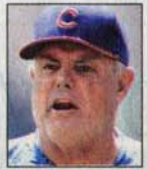
# uspensions for 2

k gets 8 games; Lou to sit for 4 SPORTS



TEMPO

# Nature's toxic riddle


# Chicago Tribune

Tuesday
June 5, 2007

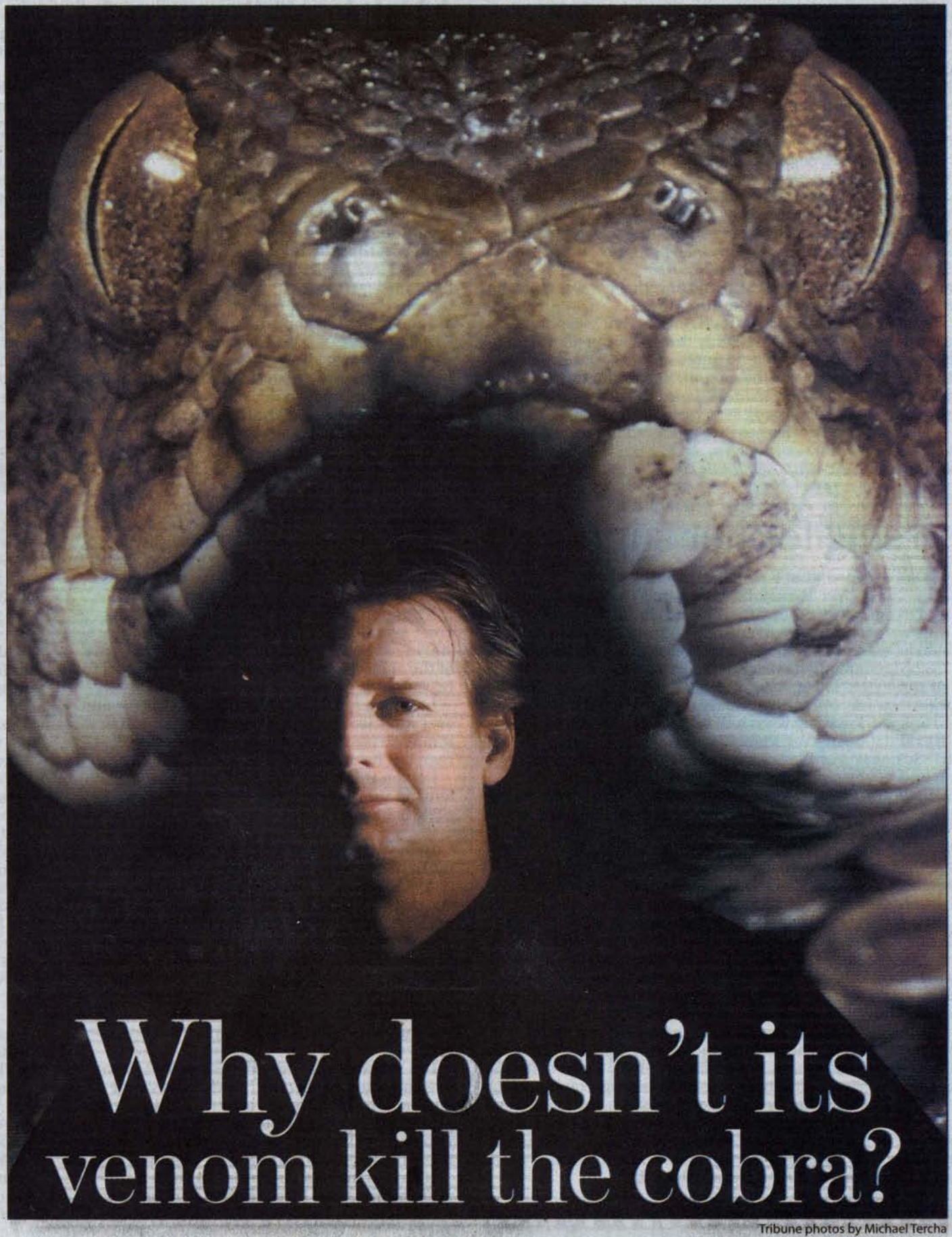



IBUNE

Chicago Tribune

# TEMPO

CS



# Why doesn't its venom kill the cobra?

Tribune photos by Michael Tercha

**University of Chicago researcher and natural toxins expert Zoltan Takacs hopes to solve this medical riddle. Above, he poses with his photo of a saw scale viper, a venomous snake that kills more people annually than any other.**

**By Charles Leroux** | Tribune senior correspondent

The first time Zoltan Takacs was bitten by a venomous snake was during his sophomore year in high school.

