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SCIENTIFIC REVIEW

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American Red Cross Scientific Advisory Committee Scientific Review: Eating Before Swimming

**Peter Chambers, Linda Quan, Peter Wernicki,
and David Markenson**

Questions to be Addressed

Does swimming within one hour of eating increase the risk of drowning in child or adult recreational or competitive swimmers?

Introduction/Overview

There is a persistent belief in the United States that swimming immediately after eating will cause stomach cramps, which could lead to drowning. This review surveys the scholarly literature to investigate whether any correlation exists between eating and fatal or non-fatal drowning events and to establish whether it is safe to swim after eating.

Review Process and Literature Search Performed:

Databases

Databases searched included PubMed, Ovid Medline and OldMedline, CINAHL, Cochrane Database of Systematic Reviews, UpToDate, MDConsult, JSTOR, Academic Search Complete, Google Scholar, Google Books, Google Web Search, ERIC, SPORTDiscus, and Physical Education Index.

Websites

<http://www.snopes.com/oldwives/hourwait.asp> Swimming myth
www.dukehealth.org: Myth or Fact: Wait 30 minutes after eating to go swimming
<http://www.medicinenet.com/script/main/art.asp?articlekey=47368> Debunking summer health myths
<http://health.discovery.com/videos/dr-know-swimming-after-eating.html> Discovery Health Video

State major criteria you used to limit your search; state inclusion or exclusion criteria (e.g., only human studies with control group? no animal studies? N subjects > minimal number? Type of methodology? Peer-reviewed manuscripts only? No abstract-only studies?

English articles searched

Human articles only

Published from 1960 to the present

No restrictions on type of study, number of subjects

Search Terms and Search Strings

Swim, swimming, swam

Drown, drowning, drowned

Eat, eating, ate

Meal, nutrients, nutrition,

Digest, digested, digestion

Gut, gut action

Exercise

Water, aquatics

When the feature was available, search terms were wild-carded to find all possible variations of the term.

Scientific Foundation

There is little recently published scientific literature or even general information on the effects of eating before swimming or swimming after eating. Several studies were conducted in the 1960s that showed no effect on swimming performance and minimal side effects at several different time intervals after a meal. No major medical or safety organizations make any current recommendations to wait before swimming after eating. No reported cases of eating before swimming causing or contributing to fatal or non-fatal drowning are reported in any of the literature searched. Currently available information suggests that eating before swimming is not a contributing risk for drowning and can be dismissed as a myth.

Summary

Recommendations and Strength (Using Table 1):

Standards:

Guidelines:

Options: Food intake restrictions prior to swimming are unnecessary (class III)

Treatment Options result from all other evidence, publications, expert opinion, etc. and are the least compelling in terms of scientific evidence.

Table 1 Recommendations and Strengths

Class	Description	Implication	Level of Evidence
I	Convincingly justifiable on scientific evidence alone.	Usually supports Standard	One or more Level 1 studies are present (with rare exceptions). Study results consistently positive and compelling
II	Reasonably justifiable by scientific evidence and strongly supported by expert opinion.	Usually supports Guideline but if volume of evidence is great enough and support from expert opinions is clear may support standard	Most evidence is supportive of guideline. Level 1 studies are absent, or inconsistent, or lack power. Generally higher levels of evidence. Results are consistently supportive of guideline.
III	Adequate scientific evidence is lacking but widely supported by available data and expert opinion. Based on current accepted practices.	Usually supports Option.	Generally lower or intermediate levels of evidence. Generally, but not consistently results are supportive of opinion.
IV	No convincing scientific evidence available but supported by rational conjecture, expert opinion and/or non peer-reviewed publications	Usually does not support standard, guideline, or option. Statement may still be made which presents what data and opinion exists. In some cases and in conjunction with rational conjecture may support option.	Minimal evidence is available. Studies may be in progress. Results inconsistent, or contradictory.

Summary of Key Articles/Literature Found and Level of Evidence/ Bibliography

Author(s)	Full Citation	Summary of Article	Level of Evidence
Singer RN, Neeves RE.	Effect of food consumption on 200-yard freestyle swim performance. <i>Research Quarterly</i> , 1968 May; 39(2):355-60	12 male competitive swimmers, ages 15-21, were fed a large meal then asked to wait different time intervals before swimming. Intervals were ½ hour, 1 hour, and 2 hours. A control group swam the same distance, but did not eat beforehand. In addition to being timed, swimmers were asked to report any discomfort or problems such as cramps or nausea. Of the total 192 trials, only 4 cases of nausea and 1 case of regurgitation were observed. No stomach cramps were observed. Swimming performance was not significantly affected in any of the waiting periods.	3b

