



# SWIMMING-INDUCED PULMONARY EDEMA (SIPE) IN TRIATHLETES: EFFECT OF AGE AND SEX?



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## Abstract

**Swimming-Induced Pulmonary Edema (SIPE) in Triathletes: Effect of Age and Sex?**  
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**Introduction:** SIPE is a condition that occurs in divers and swimmers, and the evidence overwhelmingly supports high pulmonary capillary pressure as the cause. SIPE is particularly common among triathletes, with symptoms reported by 1.4% of 1411 responders to a survey (Miller et al. Am J Emerg Med 2010;28:941-6). SIPE-susceptibility can be associated with cardiopulmonary disease, particularly hypertension, however in many cases the condition appears to be idiopathic. Evidence from another study in our lab suggests decreased LV diastolic compliance as a predisposing factor. Because this tends to decline with advancing age we hypothesized that susceptibility to SIPE among triathletes may increase with normal aging. We therefore tested the hypothesis that triathletes who experience SIPE are older than the general population of triathletes.

**Methods:** We compared the age distribution of published cases of SIPE among triathletes reported in the literature or responding to advertisements for an IRB-approved study (N=54) and compared this with the age distribution of triathletes obtained from a 2008 survey by USA Triathlon. We further analyzed the gender distribution among triathletes and those with a SIPE history.

**Results:** The data are shown below.

Age	SIPE Cases	USA Triathlon
20-29	3	2,970
30-39	13	5,340
40-49	21	4,410
50-59	14	1,650
60-69	3	330
≥70	0	45
<b>TOTALS</b>	<b>54</b>	<b>14,745</b>

The age distribution of the SIPE cases is significantly different from USA Triathlon members (P=0.0004, Fisher's exact test). There were 64.8% females in the SIPE group vs. 39.5% among USA Triathlon members (P=0.0004).

**Conclusions:** We confirm that among triathletes increased age appears to be a risk factor for SIPE. Females are at higher risk of SIPE, as has been previously observed.

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## Background

- Swimming-induced pulmonary edema (SIPE) occurs in susceptible individuals and presents with dyspnea, hemoptysis and cough during surface swimming or scuba diving, often in cold water.<sup>1</sup>
- Approximately 1.4% of triathletes have reported to have symptoms consistent with SIPE.<sup>2</sup>
- SIPE is a form of hemodynamic pulmonary edema, most likely caused by pulmonary capillary stress failure due to high pulmonary artery and capillary pressures.
- While SIPE has been reported in healthy individuals, such as military combat swimmers, hypertension and underlying cardiopulmonary comorbidities may increase risk.<sup>3</sup>
- In our lab studies, we have observed that one predisposing factor for SIPE is decreased left ventricular (LV) compliance.



Photo credit: Katherine Calder-Becker

## Hypothesis

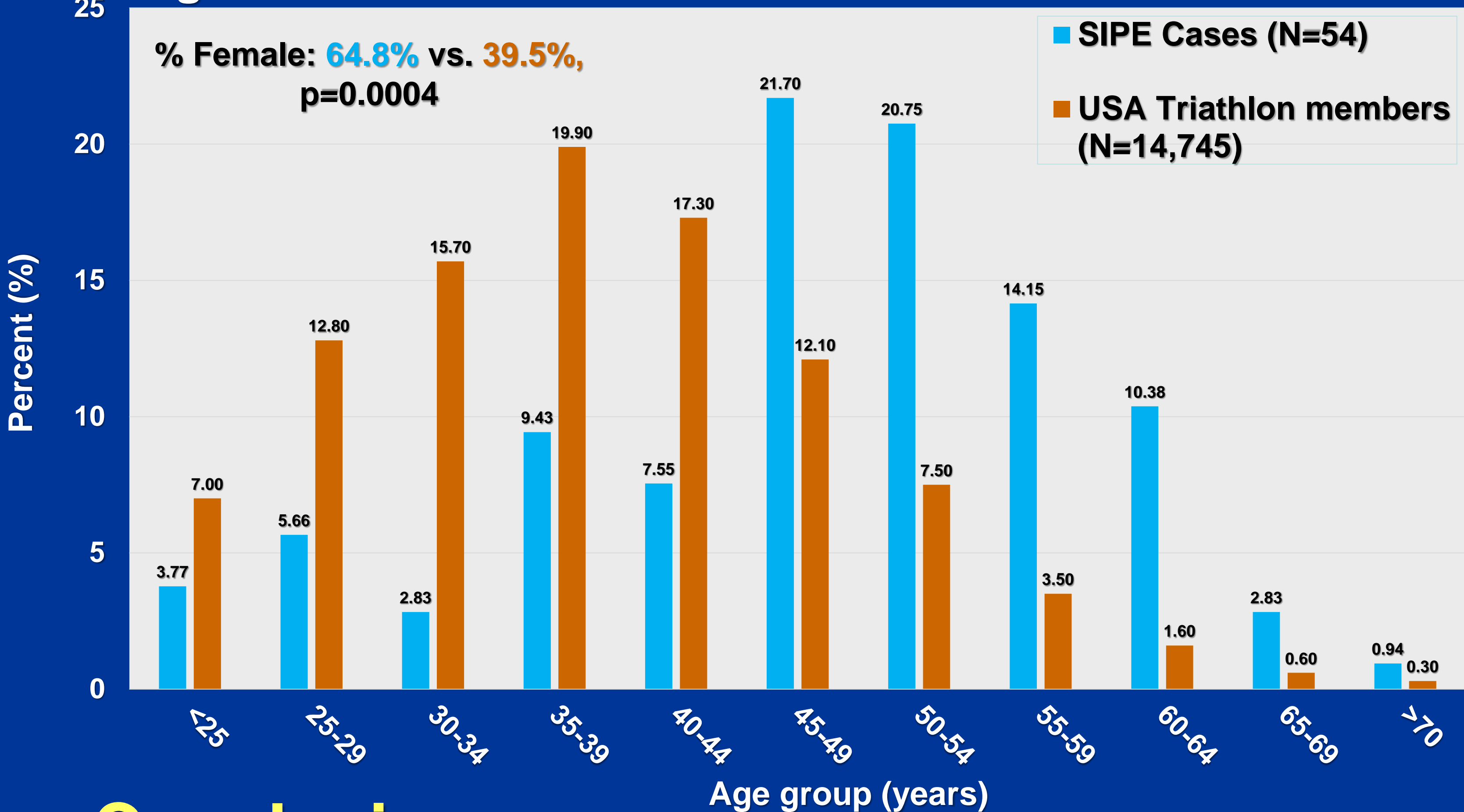
- SIPE susceptibility increases with normal aging.

## Methods

- SIPE cases were compiled from two sources: our lab studies and the published literature. After institutional approval, subjects with a history of SIPE were recruited for a physiological study and completed a survey regarding swimming and diving circumstances and medical history. Those participating in or training for a triathlon were included in this analysis.
- PubMed/Medline, EMBASE and ISIS Web of Science were used to identify cases of SIPE in triathletes. Age and sex distributions in SIPE susceptible triathletes was compared to the general triathlete population as reported in a 2008 survey from USA Triathlon.<sup>6</sup> Statistical significance (P<0.05) was assessed using Fisher's Exact Test (JMP 11.2, SAS, Cary NC).

## Results

### Age distribution of SIPE cases vs. USA Triathlon members



## Conclusions

- Triathletes who develop SIPE are older and more likely to be female, confirming previous reports.<sup>2,4,5</sup>
- Findings are consistent with mild age-related decrease in LV compliance. Other co-morbidities may also be important.

## Acknowledgement

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