"It was a long-nosed viper," recalled Takacs, 38, a natural toxins researcher at the University of Chicago. "It had shed its skin, and I was stretching the skin out next to the viper to compare the lengths. That was a mistake. Most of the time when you get bit, it's your mistake that does it."

Though Takacs has been bitten by poisonous snakes four more times since, he remains smitten by them.

He grew up in Budapest, Hungary, son of an electrical engineer father and accountant mother. His father's family was from the Transylvania region of Romania, and Takacs and his brother spent summers there, enjoying life outdoors amid the Carpathian Mountains the way boys do — catching little lizards and frogs and, later, snakes. During the school year, he and some friends would make collecting runs as far south as Bulgaria. He'd have liked to seek out exotic, tropical species, but travel was largely forbidden outside the Eastern Bloc countries in those days, so the Cold War limited him to gathering only socialist snakes.

"I started keeping them, feeding them, breeding them," he said. The more he saw and studied snakes, the more he was taken with their beauty, their evolutionary adaptations and, with the venomous species, their efficiency in dispatching prey or predators.

"Venomous snakes are born venomous," he said. "The babies have smaller fangs than adults, but, ounce for ounce, they are deadlier."

Many men have become enthralled by the combination of great beauty and great danger. In Takacs' case it was the vipers, rattlers and so forth of the world, creatures carrying — and capable of delivering — some of the most toxic substances on the planet.

He studied pharmaceutical sciences and medicine in Hungary, then came to America. His doctoral thesis at Columbia University was on evolutionary studies on cobra venom. Now, as a researcher on the faculty of the Pritzker School of Medicine at the U. of C., he's looking into the intriguing question of why a cobra's venom doesn't kill the cobra and how the answer to that question might lead to new tools in battling

PLEASE SEE **SNAKES,** PAGE 8

# Biggest, baddest ...

## Takacs' snake facts

› Worldwide **125,000 people a year are killed by venomous snakes**, but just 10 to 15 in the U.S.

› **Which is the most poisonous snake?** Well, that depends. If you mean the most toxins per gram of venom, it's the **inland taipan** in Australia. People hardly ever encounter them though, and they've never accounted for a human death.

› **In terms of human death, it's probably the saw scale viper in Northern Africa.** They are in agricultural fields, and people come in contact with them. Also there's the **lance-headed pit viper** in Central and South America and **cobras** and **kraits** in Asia.

› **If you're asking which snake you really don't want to bite you, it's probably a large black mamba.** The second largest poisonous snake in the world, it grows up to 14 feet in length and moves at 12 miles an hour. When preparing to bite, it rises up 3 or 4 feet and can strike from as far as 6 feet away.

› Some venom causes **muscle paralysis.** You can't breathe. Other species' venom contains enzymes that attack blood vessels so you **bleed internally** and, when you've lost enough blood, you go into shock. **The mamba's does both.**

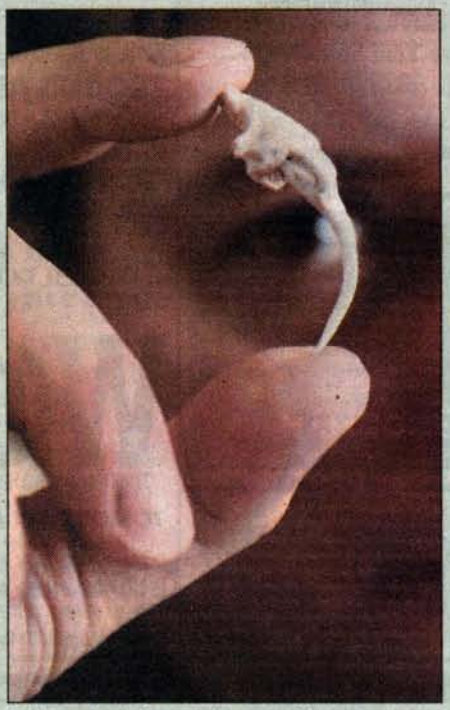
› **If a poisonous snake bites you, how long would you have?** That depends what species bit you, how much venom was injected, where on the body, what's your body mass. **It can be anything from 15 minutes to three weeks to no effect at all.**

› In a case of overkill, **one bite of the olive sea snake delivers enough venom to kill 1,500 of the fish** that are its natural prey.

