

## Patients with Irritable bowel syndrome : possible hypersensitivity to Capsicum

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**Objective** : *To determine the effect of capsaicin-containing red pepper chilli (Capsicum frutesces) on colonic transit time in patients with irritable bowel syndrome (IBS) in order to show that they are hypersensitive to capsicum.*

**Setting** : *King Chulalongkorn Memorial Hospital.*

**Design** : *Prospective study.*

**Subjects** : *Performed in twelve IBS patients and twelve healthy volunteers, age 15 - 60 years.*

**Methods** : *Total colonic transit time was measured using radiopaque polyurethane markers. On two separate weeks the identical protocol was carried out with either a sugar or a capsicum capsule taken on three consecutive mornings with 2 capsules of radiopaque markers. Abdominal x-rays were taken on days 4. The calculations were made by the formula : Colonic transit time (hours) = Sum of markers x 1.2.*

**Results** : *In the patient group, the colonic transit time before and after capsicum ingestion was  $23.15 \pm 16.21$  and  $19.60 \pm 16.87$  hours, respectively ( $P = 0.472$ ). In the Control group, the colonic transit time before and after capsicum ingestion was  $25.10 \pm 19.51$  and  $17.35 \pm 15.36$  hours, respectively ( $P = 0.218$ ). There was no significant difference of colonic transit time after capsicum ingestion between the patient and control groups.*

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**Conclusions** : *The responses of IBS patients to capsicum do not differ from healthy subjects when radiopaque markers are used to measure colonic transit time.*

**Key words** : *Irritable bowel syndrome, Capsicum, Capsaicin, Colonic transit time.*

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- วัตถุประสงค์** : เพื่อศึกษาผลของพริก (*Capsicum frutesces*) ในผู้ป่วยโรค Irritable bowel syndrome เพื่อดูปฏิกิริยาความไวของลำไส้ใหญ่โดยวัดด้วยวิธี colonic transit time
- สถานที่ที่ทำการศึกษา** : โรงพยาบาลจุฬาลงกรณ์
- รูปแบบการศึกษา** : การศึกษาแบบทำการทดลองมีกลุ่มควบคุม
- ประชากรที่ศึกษา** : ผู้ป่วยที่วินิจฉัยว่าเป็น Irritable bowel syndrome และกลุ่มควบคุม กลุ่มละ 12 คน มีอายุระหว่าง 15 - 60 ปี
- วิธีการศึกษาและวัดผล** : ตรวจวัดปฏิกิริยาตอบสนองของลำไส้ใหญ่ก่อนและหลังได้รับ capsicum ด้วยวิธี colonic transit time ซึ่งใช้เครื่องหมายที่สามารถเอ็กซเรย์มองเห็นได้ (radiopaque markers) โดยมีลักษณะต่างๆ กัน ให้รับประทานวันละ 2 เม็ด ร่วมกับน้ำตาลหรือ capsicum บรรจุเม็ด ติดต่อกันเป็นเวลา 3 วัน แล้วทำการตรวจเอ็กซเรย์ช่องท้องในวันที่ 4 นับจำนวนเครื่องหมายที่ได้ คำนวณตามสูตร colonic transit time (ชั่วโมง) = ผลรวมของเครื่องหมาย x 1.2
- ผลการศึกษา** : ในกลุ่มผู้ป่วย พบว่าค่าของ colonic transit time ก่อนและหลังได้รับ capsicum เป็น  $23.15 \pm 16.21$  และ  $19.60 \pm 16.87$  ชั่วโมงตามลำดับ ( $P = 0.472$ ) ในกลุ่มควบคุมพบว่าค่าของ colonic transit time ก่อนและหลังได้รับ capsicum เป็น  $25.10 \pm 19.51$  และ  $17.35 \pm 15.36$  ชั่วโมงตามลำดับ ( $P = 0.218$ ) ไม่พบความแตกต่างอย่างมีนัยสำคัญทางสถิติของค่า colonic transit time หลังได้รับ capsicum ในผู้ป่วยทั้งสองกลุ่ม
- วิจารณ์และสรุปผล** : ปฏิกิริยาตอบสนองของลำไส้ใหญ่ในผู้ป่วย Irritable bowel syndrome ต่อ capsicum ไม่ต่างกับคนปกติเมื่อตรวจวัดด้วยวิธีการนับเครื่องหมายจากภาพเอ็กซเรย์ในการหา colonic transit time