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Author(s)	Full Citation	Summary of Article	Level of Evidence
Asprey G, Alley L, & Tuttle W.	Effect of eating at various times on subsequent performances in the one-mile freestyle swim. <i>Research Quarterly</i> , 1968 May; 39(2):231-4.	24 male swimmers, ages 18-23 years, consumed a small meal consisting of cereal, toast, sugar, butter, and whole milk (338g, 510 calories). They then waited ½ hour, 1 hour, or 2 hours, and were then timed in the 1-mile freestyle swim. As a control, they also swam 8 trials when they had not consumed any food for 3 hours prior, for a total of 32 trials each. Subjects were asked to report any discomfort like nausea or cramping, but there were no such reports. There was no significant difference in recorded times between the control group and any of the waiting intervals.	3b
Asprey G, Alley L, & Tuttle W.	Effect of eating at various times on free-style swimming performance. <i>J. of the American Dietetic Association</i> , 1965 Sept; 47:198-200.	24 subjects, 12 male and 12 female, consumed a small meal consisting of cereal, toast, sugar, butter, and whole milk (338g, 510 calories). They then waited ½ hour, 1 hour, or 2 hours, and were timed in a 200-yard freestyle swim. As a control, they also swam 10 trials when they had not consumed any food for 3 hours prior, for a total of 40 trials each. In another trial, 20 subjects, 8 male and 12 female, swam 8 400-yard trials after eating the same meal as the other group and waiting the same intervals. They also swam 8 trials without eating as a control, for a total of 32 trials. Subjects were asked to report any discomfort like nausea or cramping, but there were no such reports. There was no significant difference in recorded times between the control group and any of the waiting intervals.	3b
Ball, J	Effect of eating at various times on subsequent performances in swimming.	14 male swimmers, ages 14-18 years, consumed a small meal consisting of cereal, toast, sugar, butter, and skim milk (459g, 472 calories). They waited ½ hour, 1 hour, 1 ½ hours, 2 hours, 2 ½ hours, or 3 hours and were then timed in the 100 yard freestyle swim. Each subject swam 10 trials at each of the waiting intervals for a total of 60 trials per subject and 840 trials overall. Subjects were asked to report any discomfort like nausea or cramping, but there were no such reports. There was no significant difference in recorded times between any of the waiting intervals.	3b
Edlin G, Golanty, E.	Health and Wellness. Jones & Bartlett Learning.	“Scientific evidence does not support the widely held belief that swimming shortly after eating induces stomach cramps, thereby increasing the risk of drowning.”	6

Author(s)	Full Citation	Summary of Article	Level of Evidence
Brouns F, Beckers E.	Is the gut an athletic organ? Digestion, absorption and exercise. <i>Sports Medicine</i> 1993 Apr;15(4):242-57.	Digestion is a process which takes place during rest. Exercise shifts blood flow away from the gastrointestinal (GI) tract towards the active muscle and the lungs. In exhausting endurance events, 30 to 50% of participants may suffer from 1 or more GI symptoms, which have often been interpreted as being a result of maldigestion, malabsorption, changes in small intestinal transit, and improper food and fluid intake. Results of field and laboratory studies show that pre-exercise ingestion of foods rich in dietary fibre, fat and protein, as well as strongly hypertonic drinks, may cause upper GI symptoms such as stomach ache, vomiting and reflux or heartburn. There is no evidence that the ingestion of nonhypertonic drinks during exercise induces GI distress and diarrhea. In contrast, dehydration because of insufficient fluid replacement has been shown to increase the frequency of GI symptoms. Lower GI symptoms, such as intestinal cramps, diarrhea--sometimes bloody--and urge to defecate seem to be more related to changes in gut motility and tone, as well as a secretion. The gut is not an athletic organ in the sense that it adapts to increased exercise-induced physiological stress. However, adequate training leads to a less dramatic decrease of GI blood flow at submaximal exercise intensities and is important in the prevention of GI symptoms.	5
	Swimming myth. http://www.snopes.com/oldwives/hour-wait.asp	Those swimming within one hour of eating will cramp up and drown was found to be a myth by this popular website. There has not been one drowning death attributed to swimming within one hour of eating. Although stomach cramps are possible with any strenuous activity after eating because activity diverts blood away from the functioning digestive tract.	7