› **The longest fangs are those of the Gaboon viper.** They can be more than 2 inches.

› **The longest venomous snake is the king cobra** of Southeast Asia. It can be nearly 16½ feet.

*— Charles Leroux*



**Takacs holds a Gaboon viper fang.**

# SNAKES: Risks include more than just bites

CONTINUED FROM PAGE 1

some debilitating diseases.

There are about 3,000 species of snakes. They are found on every continent except Antarctica, in deserts, in seas, in jungles, as far north as near the Arctic Circle, as far south as Patagonia and Tasmania.

Of those species, about 650 are poisonous. Those are the ones on whom Takacs pays visits. (He has learned to scuba dive and pilot small aircraft to get to the often remote spots where the snakes are.)

He has been to 116 countries, pretty much the entire venomous itinerary of Earth, including places such as Yemen, New Guinea and the southern Philippines where local strife has meant that snakes aren't the biggest danger.

"You rent a soldier or two for security," he said. "They're cheap."

As a teen, Takacs was jailed for looking for snakes too close to a military base. More recently, he has been accused of being a spy, though when he shows his expertise with snakes, accusation usually changes to fascination with his work. "Sometimes," he said, "a whole village will get caught up in it and help you find snakes. One time, members of a Pygmy tribe in the rain forest in the Congo were tremendously helpful. They knew where to look."

National Geographic photo provided by Zoltan Takacs

**Zoltan Takacs, shown with a Gaboon viper, has been to 116 countries in pursuit of snakes.**

## Little protective gear

Despite the bites — two from long-nosed vipers, one from a meadow viper and another from a European adder (all in a two-year period in high school) and, in 1998, a bite by a tree-dwelling eyelash viper in Costa Rica — he doesn't wear much protective gear.

"Gloves limit my fine-motor movement, and I need that," he said. He demonstrated with a pencil his technique for catching snakes. "You take a stick and hold the snake flat to the ground. Then move the stick up behind its head to immobilize the head and grab it there. Then you put it in a bag, often just a pillow case."

*'You might be lucky, even if you're bitten. ... I wouldn't count on that though.'*

— Zoltan Takacs, U. of C. professor

This is not foolproof. There is a species called side-stabbing snake that can do just that. Also, if you throw the pillow case containing the snake over your shoulder, as a buddy of his once did, the snake can bite through the case and clothing to inject venom. His friend survived.

"You might be lucky, even if you're bitten," he said. "Sometime it's what is called a dry bite in which the snake inserts its fangs but doesn't release venom. I wouldn't count on that though."

Takacs does wear protective gear when capturing sea snakes — "First I put on leather gloves that I buy at Home Depot and, over those, thick diving gloves."

The other protective device is a clear plastic mask that covers his entire face. He wears that when catching or photographing the spitting cobra found mostly in sub-Saharan Africa. This snake is capable of spitting a fine spray of venom into an opponent's face from as much as 13 feet away and can spit 40 or 50 times in rapid succession. When the venom dries, it's even more dangerous because it becomes a powder that can accidentally get in the eyes or an open wound.

After any dealing with a spitting cobra, he said, "I find the nearest creek and thoroughly wash up."

Back in his lab in Chicago, Takacs has venom, snake tissue, blood samples and toxins cloned from DNA, but no live creatures. Here he sheds his global adventurer persona and becomes Assistant Professor Takacs. He works in the recently built Ellen and Melvin Gordon Center for Integrative Science, where, students know, there always are Tootsie Rolls available in the lobby. (Ellen and Melvin Gordon, who donated $25 million for the building, are, respectively, president and chairman of the board of Tootsie Roll Industries Inc.)

His research on why cobras don't poison themselves is pure science, but it relates to the hope for future medicines based on toxins — possibly genetically altered toxins.

## Medical uses

"Snake venom is used for testing blood coagulation and diagnosing lupus," Takacs said. "also for the prevention of bleeding and to reduce hypertension. There's a cosmetic cream called Syn-ake that is supposed to smooth wrinkles in the skin. Toxins in venom can be 300,000 times more expensive than gold."

The poisons in cobra venom act on specific receptors on muscle cells. The receptors are the means by which charged atoms (ions) enter cells enabling such basic functions as communication between nerves and muscles.

In a mouse or a man — but, interestingly, not in a mongoose, a natural enemy of the cobra and the only animal with built-in cobra venom immunity — the cobra's toxins stage a direct attack on the receptors thus causing paralysis.

