"This is a major shot in the arm."

ANNE MACDONALD

DIRECTOR OF THE DEPARTMENT OF PARKS AND PARKWAYS FOR THE CITY OF NEW ORLEANS

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Brechtel, Carew was told to try to conserve all the money.

But as Carew helps unload one of the greens mowers from the truck, he appears more assured about Brechtel's future, as well as his own.

Carew is not the only one with a grin on his face as the equipment is driven off the trucks at the city's Department of Parks & Parkways location. Raymond Joseph, who has worked on Carew's crew for nearly 20 years, casts an expansive smile.

"We needed this equipment," Joseph says. "It's beautiful. It's a blessing."

Anne E. Macdonald, the city's director of the Department of Parks and Parkways and Carew's superior, is ecstatic that the equipment is in such fine condition. While not a golfer, Macdonald realizes how important it is for the city to offer residents a nice place to play golf so they can escape from their Katrina-caused troubles, even if for just a few hours.

"This is a major shot in the arm," she says.

It's not just the equipment donation that impresses Carew. It's that Lewis and Wilkerson made the trip to New Orleans to meet him. That gesture, Carew says, has boosted his morale in mankind, something he badly needed after witnessing so many human atrocities committed during the utter turmoil of the hurricane's aftermath.

Lewis and Wilkerson are glad they made the trip, too. They are inspired by Carew's tenacity to persevere. "If I didn't come, I wouldn't have had the opportunity to meet what I would deem a great American hero," Lewis says of Carew.

Wilkerson once called New Orleans home. He helped build the city's English Turn Golf & Country Club and worked there from 1987 through 1990. He says he feels good that the Carolinas GCSA donation will help enrich the city's lone municipal golf course.

And it already has. In July, Brechtel's golfers told Carew how thankful they were for the new equipment that helped to improve the course's condition.

"Our equipment and money is not going to feed anybody," Wilkerson says. "But it will help give peace of mind to somebody who's playing golf for a few hours a week."

Carew gave Lewis and Wilkerson a tour of New Orleans during their visit. He took them to what's left of the Joe Bartholomew Golf Club, which was submerged in water for about six weeks — 15-feet to 20-feet deep in some areas. The course was in the final stages of a $1-million renovation when Katrina hit. It's re-opening celebration never took place.

The land now resembles more of wasteland than a golf course, with dying trees and scrubby, overgrown weed-infested grass. Standing outside the dilapidated clubhouse, Lewis sighs deeply when asked what he thinks of what he sees.

"What comes to mind is the irony of it all," he says, explaining that golf courses in North Carolina are closing and being sold because of their high real-estate value. "Then you look at this property and realize it's a disaster, and there are no funds to renovate it."

Seeing the hurricane-ravaged city hit close to home for Lewis and Wilkerson because of the potential for such destructive hurricanes in the Carolinas.

"Both states have a coast line, and the majority of our courses are on that coast line," Wilkerson says.

The two have experienced their share of hurricanes, including five in the last three years. One of the worst hurricanes Lewis endured was Floyd in 1999. But it was nothing like Katrina.

"That was like having a cold compared to this, which is like having cancer," he says.

Wilkerson remembers the destruction that Hurricane Hugo caused to the Charleston, S.C., area in 1989. It took two to three years for the region to recover.

Carew expects it will take New Orleans about 15 to 20 years to recover.

Before returning home, Lewis and Wilkerson promise Carew that they won't forget about him and his plight.

"We'll take care of you," Lewis promises.

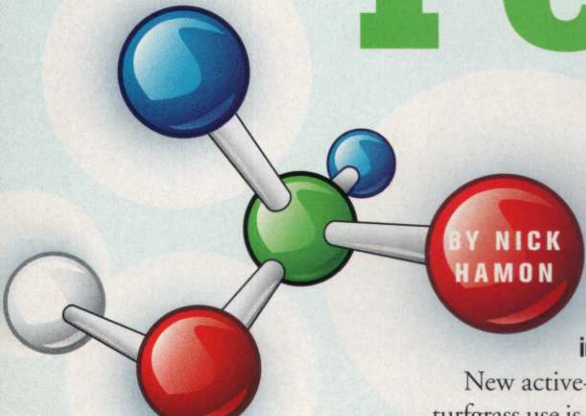
Carew is obliged, not to mention relieved, to know there are people who still care about him and his city nearly two years after Katrina.

"That's good to know," he replies softly to Lewis.