Irritable bowel syndrome (IBS) is recognized widely as one of the most common gastrointestinal disorders. The reported prevalence of IBS symptoms in Western adult populations is 11 - 25 % with females outnumbering males by 2:1.<sup>(1)</sup>

IBS is a motor disorder clinically consisting of altered bowel habits, abdominal pain, and the absence of any detectable organic pathologic causes. The diagnosis of IBS relies on a recognition of positive clinical features as well as on the meticulous exclusion of the many other disorders that have similar manifestation. Manning criteria<sup>(2)</sup> or criteria modified by an international working team (Rome),<sup>(3)</sup> help distinguish IBS from organic disease.

The pathophysiology of this syndrome can partly be explained by hypersensitivity to psycho-sensory stimulation. IBS patients may have "visceral hyperalgesia" making them more sensitive to motility-induced gut spasm and distention.<sup>(4)</sup>

A study of the prevalence of IBS in a non-Western population<sup>(5)</sup> reported that people who had symptoms satisfying the criteria of "spastic irritable colon" had abdominal pain after eating spicy food more than people who didn't have that symptom complex. Capsaicin is the main active component of red peppers and paprika, inducing hot taste, and is known to activate afferent nerve fibers.<sup>(6)</sup>

The aim of this study is to determine the effects of capsaicin-containing red pepper chilli (*Capsicum frutesces*) on colonic transit time in IBS patients in comparison with healthy control subjects.

#### Materials and Methods

Subjects: This study was performed in twelve IBS patients (patients) and twelve healthy volunteers (controls), aged 15 - 60 years, who had given their

written informed consent. The complaint of IBS patients included abdominal pain, discomfort, bloating or feeling of abdominal distention at least 3 months of continuous or recurrent symptoms. All patients obtain negative stool hemocult slide test and normal sigmoidoscopy or a negative finding double contrast barium enema. Criteria for participation included a usual stool frequency of between 3 stools daily and 3 stools weekly. Exclusion criteria were subjects who had a history of alimentary tract surgery, pregnant or lactating women, history of kidney, endocrine, liver or gastrointestinal (GI) disease: and those with a history of hypersensitivity to spicy foods. Subjects were asked to avoid the use of any medication known to influence GI motility for at least 1 week before the study. All subjects were asked to maintain their usual diet for the duration of the study.

Colonic transit studies:<sup>(7,8)</sup> Total colonic transit time was measured using radiopaque polyurethane markers containing 40 % barium sulfate (P. & A. Mauch, CH-4142 Muchenstein (Fabrication). Six gelatin capsules, each containing 10 radiopaque markers of the various shapes, were administered on three consecutive mornings. On two separate weeks the identical protocol was carried out with either a sugar or a capsicum capsule (average  $0.494 \pm 0.022$  gram of dry *C. frutesces* per capsule) taken on three consecutive mornings with 2 capsules of radiopaque markers. Abdominal x-rays were taken on day 4. The different marker types were easily distinguishable on abdominal film (Figure 1). Colonic transit time was calculated by the formula :

Colonic transit time (hours) = sum of markers x (time between ingestions / number of the markers per capsule).

