitrogen build-up and other dissolved or suspended solids. Heavier debris can be cleaned with a 66% water flush, which is performed once or twice a week.

Timed Flow-Through systems most closely replicate the still African deltas, the natural environment of the *Xenopus laevis*. The adult frog has approximately 180 lateral line organs distributed over its head, neck and trunk which detect the friction of water movement – the sensation of the next meal or a predators approach. Re-circulating water movement causes the animal to be on a constant state of alert. Pharmacal's well-designed time flow-through system greatly reduces this stress.

Constant Flow-Through systems correct a domestic water supply in the same manor as the Timed Flow-through design. Water is adjusted, sent to the tanks, then to a drain, however, the constant flow-through system delivers water constantly, 24 hours-a-day, at a low flow rate.



Pharmaceutical's Water Supply Systems

Water Correction...Time Flow...Constant Flow...Re-Circulating systems

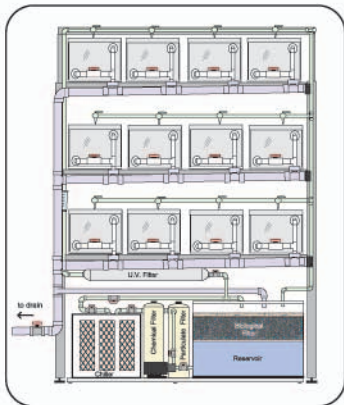
Re-Circulating systems

Re-Circulating systems comprise two water systems: the Re-Circulating Life-Support system and a Pre-Conditioned Water Supply system. Each rack can contain a life-support system, or several racks can be linked together onto one large life-support system. Re-circulating systems are an ideal choice for most fish and salt-water species.

The Life Support system filters the water so that it can be safely re-circulated back to the animal tanks. There are four basic elements to a life support system: Biological filtration, Mechanical Filtration, Chemical Filtration, and Ultra Violet (U.V.) Irradiation. The key component is the biological filter – a substrate that supports colonies of two aerobic nitrifying bacteria. The first, *Nitrosomonas*, converts ammonia to nitrite; the second, *Nitrobacter*, converts nitrite to nitrate. It is important to know that, as the animal population fluctuates, so does the beneficial bacteria population. It takes several days for the bacterial population to stabilize if large numbers of animals have been removed or added to the system. This can result in a sudden, potentially dangerous build up of toxic material which can quickly result in mortality. Care must be taken in re-circulating systems to keep a balance in these interactive populations. The Pharmaceutical systems protect against dangerous toxic build-up with automatic exchanges, system monitors and by insuring sufficient oxygenation.



Mechanical filtration removes suspended particulate matter from the water and **chemical filtration** removes dissolved compounds and elements from solution in the system. **The U.V. assembly** kills bacteria, fungi, viruses, and many protozoans. The engineers at Pharmaceutical correctly size each piece of equipment for the ideal application of your system.



(In a letter to us about their
Pharmaceutical ZFS system)

“We are producing an
average of 10,000
embryo/week with
175 fish!”

—Pfizer



Pharmacal's Water Supply Systems



Water Correction...Time Flow...Constant Flow...Re-Circulation systems

Hybrid Systems

A hybrid system incorporates the water-conserving re-circulating system with the calming timed flow-through system. It can be used with the Pharmacal XLS racks. Water is re-circulated through a life support system, but bypasses the tanks until an automatic exchange is called for. The water leaving the tank during the 5-10% exchanges, returns to the re-circulating system for filtration and treatment instead of exiting to a drain.



Water Quality Monitoring/Control Systems

Water Filtration:

- Micron filtration (down to 5um)
- Carbon filtration
- R.O. filtration
- D.I. Resin beds for D.L. water

pH Options:

- pH Monitoring
- pH OOR alarm
- pH Data Logging
- pH OOR control-Hi or Low

Conductivity Options:

- Conductivity Monitoring
- Cond OOR alarm
- Cond Data Logging
- Cond OOR control

Dissolved Oxygen:

- Oxygen Monitoring
- Oxygen OOR alarm
- Oxygen Data logging

Temperature Options:

- Optional heater
- Optional Chiller-air or water cooled
- Optional Heat exchanger
- Optional in-tank heat exchangers

To learn more about customizing your own aquatic system, please contact:

Phone: -1-800-243-5350

On days a 66% cleaning flush

is performed, however, the life-support system is momentarily by-passed, and the debris water is sent directly to the drain.

Once the cleaning flush is complete, the

water level is automatically re-

filled and re-circulation resumes. By preventing the heavier detritus from passing through the re-circulating system, the filters are prevented from fouling prematurely and the nitrate levels are kept low.