It's mid-afternoon on a stifling-hot summer day in New Orleans. But it still feels like Christmas to Carew. ■

Raymond Joseph, who has worked at Brechtel for nearly 20 years, says of the equipment donation: "It's beautiful. It's a blessing.

Pedigree of a Pesticide



BY NICK HAMON

It takes a lot of time, money, research and testing to bring a new active ingredient to market

Most golf course superintendents probably don't think much about the science and technology behind the products they choose to keep their turf free of weeds, insect pests and diseases.

New active-ingredient development for turfgrass use is not so dissimilar from that of a new pharmaceutical: Costs are high; it takes many years to get to market, and the chances of success are not guaranteed, even in the final stages of development. In fact, one might argue that pesticide development can be more complex than drug development because it includes not only efficacy and human safety testing but also detailed and costly monitoring of the environmental fate of the product.

Some facts and figures may help to put the process in perspective: Many companies spend more than $650 million annually on research and development. R&D involves not only the discovery of new active ingredients but also the continued support of existing products. In a study carried out by Phillips McDougall for American Crop Life and the European Crop Protection Association, the estimated cost of bringing a new agrochemical to market in 2000 was about $200 million.

Today, the costs are considered to be closer to $240 million. As well as in-house R&D, Bayer Environmental Science alone invests about $3 million annually with about 42 major universities in North America. Their work varies from basic research on the mode of action of new chemistry to efficacy profiling on pests, weeds and diseases.

It takes eight to 10 years on average to get a new active ingredient from the laboratory bench to the customer. And if you invest $250 million in new technology, you clearly do your best to protect your investment with patents. The life of a patent in North America varies from 17 to 20 years, which means a company has only about 10 years after launch to recoup its investment before generic companies can encroach.

How are new active ingredients discovered? Every year, our company runs as many as 1 million new molecules through a complex biological screening process. Much of the work is done with a process called combinatorial chemistry, in which new molecular structures are synthesized using complex robotics. Robots are also used to measure and weigh these chemicals, testing them for biological activity in biochemical screens. These biochemical screens are often cell-based systems involving ion channels, receptor sites and signaling pathways. We are constantly researching new modes of action to improve performance, reduce costs, improve the toxicological and ecological profiles and combat resistance to established classes of chemistry.

Despite more than half a century of industry research, the number of different modes of action available is surprisingly small. Using insecticides as an example, the most commonly used active ingredients still offer only three distinct modes of action:

- acetylcholinesterase inhibitors (organophosphates and carbamates);
- sodium channel modulators (synthetic pyrethroids); and

ILLUSTRATION BY: ISTOCK INTERNATIONAL INC.

• nicotinic acetylcholine receptor agonists and antagonists (imidacloprid).

Some of the chemistry under research involves well-understood modes of action, but much of the effort goes into the search for biologically active compounds among unknown chemistries. These biological screens run on nanograms or micrograms of active ingredient, and few (less than 1 percent) show biological activity on cellular systems or on whole organisms.

Compounds that do elicit biological responses will progress to further levels of screening, eventually encountering many target and non-target organisms, such as weeds, fungi, nematodes, mites or insects. It is at this point that chemists will work closely on redesigning the structure of the new active molecule to optimize toxicology, biological performance, costs, physical properties and environmental fate.

Of the million compounds our company tests annually, fewer than 20,000 make it through the initial screens, and perhaps only 750 will show promising activity in further studies. All of these compounds will get full biological and chemical profiling in laboratory and glasshouse trials, but fewer than 10 per year will end up being field tested at one or more of the 25 research farms that the company manages around the world.

Because the target pests, methods of application and technology needs of the turf and pest control markets are different than agriculture, Bayer Environmental Science has its own Development and Training Center in Clayton, N.C. At the Clayton site, scientists test new products on more than 40 cultivars of turf and as many as 30 different insects and diseases important to golf course superintendents. From the synthesis of a new molecule, it often takes three to four years before any field testing is done. After several years of field screening as well as intense research on manufacturing process, formulation, mammalian toxicology, environmental fate and mode of action, the company will make a decision on whether to promote this new compound into full-scale development.