But similar receptors within the cobra itself, Takacs said, have a glucose molecule that blocks the toxins from entering. "It's like a key and a lock," he said. "The key that would otherwise open the lock can't work if there's something blocking the lock." (Some other venomous species are protected in another way. They have substances in their blood that neutralizes their toxins.)

The fact that cobra venom targets only specific receptors might lead to drugs without side effects. Cobra neurotoxins converted to drugs could be helpful in fighting diseases such as Alzheimer's and diabetes.

Though he loves the "unlocking mysteries" part of lab work, Takacs often yearns to get back in the field. He's eager to return to the Solomon Islands and parts of West Africa, but such expeditions are dependent on getting government permits and financial grants.

He mentioned a future expedition, perhaps his most perilous: "I think," he said, "my next and most precious adventure is to have a family."

*cleroux@tribune.com*

Chicago Tribune
Tuesday, June 5

Back to Print Edition - Tuesday Tempo

# Why doesn't its venom kill the cobra?

**By Charles Leroux**
Tribune senior correspondent
*Published June 5, 2007*

The first time Zoltan Takacs was bitten by a venomous snake was during his sophomore year in high school.

"It was a long-nosed viper," recalled Takacs, 38, a natural toxins researcher at the University of Chicago. "It had shed its skin, and I was stretching the skin out next to the viper to compare the lengths. That was a mistake. Most of the time when you get bit, it's your mistake that does it."

Though Takacs has been bitten by poisonous snakes four more times since, he remains smitten by them.

He grew up in Budapest, Hungary, son of an electrical engineer father and accountant mother. His father's family was from the Transylvania region of Romania, and Takacs and his brother spent summers there, enjoying life outdoors amid the Carpathian Mountains the way boys do -- catching little lizards and frogs and, later, snakes. During the school year, he and some friends would make collecting runs as far south as Bulgaria. He'd have liked to seek out exotic, tropical species, but travel was largely forbidden outside the Eastern Bloc countries in those days, so the Cold War limited him to gathering only socialist snakes.

"I started keeping them, feeding them, breeding them," he said. The more he saw and studied snakes, the more he was taken with their beauty, their evolutionary adaptations and, with the venomous species, their efficiency in dispatching prey or predators.

"Venomous snakes are born venomous," he said. "The babies have smaller fangs than adults, but, ounce for ounce, they are deadlier."

Many men have become enthralled by the combination of great beauty and great danger. In Takacs' case it was the vipers, rattlers and so forth of the world, creatures carrying -- and capable of delivering -- some of the most toxic substances on the planet.

He studied pharmaceutical sciences and medicine in Hungary, then came to America. His doctoral thesis at Columbia University was on evolutionary studies on cobra venom. Now, as a researcher on the faculty of the Pritzker School of Medicine at the U. of C., he's looking into the intriguing question of why a cobra's venom doesn't kill

the cobra and how the answer to that question might lead to new tools in battling some debilitating diseases.

There are about 3,000 species of snakes. They are found on every continent except Antarctica, in deserts, in seas, in jungles, as far north as near the Arctic Circle, as far south as Patagonia and Tasmania.

Of those species, about 650 are poisonous. Those are the ones on whom Takacs pays visits. (He has learned to scuba dive and pilot small aircraft to get to the often remote spots where the snakes are.)

He has been to 116 countries, pretty much the entire venomous itinerary of Earth, including places such as Yemen, New Guinea and the southern Philippines where local strife has meant that snakes aren't the biggest danger.

"You rent a soldier or two for security," he said. "They're cheap."

As a teen, Takacs was jailed for looking for snakes too close to a military base. More recently, he has been accused of being a spy, though when he shows his expertise with snakes, accusation usually changes to fascination with his work. "Sometimes," he said, "a whole village will get caught up in it and help you find snakes. One time, members of a Pygmy tribe in the rain forest in the Congo were tremendously helpful. They knew where to look."

Little protective gear

Despite the bites -- two from long-nosed vipers, one from a meadow viper and another from a European adder (all in a two-year period in high school) and, in 1998, a bite by a tree-dwelling eyelash viper in Costa Rica -- he doesn't wear much protective gear.

"Gloves limit my fine-motor movement, and I need that," he said. He demonstrated with a pencil his technique for catching snakes. "You take a stick and hold the snake flat to the ground. Then move the stick up behind its head to immobilize the head and grab it there. Then you put it in a bag, often just a pillow case."

This is not foolproof. There is a species called side-stabbing snake that can do just that. Also, if you throw the pillow case containing the snake over your shoulder, as a buddy of his once did, the snake can bite through the case and clothing to inject venom. His friend survived.