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Author(s)	Full Citation	Summary of Article	Level of Evidence
Duke University Health System: Duke Health consumer information portal.	Myth or Fact: Wait 30 minutes after eating to go swimming. www.dukehealth.org . Updated April 22, 2010.	The common belief that the blood going to your digestive tract after eating steals the blood needed to keep your arms and legs pumping during swimming is unfounded, says Gerald Endress, exercise physiologist and director of the Duke Diet & Fitness Center. According to Endress, the body does supply extra blood to aid in digestion, but not enough blood to keep your arm and leg muscles from properly functioning. Your biggest danger related to eating and swimming is probably a minor cramp.	7
Melissa Stoppler, M.D. & William C. Shiel, Jr, MD, FACP, FACR	Debunking Summer Health Myths. www.medicinenet.com/script/main/art.asp?articlekey=47368	While it's true that the digestive process does divert the circulation of the blood toward the gut and to a certain extent, away from the muscles, the fact is that an episode of drowning caused by swimming on a full stomach has never been documented. Neither the American Academy of Pediatrics nor the American Red Cross makes any specific recommendations about waiting any amount of time after eating before taking a swim. There's a theoretical possibility that one could develop a cramp while swimming with a full stomach, but a person swimming in a pool or controlled swimming area could easily exit the water if this happens. As with any exercise after eating, swimming right after a big meal might be uncomfortable, but it won't cause you to drown.	7
Discovery Health Channel	Dr. Know: Swimming after a meal. [video] DiscoveryHealth, May 16, 2006. http://health.discovery.com/videos/dr-know-swimming-after-eating.html	Swimming after eating does not cause muscle cramps or drowning. You would need to swim for miles in order to cramp up. Swimming after a meal is bad for you is a myth.	7
Committee on Injury Violence, and Poison Prevention Weiss J	Prevention of Drowning. <i>Pediatrics</i> . 2010;126(1):e253-262.	No mention of eating or stomach cramps as a contributing factor to drowning deaths or near-drowning events.	5
Committee on Injury, Violence, and Poison Prevention	Prevention of Drowning in Infants, Children, and Adolescents. <i>Pediatrics</i> . 2003;112(2):437-439.	No mention of eating or stomach cramps as a contributing factor to drowning deaths or near-drowning events.	5

Author(s)	Full Citation	Summary of Article	Level of Evidence
Kohnle, D.	True or False: Wait a Half-hour After Lunch Before Going Back in the Water—Or You Just Might Drown - HealthLibrary. Available at: http://healthlibrary.epnet.com/GetContent.aspx?token=5344349d-8fbc-446e-8ae5-03a924025f8c&chunkid=157006	“No cases of drowning caused by swimming on a full stomach have ever been documented. In addition, neither the American Academy of Pediatrics, the US government’s Consumer Product Safety Commission, nor the Red Cross offers any guidelines or warnings related to swimming after eating.” “If a muscle cramp from eating were to occur, most swimmers would likely be able to get themselves out of the water before impairment became so severe that drowning occurred. However, children should always be well-supervised while swimming, no matter when they last ate.”	7
Hoecker, J.	Children’s swimming: Keep health risks at bay - MayoClinic.com. Available at: http://www.mayoclinic.com/health/childrens-health/CC00003 [Accessed November 15, 2010].	“It’s OK to swim immediately after a light meal or snack. If your child feels lethargic after eating a heavy meal, encourage him or her to take a break before swimming. “	6
Carroll A, Carroll AE, Vreeman R.	<i>Don’t Swallow Your Gum!: Myths, Half-Truths, and Outright Lies about Your Body and Health</i> . Macmillan; 2009. “You should wait an hour after eating before you go swimming”. Page 138-9.	Authors could find no evidence to support the myth and note that there are no reported cases of drowning or near-drowning due to eating.	6
World Health Organization	WHO Drowning. Available at: http://www.who.int/media-centre/factsheets/fs347/en/ [Accessed November 18, 2010].	No mention of eating before swimming as a risk factor for drowning. No recommendation to avoid eating before swimming.	6
CDC	CDC - Injury - Water-Related Injuries Fact Sheet. Available at: http://www.cdc.gov/HomeandRecreationalSafety/Water-Safety/waterinjuries-fact-sheet.html [Accessed November 15, 2010].	Eating before swimming is not mentioned as a risk factor for drowning and no recommendations to avoid eating before swimming are made.	6

Level of Evidence	Definitions (See manuscript for full details)
Level 1a	Population based studies, randomized prospective studies or meta-analyses of multiple studies with substantial effects
Level 1b	Large non-population based epidemiological studies or randomized prospective studies with smaller or less significant effects
Level 2a	<u>Prospective</u> , controlled, non-randomized, cohort or case-control studies
Level 2b	<u>Historic</u> , non-randomized, cohort or case-control studies
Level 2c	<u>Case series</u> ; convenience sample epidemiological studies
Level 3a	Large observational studies
Level 3b	Smaller observational studies
Level 4	Animal studies or mechanical model studies
Level 5	Peer-reviewed, state of the art articles, review articles, organizational statements or guidelines, editorials, or consensus statements
Level 6	Non-peer reviewed published opinions, such as textbook statements, official organizational publications, guidelines and policy statements which are not peer reviewed and consensus statements
Level 7	Rational conjecture (common sense); common practices accepted before evidence-based guidelines
Level 1-6E	Extrapolations from existing data collected for other purposes, theoretical analyses which is on-point with question being asked. Modifier E applied because extrapolated but ranked based on type of study.