Full-scale development means a further investment of many millions of dollars, with no guarantee that the new chemistry can jump

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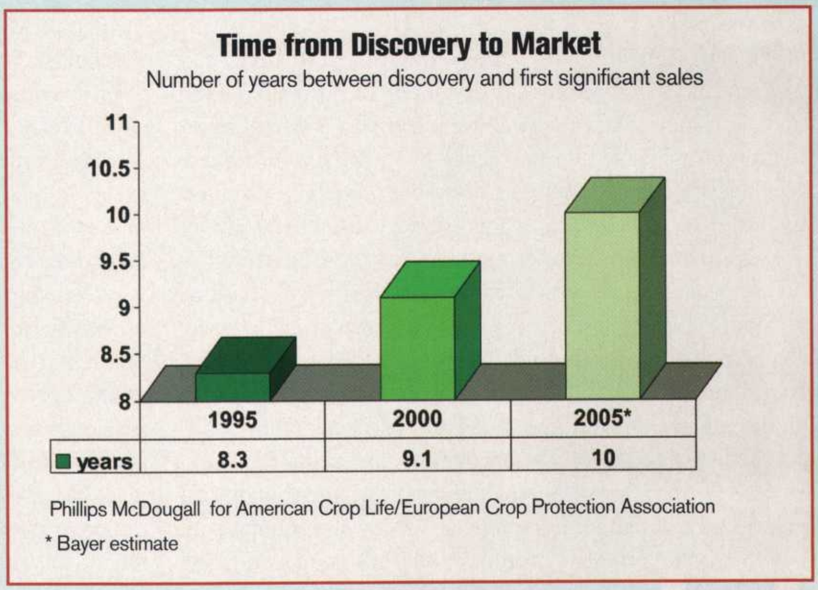

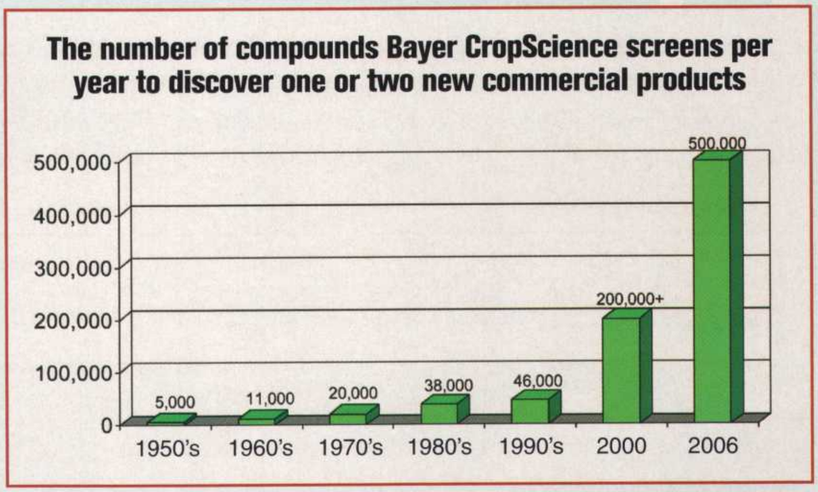

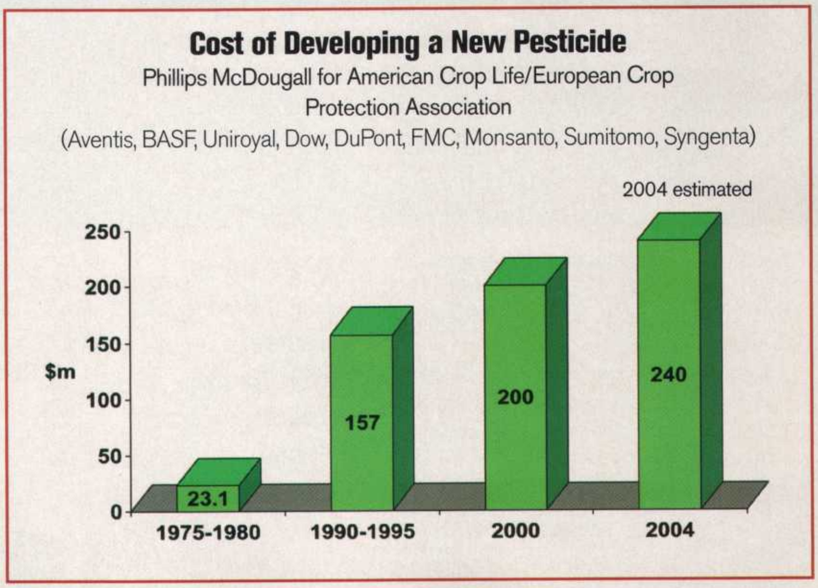

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all the cost, regulatory and efficacy hurdles that it will face in the next four to six years of the development process. Making a decision to invest in a new active ingredient is not all based exclusively on biological performance. Every detail is scrutinized: how large the market might be, what the competitive products are, whether the product is a good strategic fit, whether Bayer will recoup its $240-million investment over the life of the product and what risks are associated with making a "go" decision.