“I have requested that Pharmacal be consulted before I approve the design (of the new building) AND be the ones to move and install us into the space”

—Yale University Department of Ecology & Evolutionary Biology

Pharmacal's PharmHouse™ XLS System

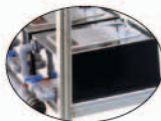


XLS Rack...XLS Combo Tanks...XLS Clear Tanks...XLS Drain Enhancers

Each PharmHouse™ XLS system is custom designed and built to the specific needs of each facility. Our engineers will first select the best-suited tank size and style, based on the buyers housing criterion and species of animal. From this information, the rack(s) will be sized and built to a customer's specifications. The design will provide a balance between maximizing your animal housing capabilities and available facility space. Because we are unique for our custom work, buyers' input is welcomed and we are usually able to meet special requirements.

The PharmHouse™ XLS System

- Single and double-sided racks available in a varied selection of height, width and shelf number
- Can be designed to accommodate more than one size tank
- Solid, passivated stainless steel rack construction
- Patented 5° forward shelf pitch facilitates flushing
- Precision water flow adjustment valves. Separate on/off valve saves having to re-set water flow rates every time a tank is moved.
- Flow-Through and Re-Circulation systems available
- Quick disconnect plumbing allows rack to be disassembled, moved and cleaned with ease
- All water lines are light impenetrable to prevent algae growth
- Drainage plumbing slightly angled to facilitate emptying of pipe, no stagnant water in pipes
- Both leveling feet and casters available



Tanks

Designed with the researcher, caretaker and animal in mind, the XLS custom-built tanks serve the needs of all. Hand fabricated to exacting standards, these tanks are bonded together by a chemical reaction and fusion at the seams. No glues are used and no residue remains. The seams actually become stronger than the surface planes and are guaranteed against leaks with normal use. These tanks can be sent through the cage washer, withstanding temperatures of 180°F.



Combination: Our most popular design and unique to Pharmacal, these tanks have three black sides, a clear front and top, and a white bottom. It provides the animals a sense of security, while still making it easy to view them. (This style is ideal for *Xenopus leavis*.)

Clear: Clear tanks offer quick and easy viewing of the animals. A black collar can be added to the tank to provide the animal a sense of security

Black: These tanks reduce stress and create a darker atmosphere more like many species natural environment.

White: These tanks shield the animal from visual stress and still allow the animal to easily be seen against the light color tank.

Smoke: Smoke tanks provide certain species with a greater sense of security than a clear tank, yet the animals are still visible to the caretaker.

Specialty Tanks: Do you have a unique type of tank you need reproduced? Because we custom build our tanks, we may be able to provide you with a special needs tank. Call for information

Tanks are also available in white, opaque polypropylene. These rigid plastic tanks are shatterproof, lightweight and seamless. In addition they withstand temperatures up to 212°F. (Sizes are more limited in this style).

Lids

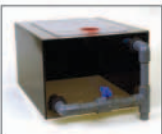
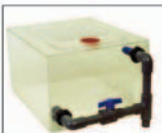
Rimmed lids prevent escapes. For very determined species, lid latches are available.



Drain Enhancers

A removable drain enhancer, at the front of each tank, acts as a baffle to draw debris from the tank. These enhancers and the tanks 5° forward pitch, effectively removes most of the effluent from the tank.

Tank sizes range from 2.5 gallons to over 30 gallons and our acrylic tanks are available in a variety of colors



Sample Drain Enhancers

“The frogs we keep in the Pharmacal system are by far the healthiest we have on campus!”

— NIH, NICHD



Enhance your research with aquatic housing that puts YOU in control! Call 1-800-243-5350.

Pharmaceutical's PharmHouse™ ZFS System

ZFS Rack...ZFS Tanks...ZFS Breeder Inserts...ZFS Baffles ...ZFS Tank Dividers

PharmHouse™ ZFS System

- Single and Double sided Racks available in your choice of 5, 6 or 7 shelves.
- Suspended drawer caging allows for hands-free access
- All water lines are light impenetrable to prevent algae growth
- Clear drip trays allow for light penetration and their unique design prevents standing water. The large size prevents water from dripping into a tank below, regardless of how far the tank has been pulled out.
- Rear outflow keeps tank front clear for easy viewing
- Precision water flow adjustment manifolds at the tank and the row
- Filter cartridges are tilted for easy access
- U.V. Sterilizer located on top and out of the way because of its low maintenance
- Automatic Reservoir Water Exchange and Re-Fill feature (*optional*) prevents nitrates from building up within the system while it maintains a constant water volume within the system.
- Both leveling feet and casters available



Standard Rack Features

- Removable Filter Pad — to collect large waste particles from water entering reservoir
- Reservoir — collects all water from tank overflow, site of parameter monitoring
- 1 Wet/Dry Filter w/ bio-media — for biological filtration of effluent
- System Pump — magnetic drive pump
- Particulate Filter — with pressure monitor & 25 µm pleated cartridge
- Carbon Canister Filter — with refillable canister & pellet carbon
- In-line Heater — temperature adjustable with digital control
- UV Sterilizer — targets bacteria, algae, fungus and protozoa
- Flow meter — 0-7gpm for monitoring water flow through the tanks
- Temperature Monitor
- Low Water Level Safety System