"You might be lucky, even if you're bitten," he said. "Sometime it's what is called a dry bite in which the snake inserts its fangs but doesn't release venom. I wouldn't count on that though."

Takacs does wear protective gear when capturing sea snakes -- "First I put on leather gloves that I buy at Home Depot and, over those, thick diving gloves."

The other protective device is a clear plastic mask that covers his entire face. He wears that when catching or photographing the spitting cobra found mostly in sub-Saharan Africa. This snake is capable of spitting a fine spray of venom into an opponent's face from as much as 13 feet away and can spit 40 or 50 times in rapid succession. When the venom dries, it's even more dangerous because it becomes a powder that can accidentally get in the eyes or an open wound.

After any dealing with a spitting cobra, he said, "I find the nearest creek and thoroughly wash up."

Back in his lab in Chicago, Takacs has venom, snake tissue, blood samples and toxins cloned from DNA, but no live creatures. Here he sheds his global adventurer persona and becomes Assistant Professor Takacs. He works in the recently built Ellen

and Melvin Gordon Center for Integrative Science, where, students know, there always are Tootsie Rolls available in the lobby. (Ellen and Melvin Gordon, who donated $25 million for the building, are, respectively, president and chairman of the board of Tootsie Roll Industries Inc.)

His research on why cobras don't poison themselves is pure science, but it relates to the hope for future medicines based on toxins -- possibly genetically altered toxins.

Medical uses

"Snake venom is used for testing blood coagulation and diagnosing lupus," Takacs said. "also for the prevention of bleeding and to reduce hypertension. There's a cosmetic cream called Syn-ake that is supposed to smooth wrinkles in the skin. Toxins in venom can be 300,000 times more expensive than gold."

The poisons in cobra venom act on specific receptors on muscle cells. The receptors are the means by which charged atoms (ions) enter cells enabling such basic functions as communication between nerves and muscles.

In a mouse or a man -- but, interestingly, not in a mongoose, a natural enemy of the cobra and the only animal with built-in cobra venom immunity -- the cobra's toxins stage a direct attack on the receptors thus causing paralysis.

But similar receptors within the cobra itself, Takacs said, have a glucose molecule that blocks the toxins from entering. "It's like a key and a lock," he said. "The key that would otherwise open the lock can't work if there's something blocking the lock." (Some other venomous species are protected in another way. They have substances in their blood that neutralizes their toxins.)

The fact that cobra venom targets only specific receptors might lead to drugs without side effects. Cobra neurotoxins converted to drugs could be helpful in fighting diseases such as Alzheimer's and diabetes.

Though he loves the "unlocking mysteries" part of lab work, Takacs often yearns to get back in the field. He's eager to return to the Solomon Islands and parts of West Africa, but such expeditions are dependent on getting government permits and financial grants.

He mentioned a future expedition, perhaps his most perilous: "I think," he said, "my next and most precious adventure is to have a family."

- - -

Biggest, baddest ... Takacs' snake facts

- Worldwide 125,000 people a year are killed by venomous snakes, but just 10 to 15 in the U.S.

- Which is the most poisonous snake? Well, that depends. If you mean the most toxins per gram of venom, it's the inland taipan in Australia. People hardly ever encounter them though, and they've never accounted for a human death.

- In terms of human death, it's probably the saw scale viper in Northern Africa. They are in agricultural fields, and people come in contact with them. Also there's the lance-headed pit viper in Central and South America and cobras and kraits in Asia.

- If you're asking which snake you really don't want to bite you, it's probably a large black mamba. The second largest poisonous snake in the world, it grows up to 14 feet in length and moves at 12 miles an hour. When

preparing to bite, it rises up 3 or 4 feet and can strike from as far as 6 feet away.

- Some venom causes muscle paralysis. You can't breathe. Other species' venom contains enzymes that attack blood vessels so you bleed internally and, when you've lost enough blood, you go into shock. The mamba's does both.

- If a poisonous snake bites you, how long would you have? That depends what species bit you, how much venom was injected, where on the body, what's your body mass. It can be anything from 15 minutes to three weeks to no effect at all.

- In a case of overkill, one bite of the olive sea snake delivers enough venom to kill 1,500 of the fish that are its natural prey.

- The longest fangs are those of the Gaboon viper. They can be more than 2 inches.

- The longest venomous snake is the king cobra of Southeast Asia. It can be nearly 16 1/2 feet.

-- Charles Leroux

---

cleroux@tribune.com