Once in full development, a whole new team of scientists will shepherd the product through a complex package of new tests. To get an EPA or EU registration, more than 150 regulatory studies will be done during a four-year period, including product chemistry, ecological toxicity, mammalian toxicity, nontarget plant and insect toxicity, environmental fate, metabolism and residue chemistry and risk assessment. Work will commence on:

- chemical synthesis and production (scaling up from a few pounds to making hundreds of tons);
- manufacturing (do we need to invest $50 million on a new manufacturing plant or can we adapt an existing plant?);
- how best to formulate and deliver to the target organism; and
- optimizing bioavailability (drop size, retention, rainfastness, systemicity, crystal size of dry deposit on surface).

Thousands of field trials will be carried out on farms around the world. At the same time, we will work closely with university experts to get their input on performance and benefits compared to existing products. If all goes well — after eight to 10 years from the initial synthesis and discovery, an investment exceeding $200 million, and the involvement of thousands of scientists and university researchers — the new product will be granted a label of registration.

As exciting as it is to get a new product to market, the work of the scientist has only just begun. Thousands of trials will be monitored closely to better understand performance and mode of action. Formulations will be optimized continuously for new pest targets. Also, compatibility studies, benefits of mixtures, application timing and techniques will be analyzed for many years.

In fact, some of the most intensive research goes into the continuous improvements of existing products. At any one time, we might be looking closely at up to six new active ingredients per year. Many will not make the transition into the environmental science markets, but a few will have the perfect profile for use by professionals in turf, ornamental or urban pest management. ■

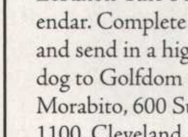
Nick Hamon, Ph.D., is director of development and technical service for Bayer Environmental Science.

CALL FOR ENTRIES!

2008 Dog Days of Golf Calendar

Is Your Canine Camera-Friendly? If so, please submit a photo of your dog to be considered for the Lebanon Turf's 2008 Dog Days of Golf calendar. Photos of your dog in a golf related setting, in action or with you are encouraged. The 2008 calendar will feature superintendent's dogs and be circulated to golf course professionals throughout the country. Any questions? Please call Cynthia Andrews, 1-800-532-0090 ext 253.

Submit your nomination today for the Lebanon Turf's 2008 Dog Days of Golf calendar. Complete the following information and send in a high-resolution photo of your dog to Golfdom magazine, Attn: Kristen Morabito, 600 Superior Avenue East, Suite 1100, Cleveland, Ohio 44114 or e-mail it to kmorabito@questex.com.



Deadline for entries: August 31, 2007

Free Hat & Bandana for First 25 Entries!

Dog's Name: ______________________

Dog's Breed: ______________________

Course: ______________________

Your Name: ______________________

Address: ______________________

Phone: ______________________

Email: ______________________

Calendar brought to you by: **LebanonTurf** Golfdom

TURFGRASS TRENDS

CURING TAKE-ALL PATCH

Curative Control of Take-all Patch Successful in Decline Phase

By Steven J. McDonald and Mike A. Fidanza

Take-all patch (*Gaeumannomyces graminis* var. avenae) can be a troublesome disease to control in young stands of creeping bentgrass (*Agrostis stolonifera*) (Smiley et al., 2005). Take-all patch (TAP) is a root disease that often affects creeping bentgrass maintained on golf course tees, greens and fairways. This disease can be especially damaging to turf grown in sand-based soils with a pH greater than 6.5.

PHOTO 1

Take-all patch manifests as circular or oblong orange to tan patches, which can wilt quickly in mid-summer.

In late spring, symptoms of TAP include circular or oblong, orange to tan patches in the turf canopy. During the heat of mid-summer, however, those patches tend to wilt quickly, turn reddish-purple and eventually white to straw color (Photo 1).

Typically after 10-12 years, and sometimes as soon as two to four years, TAP goes through a decline phase in which the disease becomes less and less severe and may not persist or occur during the summer (Dernoeden, 1983).