= sum of markers x 1.2

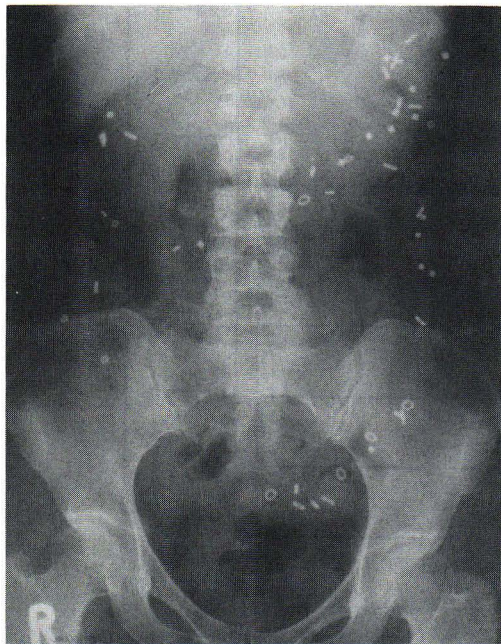


Figure 1. Plain radiograph of the abdomen showing the radiopaque markers.

**Statistical analysis**

The student's t test was used for parametric data, and X<sup>2</sup> analysis for non-parametric data. Statistical significance was judged by p < 0.05 in all instances.

**Results**

The characteristics data of all subjects is shown in Table 1. There was no significant difference

between the Patient and Control groups in any of the variables. The baseline mean colonic transit time was 23.15 ± 16.21 hours for the Patient group and 25.10 ± 19.51 hours for the Controls (Figure 2).

In the Patient group, the mean colonic transit time before and after capsicum ingestion was 23.15 ± 16.21 and 19.60 ± 16.87 hours, respectively (P = 0.472) (Figure 3).

In the Control group, the mean colonic transit time before and after capsicum ingestion was 25.10 ± 19.51 and 17.35 ± 15.36 hours, respectively (P = 0.218) (Figure 4).

There was no significant difference of mean colonic transit time after capsicum ingestion in either the Patient or the Control group (Figure 5).

**Table 1.** Characteristic data of all subjects.

Variable	Patients (12)	Control (12)
Age (yr.)	36.83 ± 11.65	40.17 ± 8.30
Sex (M/F)	2/10	3/9
Stool frequency per wk.	9	7
Baseline colonic transit time (hr.)	23.15 ± 16.21	25.10 ± 19.51

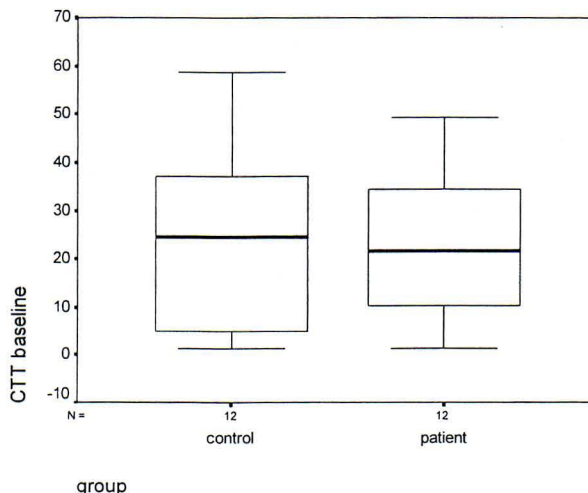


Figure 2. Baseline colonic transit time of all subjects.