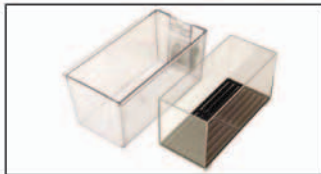
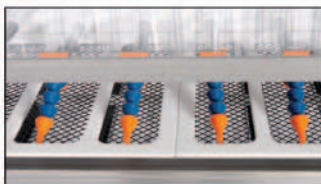
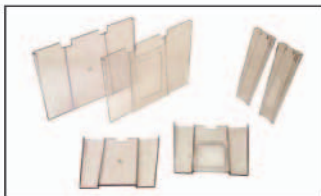
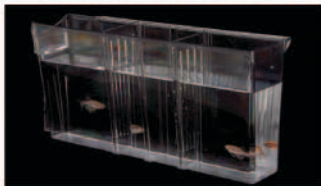
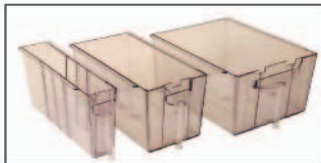
Enhance your research with aquatic housing that puts YOU in control! Call 1-800-243-5350.

Tanks

- Polycarbonate tanks are available in three sizes: 1.25-liter, 3.3-liter and 5.5-liter. The sizes are interchangeable anywhere upon the rack. One 5.5-liter tank can take the place of three 1.25-liter tanks. One 3.3-liter tank can take the place of two 1.25-liter tanks.
- For increased capacity of singly housed animals per rack, the 1.25-liter tanks are sub-dividable into two or three compartments. Jump barriers work in conjunction with the divider baffles to effectively seal the compartments from each other.
- Tanks feature an inverted V-channel baffle for superior waste removal. Screened baffles are available to prevent loss when rearing fry.
- As water leaves the tank, it travels through an elongated down spout at the rear of the tank. This down spout reduces splash and evaporation. It is easily removed for cleaning purposes.
- Net tank covers allows for quick easy feeding.
- Transport lids are used when the tank is removed from the rack.
- Breeder inserts allow for superior egg collection. The dark bottom of the insert encourages egg laying in zebrafish. The eggs drop through the bottom channel, preventing the adults from consuming them. The insert is easily removed to transfer the adults to another tank after laying is complete.

ZFS Photo-Period Feature

The PRL Photoperiod rack is available as a light tight enclosure so the animals can be housed on a programmed light cycle. Fluorescent lights, located in the doors for easy access, and light-tight air vents are used to prevent the enclosed chamber from warming. A diffuser panel between the bulbs and the tanks guarantee even light distribution to the animals. Unique to the Pharmacal system is a "dawn & dusk" feature that turns the lights on and off gradually, thus preventing the animals from being startled by the change. The enclosure doors can be removed, allowing the rack to be kept on the animal room's light cycle, if desired.



Pharmacal's PharmHouse™ System Extras



ZFS Rack Configurations	Rack Dimensions	Number of tank niches per row	Total number of tanks (of one size) per rack		
			1.25L	3.3L	5.5L
Double-sided Racks					
5 shelf	60" x 24" x 74"	18 (per side)	180	90	60
6 shelf	60" x 24" x 84"	18 (per side)	216	108	72
7 shelf	60" x 24" x 94"	18 (per side)	252	126	84
Single-sided Racks					
5 shelf	60" x 14" x 74"	18	90	45	30
6 shelf	60" x 14" x 84"	18	108	54	36
7 shelf	60" x 14" x 94"	18	126	63	42

Common Capabilities of Pharmacal Control Boxes

- Touch-screen Control
- Automated Daily Water Exchanges
- Temperature Monitoring and Control
- Out of Temperature Range Alarm
- Temperature Safety Shut Down
- Interlock Safety — shuts system down if water level is too low
- Automatic System Water Re-fill
- Low Water Level Alarm
- Manual Exchange Button
- Re-set Button — stops/resets exchanges
- Audible alarm with muting capability



Optional Upgrades

- Ethernet Connection
- Data Logging
- Real Time Monitoring
- Passcode Protection
- Conductivity Monitoring
- Conductivity Control
- pH Monitoring
- pH Control
- Dissolved Oxygen Monitoring
- User Settable Parameter Target Set Points
- Gradual Dose/Dwell System — brings parameters to set points slowly and prevents overshooting.
- Dosing Safety — prevents overdosing during system maintenance and re-filling of the reservoir
- Target Set Points for Parameters

Service

Pharmacal values the customer's satisfaction and is well known for their outstanding service and support. Yearly Preventative Maintenance and Emergency Service contracts are offered by PRL on all our aquatic systems.

(a letter from one buyer to another potential buyer)

“I've nothing but good things to say about Pharmacal as a company. I went to see it (the Pharmacal XLS System) being assembled at their main warehouse with the PI that plans to use the system. I know he was very impressed and very happy with it.”

—University of Connecticut





Call Today to Learn More About
Our PharmHouse™ Customized Aquatic Housing



562 Captain Neville Drive
Waterbury, Connecticut 06705
tel 800.243.5350
fax 203.755.4309
www.pharmaceutical.com
more info@pharmaceutical.com