Previous research efforts have shown that adjusting soil chemical properties by acidifying soil can reduce the severity of TAP (Goss and Gould, 1967). Furthermore, the micronutrient manganese (Mn) has been shown to suppress TAP (Hill et al., 1999, Heckman et al., 2003). The research showed that applications of Mn over the course of one year could decrease the severity of take all patch.

Preventive applications of fungicides are commonly used to control TAP of younger stands of bentgrass (Latin, 2005). Best TAP control was observed after applications of fungicides in the late autumn and again the following early spring. Fungicide treatments should be applied in high water-carrier volume (more than 2 gallons per 1,000 square feet) and/or watered-in (0.2 inches of water). In many instances, however, it can be logistically difficult for golf course superintendents to make preventive fungicide applications. Research is extremely limited on the impact of fungicide, Mn, and wetting agent materials applied alone or in tank-mixes to suppress TAP symptoms in the

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OUR SPONSORS

TABLE 1

Treatment List

Product or products	Active Ingredient/ Nutrient/Composition	Rate or nutrients supplied
Heritage TL	Azoxystrobin	2 fl oz/1,000ft^2 product
Headway	Azoxystrobin + propiconazole	3 fl oz/1,000ft^2 product
Headway + 0-0-0-5% Mn + Flow Thru Wetting Agent	Azoxystrobin + propiconazole + Mn + proprietary blend of surfactants	3 fl oz product + 0.01 lb Mn + 3 /1,000ft^2 product
Lynx[x]	Tebuconazole	1.5 fl oz/1,000ft^2 product
Tartan	Trifloxystrobin + Triademefon	2 fl oz/1,000ft^2 product
Insignia	Pyraclostrobin	0.9 oz/1,000ft^2 product
Nutrient + Wetting Agent Program (0-0-0-5% Mn, Techmangum 32%$MnSO_4$, 12-0-0, and Flow Thru Wetting Agent)	Mn + Mn, N + S, proprietary blend of surfactants	0.07 lb Mn, 0.27 lb S, 0.12 lb N + 3 fl oz/1,000ft^2 product
Untreated Control	-	-

[x]*Lynx is the proposed name for tebuconazole and it is not currently registered by the U.S. Environmental Protection Agency.*

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summer. Therefore, the purpose of this field study was to evaluate a method to provide the best curative control of TAP in a creeping bentgrass fairway.

Curative control

A curative TAP trial was conducted on the seventh fairway at Bellewood Golf Club in North Coventry, Penn.

Prior to the study year, this site had been annually damaged by TAP. The fairways were originally seeded to PennTrio creeping bentgrass in 1998. Soil at the site had a pH of 6.4 with 5.4 percent organic matter. Generally, 2 pounds of nitrogen per 1,000 square feet was supplied to the fairways annually, and there was 1 pound potassium applied in April 2006.

Black ectotrophic hyphae typical of *Gaeumannomyces graminis* var. avenae had been microscopically identified on infected creeping bentgrass roots at the site about two weeks before initiation of the study. The site had an average of 15 to 20 percent blighted turf at the start of the study. Treatment information is outlined in Table 1. All treatments were applied at approximately 14-day intervals. Those dates were June 14 and 29, and July 12, 2006. Treatments were applied in 4 gallons of water per 1,000 square feet.

A light syringe (0.2 inch) was applied to the study area the evening following applications. Individual plots measured 5 feet by 5 feet, and arranged in a randomized complete block design with three replications (Photo 2, p. 52).

Disease ratings were assessed as a percent of plot area blighted by TAP on linear 0 to 100 scale, with 0 = no disease and 100 = entire plot area blighted.

PHOTO 2

Test plots were 5 feet by 5 feet and were arranged in a randomized complete block design with three replications.

Results and summary

On June 21 (seven days after the initial treatment), no statistical differences were observed among all treatments, including the untreated check (Table 1). However, all treatments except Tartan (21 percent TAP) were associated with a noticeable reduction of TAP severity (10.4 to 19 percent), when compared to the untreated control (22.3 percent TAP).

A similar trend was observed on June 29 and all plots were retreated on June 29. By July 12, statistically significant treatment differences were observed. Turf treated with the nutrient plus wetting agent program (1.7 percent TAP), and all fungicide-treated plots (0.3 to 4.6 percent TAP) except those plots that received Insignia (8.6 percent TAP), exhibited statistically lower TAP compared to the untreated plots (13.3 percent TAP). Following a stretch

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