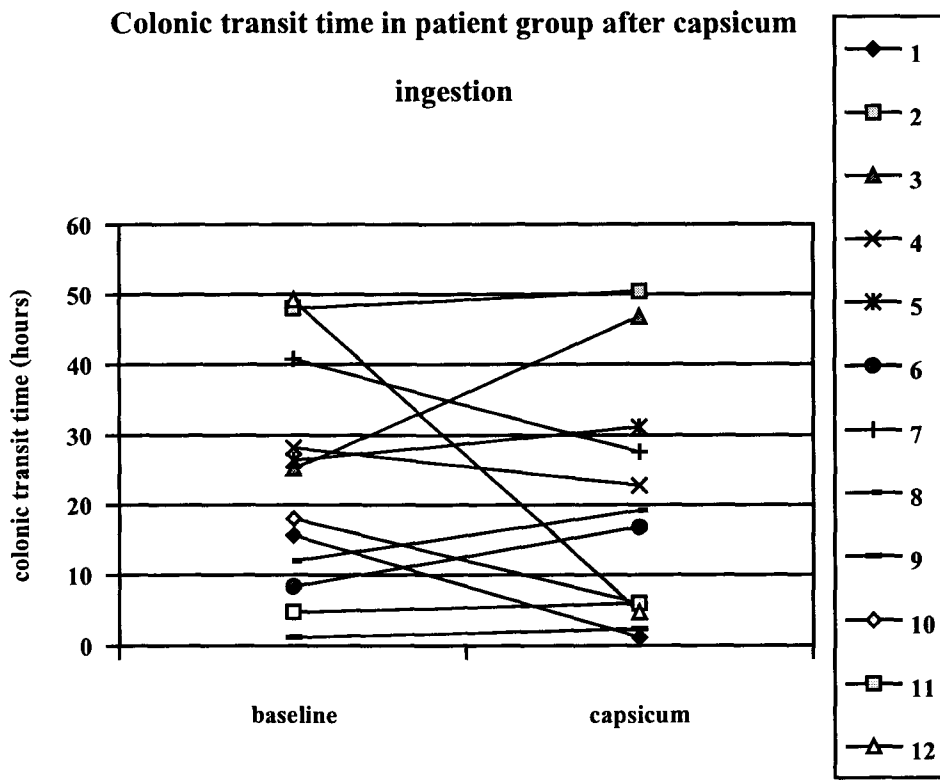


Figure 3. Colonic transit time before and after capsicum ingestion in IBS patients.

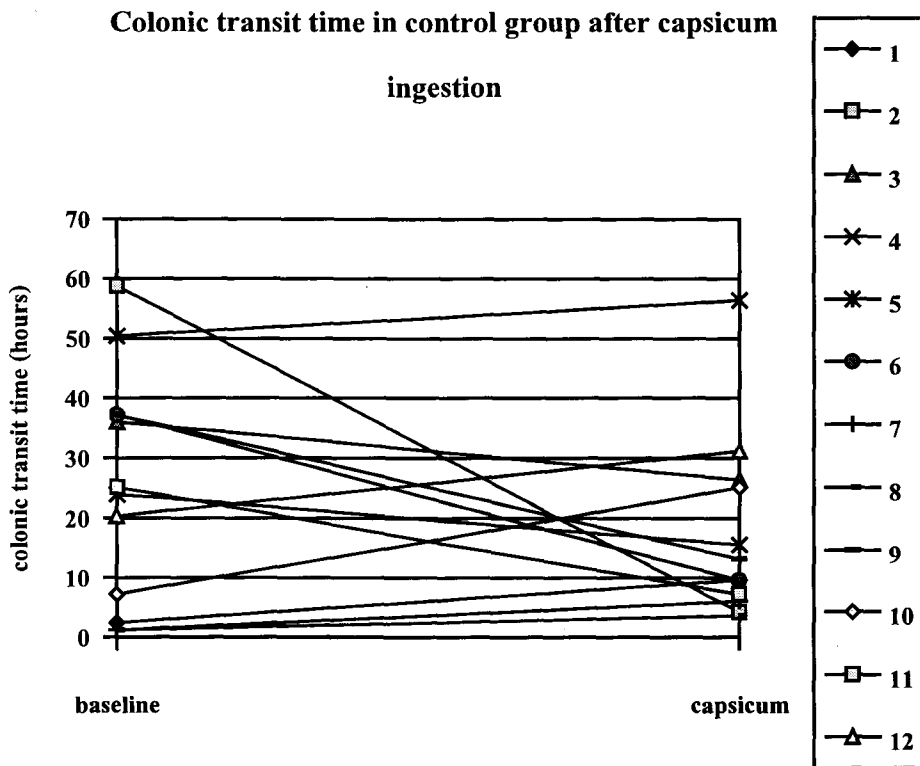


Figure 4. Colonic transit time before and after capsicum ingestion in Control.

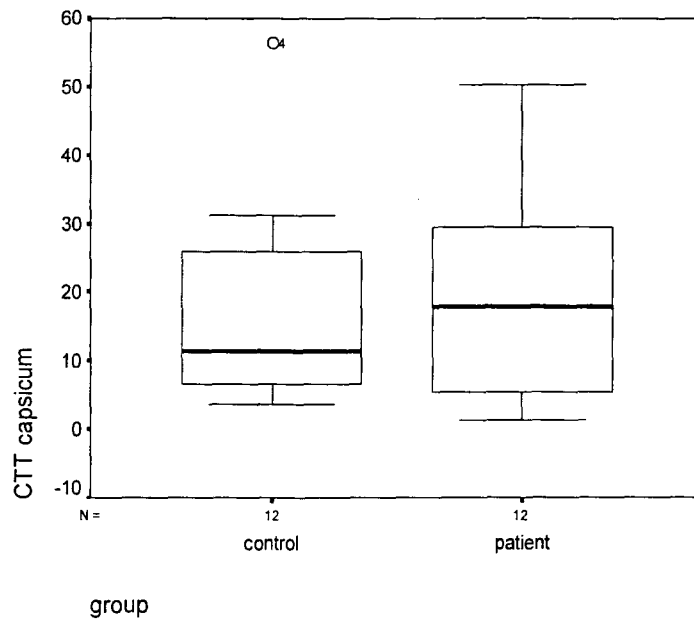


Figure 5. Colonic transit time of all subjects after capsicum ingestion.

### Discussion

Capsaicin (8-methyl-N-vanillyl-6-nonenamide) is the main active component of red pepper, inducing hot taste, and is known to activate afferent nerve fibers.<sup>(6)</sup> Short term administration of capsaicin to peripheral nerve endings is known to have an excitatory action on thin unmyelinated primary afferent neurons and simultaneously stimulates the release of substance P, calcitonin gene - related peptide (CGRP), and possible other neurotransmitters from the peripheral endings of the sensory neurons.<sup>(10-11)</sup> In in-vitro studies using distal colon of rabbits, capsaicin caused a transient stimulation of motility followed by an inhibition of the contractile activity.<sup>(9)</sup>

In contrast to these animal studies, the effect of capsaicin on human gastrointestinal motility is mostly unknown. Ethical consideration and liability, due to possible neurotoxic effects, which, however, occur only at higher dosages, make it difficult to get approval for studies involving oral application of pure capsaicin to human volunteers. In humans, red pepper

in different dosages and preparations failed to show a significant effect on oracecal transit time.<sup>(10-11)</sup>

Since IBS patients are known to have visceral hyperalgesia,<sup>(4)</sup> and spicy food has been suggested as a possible indicator of such a hypersensitivity,<sup>(5)</sup> we tried to show this possible hypersensitivity by this study. However, the results are in no way supportive of this hypothesis. The explanation is that either our hypothesis is false or the test procedure of colonic transit time is too crude to measure the difference. In this study we use *Capsicum frutesces* and there are distinct structural differences between this compound and the capsaicinoids, especially the synthetic analog nonivamide.<sup>(12)</sup> We cannot rule out the another ingredient of this chilli could influence the gastrointestinal motility.

Transit through the colon as measured by this technique was not related to age or gender. However, this study demonstrated that capsicum appeared not to influence colonic transit in healthy or IBS patients.

## Conclusions

The responses of IBS patients to capsicum in *Capsicum frutesces* do not differ from healthy subjects when radiopaque markers are used to measure colonic transit time.

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